

**ADDENDUM NO. 2**

**DATE: 06/07/21**

**PROJECT:**

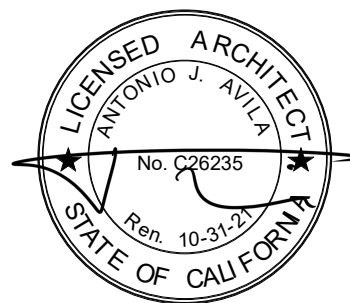
Addams Elementary School Building Addition and Modernization  
FUSD Bid No 22-01

**OWNER:**

FRESNO UNIFIED SCHOOL DISTRICT  
4600 N. Brawley Ave  
Fresno CA 93722

**ARCHITECT:**

DARDEN ARCHITECTS, INC.  
Attention: Antonio J. Avila  
6790 N. West Avenue  
Fresno, California 93711  
T. (559) 448-8051  
F. (559) 446-1765



DARDEN PROJECT NO. 1725  
DSA File Nos. 10-48  
DSA APPL. NO. 02-117220

It will be the responsibility of the General Contractor to submit the information contained in this addendum to all its subcontractors and suppliers. Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject Bidder to disqualification.

The following additions, deletions, and revisions to the SHEETS and Project Manual are hereby made and do become a part of these Contract Documents.

## **INDEX OF ADDENDA TRANSMITTED HEREWITH**

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### **PROJECT MANUAL:**

#### **BIDDING AND CONTRACT REQUIREMENTS:**

**CHANGES TO BIDDING REQUIREMENTS** ..... AD2-CBR01 THRU AD2-CBR08

### **SPECIFICATIONS:**

**CHANGES TO SPECIFICATIONS** ..... AD2-SP01 THRU AD2-SP31

### **SHEETS:**

#### **CHANGES TO SHEETS:**

CIVIL ..... AD2-C01 THRU AD2-C09  
ARCHITECTURAL ..... AD2-A01 THRU AD2-A08  
MECHANICAL ..... AD2-M01  
PLUMBING ..... AD2-P01 THRU AD2-P06  
ELECTRICAL ..... AD2-E01 THRU AD2-E05

### **ATTACHMENTS:**

#### **DOCUMENTS OR SPECIFICATIONS:**

Work Area Site Plans ..... (Pages 1 thru 6)  
Spec Section 08 70 10- HARDWARE GROUP SCHEDULES ..... (Pages 1 thru 5)  
Spec Section 10 21 13 - TOILET PARTITIONS ..... (Pages 1 thru 7)  
Spec Section 23 09 23- BUILDING AUTOMATION SYSTEM ..... (Pages 1 thru 20)  
Spec Section 28 16 00 – INTRUSION DETECTION (Page 18 only) ..... (Pages 1)  
Spec Section 282000 – ELECTRONIC SURVEILLANCE ..... (Pages 1 thru 29)  
Spec Section 322113 – CHAIN LINK FENCING ..... (Pages 1 thru 4)  
APPENDIX “A” – STORM WATER PROTECTION PLAN ..... (Pages 1 thru 419)  
APPENDIX “B” – INTERIOR COLOR SCHEDULE ..... (Pages 1 thru 9)  
APPENDIX “C” – EXTERIOR COLOR SCHEDULE ..... (Pages 1 thru 6)  
APPENDIX “D” – HAZARDOUS MATERIALS REPORT ..... (Pages 1 thru 115)

### **SHEETS:**

CIVIL ..... AD2-CX01 thru AD2-CX09.  
ARCHITECTURAL ..... AD2-AX01 thru AD2-AX09.  
MECHANICAL ..... AD2-MX01  
PLUMBING ..... AD2-PX01 thru AD2-PX02.  
ELECTRICAL ..... AD2-EX01 thru AD2-EX05.

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## PROJECT MANUAL:

## BIDDING AND CONTRACT REQUIREMENTS:

### CHANGES TO BIDDING REQUIREMENTS:

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**AD2-CBR01 Refer to 00 21 00- INFORMATION TO BIDDERS:**

1. Refer Architect's/ Engineer's Estimate Revise to indicate the following
  - a. *The Architect/Engineers' estimate for this project is around **\$9,500,000***

**AD2-CBR02 Refer to Bid Requirements:**

1. A Commissioning Agent will be hired by the District. A commissioning Specification cannot be provided at this time, the following Items shall be commissioned in this project:
  - a. FIRE SPRINKLER System
  - b. PLUMBING Systems
  - c. MECHANICAL Systems
  - d. ENERGY MANAGEMENT Systems
  - e. ELECTRICAL Systems
  - f. COMMUNICATIONS Systems
  - g. ELECTRONIC SAFETY AND SECURITY Systems

**AD2-CBR03 Add Attached Work Area Overall Site Plan**

1. Add attached Work Area Overall Site Plan identified as AD2-CBR1.

**AD2-CBR04 Add Attached Work Area Overall Site Plan – Work Area 1**

1. Add attached Work Area Overall Site Plan identified as AD2-CBR2.

**AD2-CBR05 Add Attached Work Area Overall Site Plan – Work Area 2a**

1. Add attached Work Area Overall Site Plan identified as AD2-CBR3.

**AD2-CBR06 Add Attached Work Area Overall Site Plan – Work Area 2b**

1. Add attached Work Area Overall Site Plan identified as AD2-CBR4.

**AD2-CBR07 Add Attached Work Area Overall Site Plan – Work Area 3**

1. Add attached Work Area Overall Site Plan identified as AD2-CBR5.

**AD2-CBR08 Add Attached Work Area Overall Site Plan – Work Area 4**

1. Add attached Work Area Overall Site Plan identified as AD2-CBR6.

## SPECIFICATIONS:

### CHANGES TO SPECIFICATIONS:

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**AD2-SP01 Refer to Specification Section 00 72 00.05 – PROTECTION OF WORK AND PROPERTY:**

1. Refer to D, insert the following:  
*9) Due to the high rate of crime and vandalism on site and within the adjacent neighborhood, the Contractor shall be responsible for providing 24-hour supervision/ security of the project work areas for the entire duration of the contract. Contractor shall be responsible for the areas of work until buildings/ portion of the site have been turned over and accepted by the Owner. Written notification shall be provided to the Owner 48 hours in advance to removing supervision/ security in any area.*

**AD2-SP02 Refer to Specification Section 01 11 13– SUMMARY OF WORK:**

1. Refer to Part 1.1.A, Remove and replace paragraph with the following:
  - a. *A. Work Included: Construction of BASE BID Portions of the work for ADDAMS ES NEW KINDERGARTEN, ADMINISTRATION BUILDING, PORTABLE CLASSROOMS, AND MODERNIZATION, in Fresno, California. The Work is Defined as all material, labor, equipment, and services necessary to do all work shown on the drawings and called for in the Specifications.*
2. Refer to Part 1.7.A. 1, Remove and replace section with the following:
  - 1. Work Area 1: Interim Housing, Play Structure Placement and PG&E Transformer:**
    - a. *Once the Notice to Proceed (NTP) is issued to the contractor, they shall have access to the portion of the site related to the New & Relocated Portables Building , Interim Housing Portable Buildings (Separate DSA Application), New Play Structure, West Parking lot improvements and PG & Transformer.*
    - b. *Utility connections or tie-ins that will affect other site buildings must be done after hours or during the summer, so as not to negatively affect the function of the existing buildings on site.*
  - Work Area 2a: Kindergarten Building M, Early Learning Play Area, and Shade Structure:**
    - a. *Once all portables are placed and existing portables have been vacated (allow 3-days for owner move-in, this can be concurrent with the end of the previous work area ) , the contractor will have full access to Work Area 2a.*
    - b. *Which includes Kindergarten Building M, Early Learning Play area, Shade Structure, and Site work improvements.*
  - Work Area 2b: Staff Parking Lot, Drop-off and Modernize Existing Portables:**
    - a. *Once summer begins the contractor shall have access to the area designated for the Staff Parking Lot, drop-off and Existing Portables to be Modernized. This work must be completed and available for use prior to the commencement of the new School Year.*
  - Work Area 3: Administration Building L and East Visitor Parking Lot**
    - a. *Once the Kindergarten Classroom building is complete & occupied (allow 3-days for owner move-in, this can be concurrent with the end of the previous work area ), and the existing portables have been vacated; the contractor shall have access to*

the portion of the site related to the construction of the Administration Building L and East Visitor Parking Lot.

**Work Area 4: Building B Classroom Modernization and Playfields:**

a. Once Building L is completed & occupied (allow 3-days for owner move-in, this can be concurrent with the end of the previous work area) , the remodel of the admin area in the Existing Building B shall begin. This also includes turning the storage room into an Exterior hallway.

b. Once all interim portables are emptied, remove the interim portables and associated site work.

c. Once all the interim portables are removed, begin work on the Baseball and Soccer fields and associated site work.

3. Refer to Part 1.7.B.1 , Remove and replace section with the following:

1. **Work Area 1: Interim Housing, Play Structure Placement and PG& E Transformer:**

a. Start Date: NTP Date: **Tentatively 08/12/2021**

b. Duration: - **78 days** Completion Milestone #1 Date: **10/28/2021**

2. **Work Area 2a: Kindergarten Building M, Early Learning Play Area, and Shade Structure:**

a. Start Date: **10/28/2021**

b. Duration: - **366 days** Completion Milestone #2 Date: **10/28/2022**

3. **Work Area 2b: Staff Parking Lot, Drop-off and Modernize Existing Portables:**

a. Start Date: **06/13/2022**

b. Duration: - **57 days** Completion Milestone #3 Date: **08/08/2022**

4. **Work Area 3: Administration Building L and East Visitor Parking Lot:**

a. Start Date: **10/28/2022**

b. Duration: - **245 days** Completion Milestone #4 Date: **06/29/2023**

5. **Work Area 4: Building B Classroom Modernization and Playfields:**

a. Start Date: **06/12/2023**

b. Duration: - **61 days** Completion Milestone #4 Date: **08/11/2023**

**AD4-SP03 Refer to Specification Section 01 21 00 - ALLOWANCES:**

1. Refer to Section 3.3 Schedules, strike out Allowance No. 1, it will not be utilized in this project.

**AD4-SP04 Refer to Specification Section 01 23 00 - ALTERNATES:**

1. Refer to Section 3.1 Schedules, Add the following:
  - a. **A. ADDITIVE ALTERNATE BID NO. 1: MODERNIZATION OF WEST STAFF PARKING LOT**
    - i. Included in this alternate is the cost to remove and replace the existing asphalt in the East parking lot, including providing Heavy Duty concrete at the Accessible parking stalls.
    - ii. Base bid shall entail a slurry coat of the existing lot and restriping of all stalls.

- AD2-SP05 Refer to Specification Section 01 29 73.01– SCHEDULE OF VALUES:**
1. Refer to Part 2.1.A, insert the following:
    4. *Two separate DSA applications are being used for this bid. One for the interim housing portables and one for the main Addition & Modernization project. The project costs shall be tracked separately and provided to the Architect and Owner to review periodically throughout the project and at project closeout for each application for DSA purposes. The schedule of values and pay applications shall be separated accordingly.*
- AD2-SP06 Refer to Specification Section 01 64 00– OWNER-FURNISHED ITEMS:**
1. Refer to Part 3.4 Schedules, insert the following:
    - a. C. Play Structures OFCI
- AD2-SP07 Refer to Specification Section 03 33 00– CAST-IN-PLACE CONCRETE:**
1. Refer to Part 2.1.A.19 Truncated Domes:
    - a. Strike out this section
    - b. refer to 32 33 10- TACTILE DETECTABLE WARNING SURFACE TILE for requirements.
- AD2-SP08 Refer to Specification Section 07 18 50 – VAPOR-ALKALINITY CONTROL**
1. Refer to 1.1, c. Cost of work:
    - a. Strike out Item 1. No additional line item shall be included in the bid form this work shall be included in the base bid scope. Provide a separate line item in the Schedule of Values for Evaluation by the Owner and Architect.
- AD2-SP09 Refer to Specification Section 07 31 13-SHINGLES:**
1. Refer to 1.7 B., 1/. A., 2. Revise Warranty Period from 30 years to "Fifty (50) Years."
  2. Refer to 1.7 B., 1/. A., 2. Add 3) as follows:
    - 3) Special Warranty, No Dollar Limit (NDL): Twenty (20) Years.
      - a). *Special Warranty for SBS Shingles: Manufacturer's standard or customized form, without monetary limitation (NDL), in which manufacturer agrees to repair or replace components of asphalt shingle roofing system that fail in materials or workmanship within specified warranty period.*
      - b). *Special warranty shall include asphalt shingles, flashings, roof insulation, nail base, and other components of roofing system.*
  3. Refer to 2.1 A, 4., a. Revise Specified Ridge Vent manufacturer to read:
    - i. AIR VENT, INC. "Shingle Vent"
  4. Refer to 2.3 B. Revise to "Vapor-Retarding Underlayment."
  5. Refer to 2.3 B. Revise sub paragraphs 1 and 2 as follows:
    1. Base Layer:
      - a. Synthetic Underlayment: UV-resistant polypropylene polymer fabric; e in compliance with ASTM D 226 "Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing" and D 4869 "Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing" and as recommended by system manufacturer.

- 1). Vapor Transmission: Less than 0.05 perms.
- 2) Thickness: 15 mil minimum.
- 3) Tensile Strength, MD per ASTM D 5034: 107 lbs.
- 4) Tensile Strength, MD per ASTM D 5034: 107 lbs.
- 5) Tear Strength, MD per ASTM D 4533: 19.1 lbs.
- 6) Tear Strength, CD per ASTM D 4533: 24.9 lbs.
2. Second Layer:
  - a. SBS Modified roofing membrane with a mineral release surface that complies with ASTM D4601 "Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing", ASTM D 4689 "Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing" and ASTM D 226 "Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing".

- AD2-SP10 Refer to Specification Section 07 51 13- BUILT-UP ROOFING:**
1. Omit Section 07 51 13- BUILT-UP ROOFING, this will no longer be used on this project.
- AD2-SP11 Refer to Specification Section 087000 – HARDWARE**
1. Refer to Hardware Groups where Hager Hinge BB1268 is indicated.
    - a. Strike out this hinge product number and replace with BB1168.
  2. Refer to Hardware Groups:22E and 222E
    - a. Only one set of door closers are required for these groups omit additional line item listed.
  3. Refer to Hardware Groups, Remove and replace existing Groups with the attached section indicated with an AD2 in the right-hand corner.
- AD2-SP12 Refer to Specification Section 09 24 00 CEMENT PLASTER:**
1. Remove all references to Elastomeric Finish Coat with Integral color, The Cement Plaster System shall be painted with the appropriate Painting System.
- AD2-SP13 Refer to Specification Section 09 50 00 ACOUSTICAL CEILINGS:**
1. Refer to 3.6.A.1. Type ACT-I, Replace with the following:
    - i. Cirrus Second Look" Beveled Tegalur 15/16" ( Item No. 513)
- AD2-SP14 Refer to Specification Section 09 67 23 RESINOUS FLOORING:**
1. Refer to section 2.1.A:
    - i. The Preferred Resinous Flooring Material shall be Sherwin Williams/ General Polymers Ceramic Carpet System. Color to be selected by Architect from Full range of Manufacturers standard colors.
  2. Refer to section 2.2.B.1:
    - i. A Nominal ¼" thick system shall be provided.
- AD2-SP15 Refer to Specification Section 100500- MISCELLANEOUS SPECIALTIES:**
1. Refer to Section 3.3, Add the following:
    3. Vertical Louver Blinds:
      - a. Provide vertical Louver Blinds, Model #EL "Elite Blind", as

manufactured by LOUVERDRAPE, INC.

- i. Blinds are to be installed at **all** Interior and Exterior windows in New Classroom Building and Portable Classrooms.
- ii. Blinds shall cover all glass areas. Field verify height of blinds before fabricating.
- iii. Do not provide a bottom chain.
- iv. Installer shall be responsible to report to the Architect any clearance problems that would prevent proper operation of the blinds. Submittals shall include direction of draw and stacking locations.
  - a. Vane Description:  
Unperforated.
  - b. Louver Width: 3-1/2 inches.
  - c. Vane Material: PVC.
  - d. Vane Profile: Curved.
  - e. Vane Directional Control: Chain.
  - f. Traversing Control: Manual with Chain.
  - g. Draw: As indicated on the drawings.
  - h. Mounting: Recessed Ceiling track as detailed.
  - i. Color:
    - 1) As selected by Architect from manufacturer's full range of colors produced for vertical blinds specified.
  - j. Flame Spread Index of PVC vane material: Class A per ASTM E 1264 "Classification for Acoustical Ceiling Products", with a Flame Spread of 20.
  - k. Smoke Density Developed Index of PVC vane material: 205 in accordance with ASTM E 84 "Test Method for Surface Burning Characteristics of Building Materials".

**AD2-SP16 Refer to Specification Section 10 21 13 TOILET PARTITIONS:**

1. Replace section with the attached section 10 21 13 Toilet Partitions, identified with an AD2 in the upper right-hand corner.

**AD2-SP17 Refer to Specification Section 22 00 00 PLUMBING:**

1. Add the following:
  - i. *All Non- Metallic pipe shall be provided with a 12 Ga. Solid Copper tracer wire with colored insulation. (colored insulation and tape shall match USA Marking protocols; water: Blue, Reclaimed water: Purple, Sewer: Green, Gas: Yellow, Communications: Orange, Ect...)*

**AD2-SP18 Refer to Specification Section 23 09 23- BUILDING AUTOMATION SYSTEM ( BAS):**

1. Remove and replace entire section with the attached 23 09 23- BUILDING AUTOMATION SYSTEM section indicated with an AD2 in the right-hand corner.

**AD2-SP19 Refer to Specification Section 26 50 00- LIGHTING:**

1. Refer to Subsection 2.06 Controls, remove this sub-section in its entirety.

- AD2-SP20 Refer to Specification Section 27 20 00- DATA COMMUNICATIONS:**
1. The Contractor shall furnish Cisco WSC3850-12X48UL 48-Port Switch with PWR-C1-1100XAC/2 Power Supplies in a quantity Sufficient to Energize every Data Port.
- AD2-SP21 Refer to Specification Section 27 30 00- VoIP COMMUNICATIONS SYSTEMS:**
1. Remove this section in its Entirety
    - a. The Contractor shall terminate phone outlets to a TE-66 block mounted at the back of the IDF with CAT6 Cable. The incoming 25-pair cable shall be terminated to the same location. The contractor is responsible for cross connecting the trunk cable at the existing phone system under direction of FUSD Electronics.
    - b. Phone Handset will be furnished by the OWNER.
- AD2-SP22 Refer to Specification Section 28 16 00- INTRUSION DETECTION:**
1. Refer to section 2.04 Control Panel, The DMP head end shall be Model XR550DNL-G.
  2. Refer to page 18 of this section, remove and replace with attached sheet indicated with an AD-2 in the upper right-hand corner.
- AD2-SP23 Refer to Specification Section 28 13 00- ELECTRONIC ACCESS CONTROL:**
1. Remove Specification Section 28 16 00- ELECTRONIC ACCESS CONTROL, it will not be used in this project
- AD2-SP24 Refer to Specification Section 28 20 00- ELECTRONIC SURVEILLANCE:**
1. Remove and Replace Specification Section 28 20 00- ELECTRONIC SURVEILLANCE with the attached section indicated with an AD-2 in the upper right-hand corner.
- AD2-SP25 Refer to Specification Section 32 31 13- CHAIN LINK:**
1. Remove and replace entire section with the attached 32 31 13- CHAIN LINK FENCING section indicated with an AD2 in the right-hand corner.
- AD2-SP26 Refer to Specification Section 33 12 00- WATER UTILITIES:**
1. Refer to Part 2.1, add the following:
    - a. *Provide 12 Ga. Solid Copper tracer wire with colored insulation. (colored insulation and tape shall match USA Marking protocols; water: Blue, Reclaimed water: Purple, Sewer: Green, Gas: Yellow, Communications: Orange, Ect...)*
  2. All PVC piping and accessories shall be Schedule 80.
- AD2-SP27 Refer to Specification Section 33 44 00- STORM DRAINAGE:**
1. Refer to Part 2.1, add the following:
    - a. *Provide 12 Ga. Solid Copper tracer wire with colored insulation. (colored insulation and tape shall match USA Marking protocols; water: Blue, Reclaimed water: Purple, Sewer: Green, Gas: Yellow, Communications: Orange, Ect...)*

- AD2-SP28      Add APPENDIX "A" – STORM WATER PROTECTION PLAN:**  
1. Add the attached STORM WATER PROTECTION PLAN to the bid documents identified as Appendix "A".
- AD2-SP29      Add APPENDIX "B" – INTERIOR COLOR SCHEDULE:**  
1. Add the attached INTERIOR COLOR SCHEDULE to the bid documents identified as Appendix "B".
- AD2-SP30      Add APPENDIX "C" - EXTERIOR COLOR SCHEDULE:**  
1. Add the attached EXTERIOR COLOR SCHEDULE to the bid documents identified as Appendix "C".
- AD4-SP31      Add APPENDIX "D" – HAZARDOUS MATERIAL REPORT:**  
1. Add the attached HAZARDOUS MATERIAL REPORT to the bid documents identified as Appendix "D".

## **SHEETS:**

### **CHANGES TO SHEETS:**

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#### **CIVIL:**

- AD2-C01      Refer to Sheet SD/X101- DETAILS:**  
1. Remove sheet SD/X101- DETAILS and replace with the attached sheet indicated with AD2-CX01 in the lower right-hand corner.
- AD2-C02      Refer to Sheet SD/X105- DETAILS:**  
1. Remove sheet SD/X105- DETAILS and replace with the attached sheet indicated with AD2-CX02 in the lower right-hand corner.  
2. Refer to H- Play Equipment:  
i. 1. Play Equipment Details are for Miracle Play Systems Equipment. All Play equipment shall be **furnished by the Owner and installed by the Contractor**. These are District Standard Layouts. Contact Matt Durkin with Miracle Play Structures for additional information.  
1. E-mail: Matt@miracleplaygroup.com, Phone Number: (800) 879-7730  
ii. Contractor Shall be responsible for coordinating delivery to the site, providing storage, and providing equipment necessary for un-hauling from delivery truck and installation.
- AD2-C03      Add Sheet SD/X106- DETAILS:**  
1. Add the attached Sheet AD2-CX03.
- AD2-C04      Refer to Sheet SD/C301- SITE PLAN:**  
1. Remove Sheet SD/C301- SITE PLAN and replace with the attached sheet indicated with AD2-CX04 in the lower right-hand corner.

- AD2-C05      Refer to Sheet SD/C401- HORIZONTAL CONTROL:**
1. Remove Sheet SD/C401- SITE PLAN and replace with the attached sheet indicated with AD2-CX05 in the lower right-hand corner.
- AD2-C06      Refer to Sheet SD/C402- HORIZONTAL CONTROL:**
1. Remove Sheet SD/C402 HORIZONTAL CONTROL and replace with the attached sheet indicated with AD2-CX06 in the lower right-hand corner.
- AD2-C07      Refer to Sheet SD/C403- HORIZONTAL CONTROL TABLE:**
1. Remove Sheet SD/C403 HORIZONTAL CONTROL TABLE and replace with the attached sheet indicated with AD2-CX07 in the lower right-hand corner.
- AD2-C08      Refer to Sheet SD/C501- GRADING AND DRAINAGE PLAN:**
1. Remove Sheet SD/C501 GRADING AND DRAINAGE PLAN and replace with the attached sheet indicated with AD2-CX08 in the lower right-hand corner.
- AD2-C09      Refer to Sheet SD/C601- UTILITY PLAN:**
1. Remove Sheet SD/C601 UTILITY PLAN and replace with the attached sheet indicated with AD2-CX09 in the lower right-hand corner.

**ARCHITECTURAL:**

- AD2-A01      Refer to Sheet SD/A100- DEMOLITION SITE PLAN:**
1. Remove Sheet SD/A100- DEMOLITION SITE PLAN and replace with the attached sheet AD2-AX01.
- AD2-A02      Refer to Sheet SD/A101- OVERALL SITE PLAN:**
1. Remove Sheet SD/A101- OVERALL SITE PLAN and replace with the attached sheet AD2-AX02.
  2. Refer to Existing Portables P28 Through P38, The Following shall be done in each:
    - a. Remove and Replace Carpet & Base
      - i. Provide Walk-off Carpet at Entry Door Area.
    - b. Remove and Replace Ceiling tiles
      - i. Replaces with ACT-1 Ceiling Tiles
    - c. Paint Existing Ceiling Grid
    - d. Provide Typical Classroom Audio Visual Set up as indicated on the Attached AD2-AX08
    - e. Remove and Replace Existing Casework, provide typical classroom set up as indicated on AD2-AX08
      - i. Does not apply to P36 through 38. (including new Sinks)
    - f. Remove and Salvage Existing Smart Boards to the Owner,
    - g. Provide (1) 6'x4' White Board, remove and reinstall existing white boards as necessary to install new board between them.
    - h. Remove and replace Sheet Metal at portable Mod line, corners, ceiling

- Trim and windows, Paint to match existing adjacent Surfaces.
- i. Paint Existing Tack Board
  - i. In each classroom include the removal and replacement of 10 damaged tackboard panels. Panels shall be selected by Owner.
- 3. Refer to sheets AD2-AX08 & AX09 for Typical scope in the Existing Portables.

**AD2-A03 Refer to Sheet X/A201- INTERIOR FINISH SCHEDULE:**

- 1. Remove sheet X/A201- Interior Finish Schedule and replace with the attached sheet indicated with AD2-AX03 in the lower right-hand corner.

**AD2-A04 Refer to Sheet X/A301- CASEWORK SCHEDULE:**

- 1. Remove sheet X/A301- CASEWORK SCHEDULE and replace with the attached sheet indicated with AD2-AX04 in the lower right-hand corner.

**AD2-A05 Refer to Sheet X/A501- EXTERIOR DETAILS:**

- 1. Remove sheet X/A501- EXTERIOR DETAILS and replace with the attached sheet indicated with AD2-AX05 in the lower right-hand corner.

**AD2-A06 Refer to Sheet X/A502- EXTERIOR DETAILS:**

- 1. Remove sheet X/A502- EXTERIOR DETAILS and replace with the attached sheet indicated with AD2-AX06 in the lower right-hand corner.

**AD2-A07 Refer to Sheet X/A503- EXTERIOR DETAILS:**

- 1. Remove sheet X/A503- EXTERIOR DETAILS and replace with the attached sheet indicated with AD2-AX07 in the lower right-hand corner.

**AD2-A08 Refer to Sheet B/A101- DEMOLITION FLOOR PLAN AND FLOOR PLAN:**

- 1. Refer to View A1-Floor Plan, Omit Window Opening 121b.
  - a. The entire existing opening at Exterior Wall shall be infilled.

**MECHANICAL:**

**AD2-M01 Refer to Sheet X/M101 -**

- 1. A/C unit schedule, Change, HC-1A thru 1K, HC-2A thru 2E, HC-4A & B, and HC-5 filters in A/C unit schedule to, Type AP Thirteen & Efficiency (MERV) to 13.
- 2. HC-1A thru 1K, 2A thru 2E, and HC-5, These units are served with 460/3 ph. power. Change the MCA to 11.0 MCA, (Fuse size ok)
- 3. HC-4A & B, this unit is served with 208/3 ph. power. Change MCA to 24.0 and MOCP to 35.
- 4. HC-4A & B, change blower drive to belt drive.
- 5. Delete item #2 UV-C lights under the A/C Schedule

**PLUMBING:**

**AD2-P01 Refer to Sheet SD/P101 – PLUMBING SITE PLAN**

- 1. For all cleanouts to grade which are NOT upper terminal cleanouts, provide the 2-way cleanout to grade shown in detail A-X/P101

**AD2-P02 Refer to Sheet X/P101 – PLUMBING DETAILS**

- 1. For all cleanouts to grade which are NOT upper terminal cleanouts, provide

- the 2-way cleanout to grade shown in detail A-X/P101
2. Revise the Gas Meter Isometric Detail L-X/P101 per the attached Drawings AD2-PX01 and AD2-PX02

**AD2-P03 Refer to Sheet X/P102- PLUMBING FIXTURE SCHEDULE & CALCULATIONS:**

1. Refer to Plumbing Fixture Schedule S-1 Classroom Sink, Add the following:
  - a. Provide HAWS #501LF Drinking Bubbler at Right Front.
2. At WC-2, change the flush valve trap primer suffix to be TPO in lieu of YPO.
3. At WH-3 water heater, change the voltage/phase to be 208V/1 phase.

**AD2-P04 Refer to Sheet L/P103- ENLARGED PLUMBING PLAN:**

1. Omit TP-1 trap primer and access door in Restrooms 102a, 111, & 113. Instead of serving the floor drain from TP-1, provide a trap primer flush valve connection (Zurn suffix – TPO) at the water closet in each room to supply water to the floor drain.
2. Change the lavatory fixture mark number to be L-2 instead of L-1 in Restrooms 102a, 111, and 113.

**AD2-P05 Refer to Sheet M/P102- ENLARGED PLUMBING PLAN:**

1. At Enlarged Plumbing Plan 1, omit TP-1 trap primer and access door in Restroom 106a. Instead of serving the floor drains 106a & 107a from TP-1, provide a trap primer flush valve connection (Zurn suffix – TPO) at the water closet in each room to supply water to each floor drain.
2. At Enlarged Plumbing Plan 2, omit TP-1 trap primer and access door in Restroom 102a. Instead of serving the floor drains in 102a & 103a from TP-1, provide a trap primer flush valve connection (Zurn suffix – TPO) at the water closet in each room to supply water to each floor drain.
3. At Enlarged Plumbing Plan 3, omit TP-1 trap primer and access door in Restroom 113. Instead of serving the floor drains in 112 & 113 from TP-1, provide a trap primer flush valve connection (Zurn suffix – TPO) at the water closet in each room to supply water to each floor drain.

**AD2-P06 Add Sheet P/P101- PLUMBING PORTABLES:**

1. Add the attached Sheet AD2-PX03.

**ELECTRICAL:**

**AD2-E01 Refer to Sheet X/E104- ELECTRICAL DETAILS AND LOW VOLTAGE SINGLE LINE DIAGRAM:**

1. Remove sheet X/E104- ELECTRICAL DETAILS AND LOW VOLTAGE SINGLE LINE DIAGRAM and replace with the attached sheet indicated with AD2-EX01 in the lower right-hand corner.

**AD2-E02 Refer to Sheet L/E101- LIGHTING, POWER AND COMM PLANS:**

1. Remove sheet L/E101- LIGHTING, POWER AND COMM PLANS and replace with the attached sheet indicated with AD2-EX02 in the lower right-hand corner.

**AD2-E03      Refer to Sheet L/E201- ROOF POWER INTRUSION PLANS:**

1. Remove sheet L/E201- ROOF POWER INTRUSION PLANS and replace with the attached sheet indicated with AD2-EX03 in the lower right-hand corner.

**AD2-E04      Refer to Sheet M/E301- INTRUSION PLAN:**

1. Remove sheet M/E301- INTRUSION PLAN and replace with the attached sheet indicated with AD2-EX04 in the lower right-hand corner.

**AD2-E05      Refer to Sheet P/E201- ELECTRICAL PLAN AND TYPICAL MODULAR BUILDING ELECTRICAL PLAN:**

1. Remove sheet P/E201- ELECTRICAL PLAN AND TYPICAL MODULAR BUILDING ELECTRICAL PLAN and replace with the attached sheet indicated with AD2-EX05 in the lower right-hand corner.

**END OF ADDENDUM NO. 2**

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Application Changes Not for Construction

# OVERALL SITE PLAN

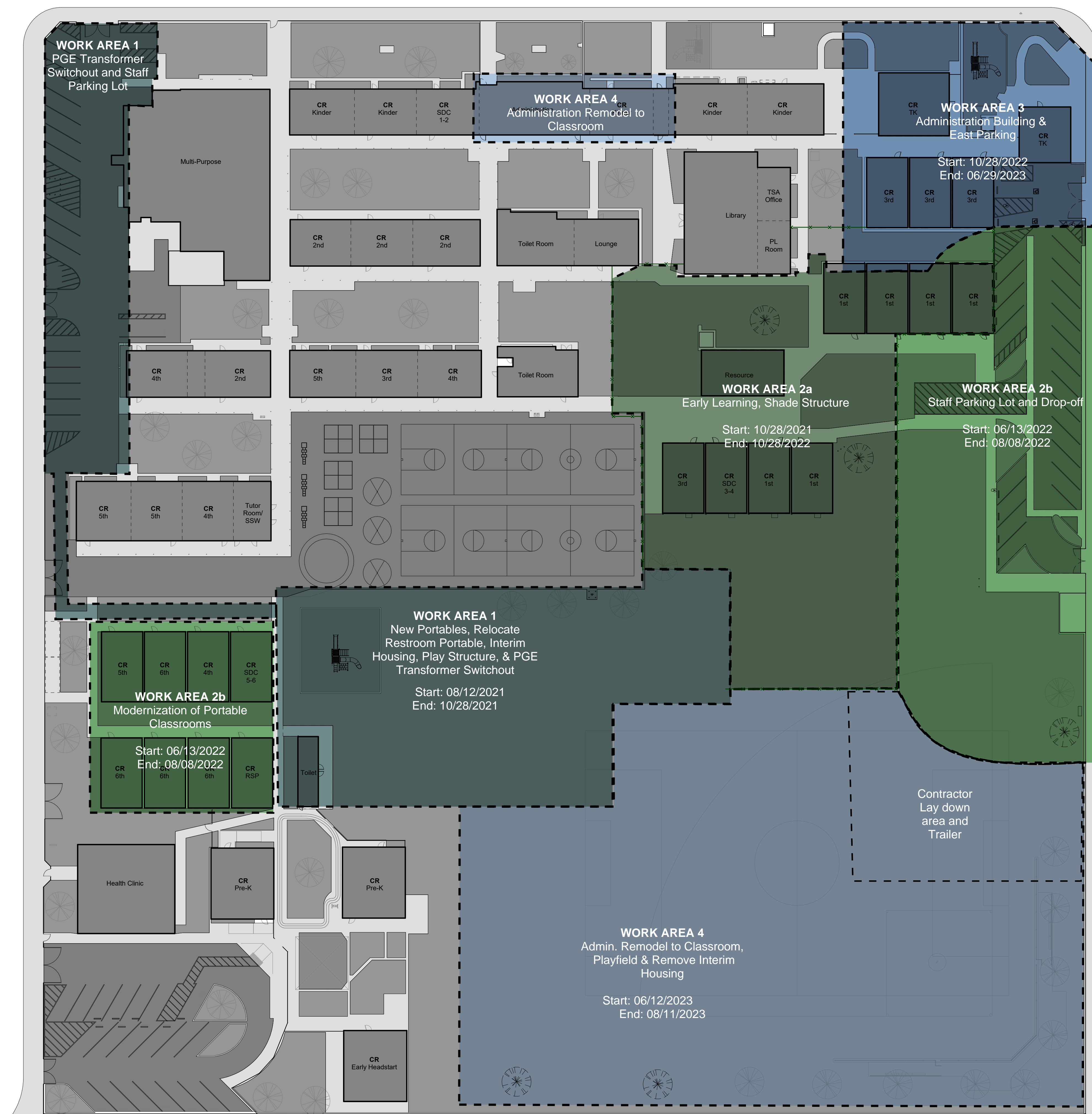
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Established 1959

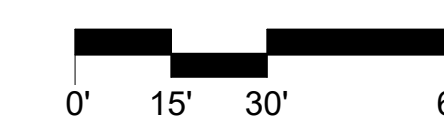
6790 N. West Avenue  
Fresno, California 93711  
T. 559.448.8051

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## LEGEND

- New Building
- Existing Building
- Modernization of Existing Building
- New Permanent Portable Building
- Leased Portables (Interim Housing)
- Asphalt Paving
- Planting/ Turf
- Sidewalk
- Mulch/ Wood Chips



**Fresno Unified School District**  
Addams Elementary School Building Additions and Modernization  
2117 W McKinley Ave, Fresno, CA 93728



AD2- CBR1



- LEGEND
- New Building

Existing Building

Modernization of Existing Building

New Permanent Portable Building

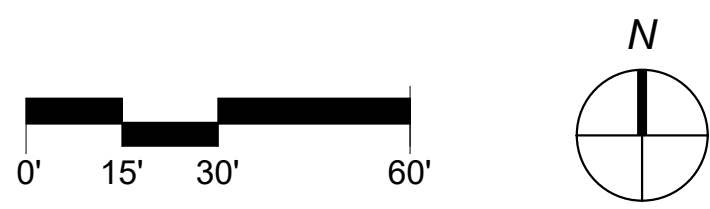
Leased Portables (Interim Housing)

Asphalt Paving

Planting/ Turf

Sidewalk

Mulch/ Wood Chips



OVERALL SITE PLAN -WORK AREA 1

Fresno Unified School District

Addams Elementary School Building Additions and Modernization

2117 W McKinley Ave, Fresno, CA 93728

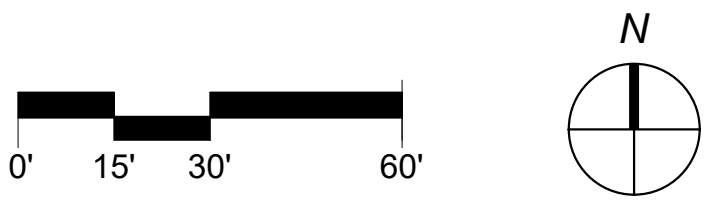


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Application Changes Not for Construction



LEGEND

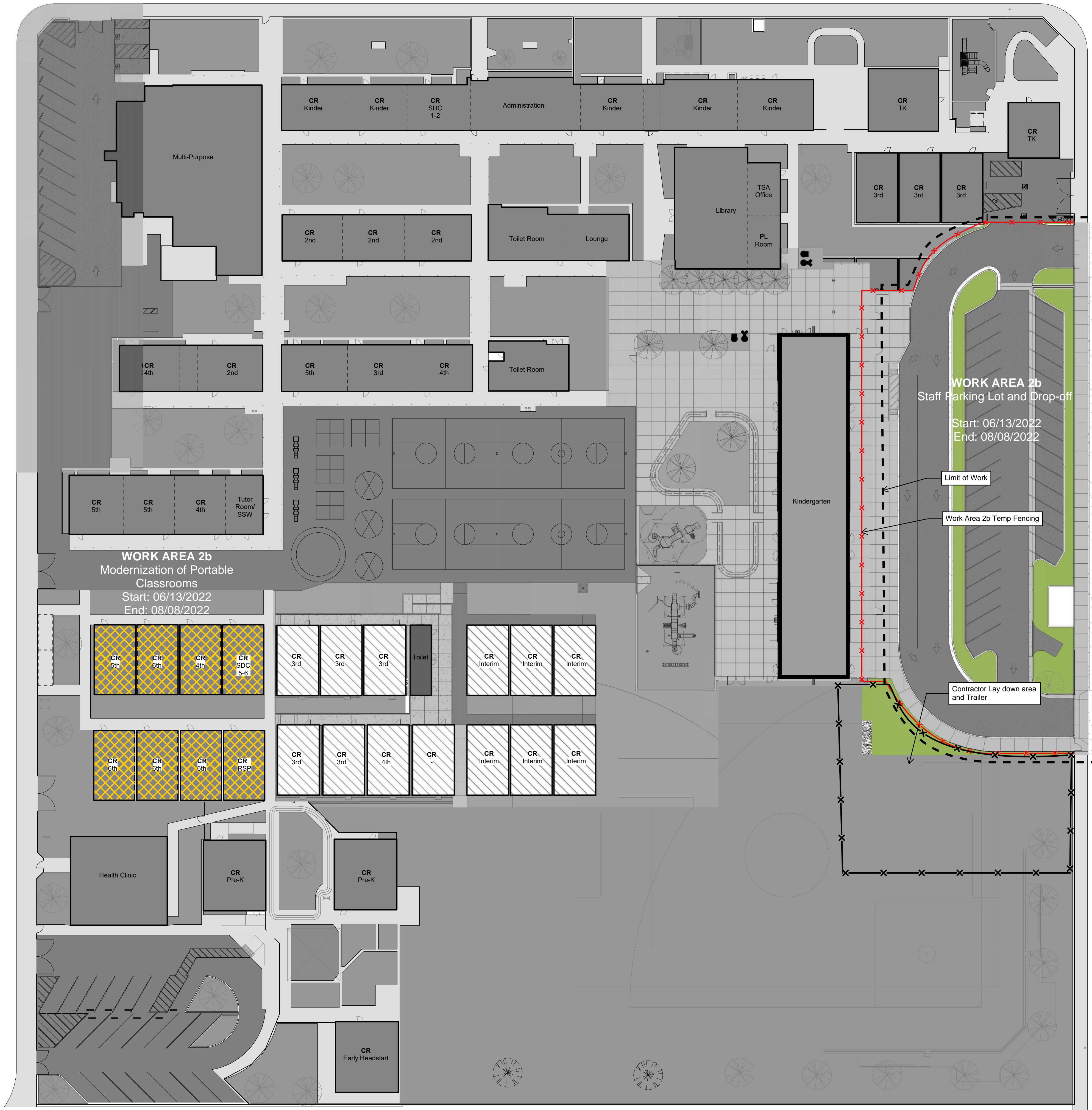
- New Building
- Existing Building
- Modernization of Existing Building
- New Permanent Portable Building
- Leased Portables (Interim Housing)
- Asphalt Paving
- Planting/ Turf
- Sidewalk
- Mulch/ Wood Chips

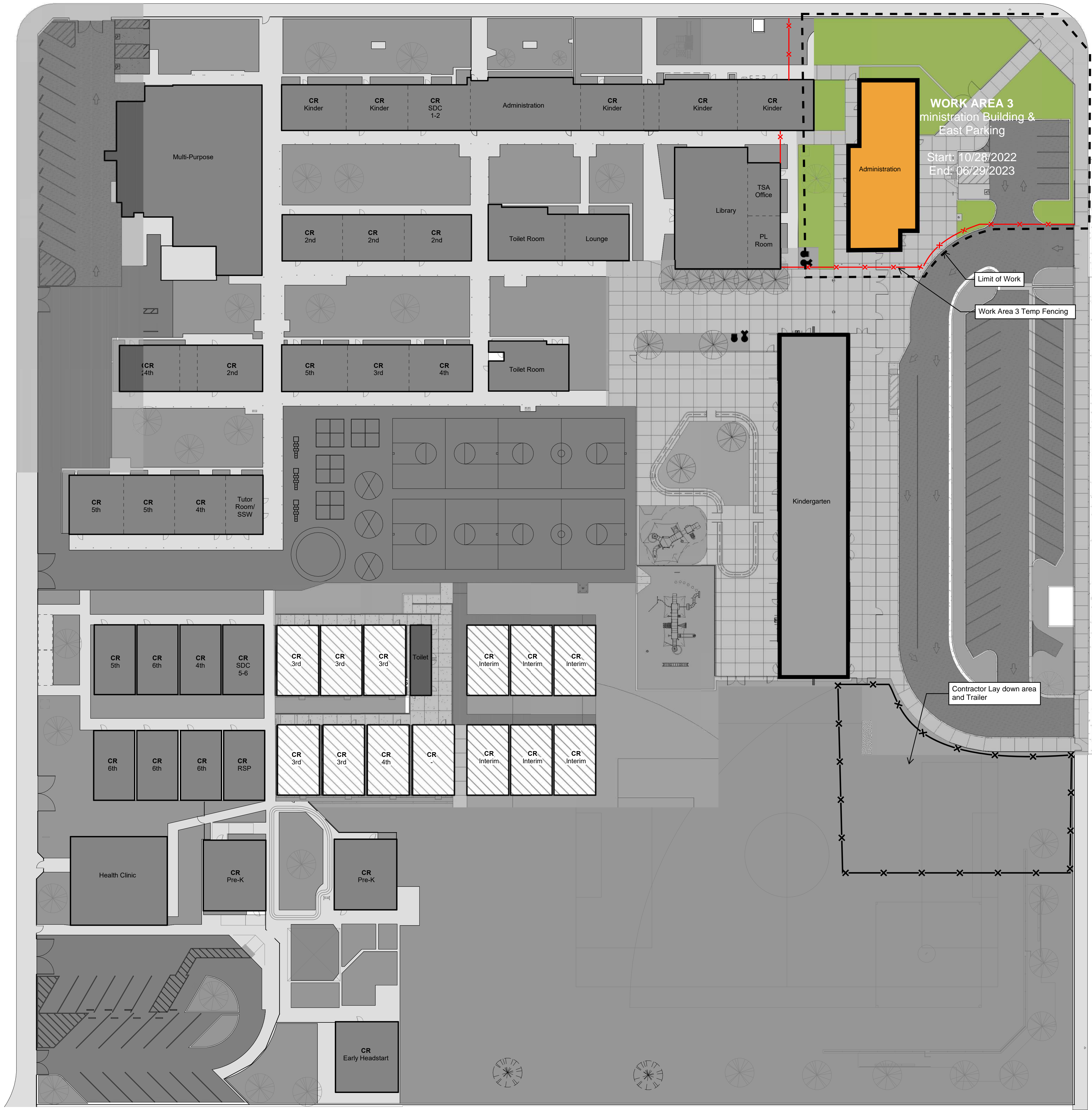


OVERALL SITE PLAN -WORK AREA 2a

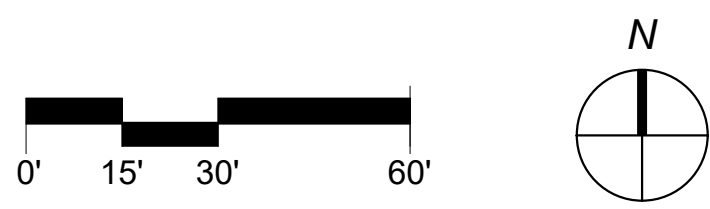
**Fresno Unified School District**  
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- LEGEND
- New Building
  - Existing Building
  - Modernization of Existing Building
  - New Permanent Portable Building
  - Leased Portables (Interim Housing)
  - Asphalt Paving
  - Planting/ Turf
  - Sidewalk
  - Mulch/ Wood Chips



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Application Changes Not for Construction

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Changes\_No DCR\_andrew@dardenarchitects.com.rvt

# OVERALL SITE PLAN -WORK AREA 4

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## LEGEND

- New Building
- Existing Building
- Modernization of Existing Building
- New Permanent Portable Building
- Leased Portables (Interim Housing)
- Asphalt Paving
- Planting/ Turf
- Sidewalk
- Mulch/ Wood Chips

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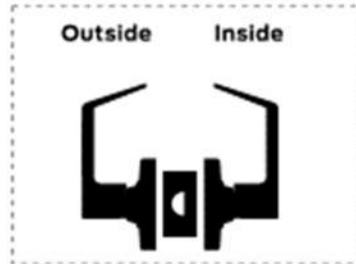
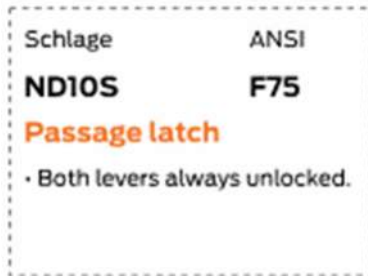
**Fresno Unified School District**  
Addams Elementary School Building Additions and Modernization  
2117 W McKinley Ave, Fresno, CA 93728



AD2- CBR6

## HARDWARE GROUPS

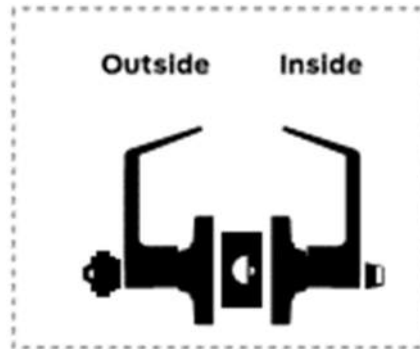
### SCHLAGE LOCKSET GROUPs 10, 53, 75, 80, 85 & 95 - INTERIOR AND EXTERIOR



#### No. 10 – INTERIOR PASSAGE DOOR

EACH OPENING TO HAVE:

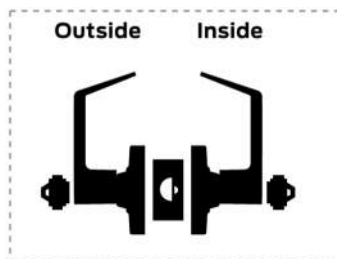
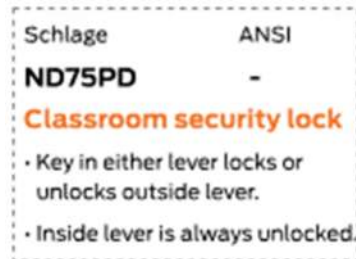
QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	SD HINGE	BB1279 4.5 X 4.5 NRP (New Construction)	626	HAG
1	EA	CONTINUOUS HINGE	HD-780 (Modernization)	CLEAR	HAG
1	EA	OFFICE LOCK	ND10PD RHO	626	SCH
1	EA	CYLINDERS	NONE	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	DOOR STOP	1209	626	TRI
3	EA	SILENCER	GJ64	GRY	GJ



## No. 53C – INTERIOR DOOR - OFFICE LOCK WITH CLOSURE

EACH OPENING TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	SD HINGE	BB1279 4.5 X 4.5 NRP (New Construction)	626	HAG
1	EA	CONTINUOUS HINGE	HD-780 (Modernization)	CLEAR	HAG
1	EA	OFFICE LOCK	ND53PD RHO	626	SCH
1	EA	CYLINDERS	CLASSIC 23-065	626	SCH
1	EA	SURFACE CLOSER	4111 / 4011-3077EDA, 72	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	DOOR STOP	1209	626	TRI
3	EA	SILENCER	GJ64	GRY	GJ



## No. 75C – INTERIOR DOOR - CLASSROOM SECURITY LOCK WITH CLOSURE

EACH OPENING TO HAVE:

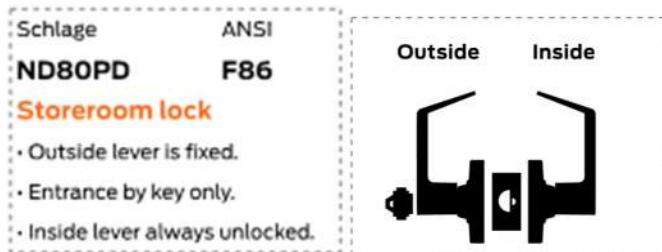
QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HD HINGE	BB1168 4.5 X 4.5 NRP (New Construction)	626	HAG
1	EA	CONTINUOUS HINGE	HD-780 (Modernization)	CLEAR	HAG
1	EA	CLASSROOM SECURITY	ND75PD RHO XN12-035	626	SCH
2	EA	CYLINDERS	CLASSIC 23-065	626	SCH
1	EA	SURFACE CLOSER	4111 / 4011-3077EDA, 72, TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	DOOR STOP	1209	626	TRI
3	EA	SILENCER	GJ64	GRY	GJ

# SPECIFICATIONS

FRESNO UNIFIED SCHOOL DISTRICT

HARDWARE GROUPS

REV DATE: 01/22/2020



## No. 80 – STOREROOM LOCK

EACH OPENING TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	SD HINGE	BB1279 4.5 X 4.5 NRP (New Construction)	626	HAG
1	EA	CONTINUOUS HINGE	HD-780 (Modernization)	CLEAR	HAG
1	EA	STOREROOM LOCK	ND80PD RHO	626	SCH
1	EA	CYLINDERS	CLASSIC 23-065	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	DOOR STOP	1209HO	626	TRI
3	EA	SILENCER	GJ64	GRY	GJ

## No. 80C – STOREROOM LOCK WITH CLOSURE

EACH OPENING TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	SD HINGE	BB1279 4.5 X 4.5 NRP (New Construction)	626	HAG
1	EA	CONTINUOUS HINGE	HD-780 (Modernization)	CLEAR	HAG
1	EA	STOREROOM LOCK	ND80PD RHO	626	SCH
1	EA	CYLINDERS	CLASSIC 23-065	626	SCH
1	EA	SURFACE CLOSER	4111 / 4011-3077EDA, 72, TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	DOOR STOP	1209	626	TRI
3	EA	SILENCER	GJ64	GRY	GJ

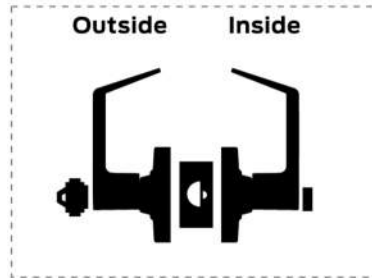
# SPECIFICATIONS

FRESNO UNIFIED SCHOOL DISTRICT

HARDWARE GROUPS

REV DATE: 01/22/2020

Schlage	ANSI
<b>ND85PD</b>	-
<b>Faculty restroom lock</b>	
<ul style="list-style-type: none"> <li>• Outside lever is fixed.</li> <li>• Entrance by key only.</li> <li>• Push-button in inside lever activates visual occupancy indicator, allowing only emergency master key to operate.</li> <li>• Turn inside lever or close door to release visual occupancy indicator.</li> <li>• Rotation of inside spinner-button provides lock-out feature by keeping indicator thrown.</li> </ul>	



No. 85C – INTERIOR / SINGLE OCCUPANCY FACULTY

## RESTROOM + CLOSURE

EACH OPENING TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	SD HINGE	BB1268 4.5 X 4.5 NRP (New Construction)	626	HAG
1	EA	CONTINUOUS HINGE	HD-780 (Modernization)	CLEAR	HAG
1	EA	STOREROOM LOCK	ND85PD RHO	626	SCH
1	EA	CYLINDERS	CLASSIC 23-000	626	SCH
1	EA	SURFACE CLOSER	4111 / 4011-3077EDA, 72, TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	DOOR STOP	1209	626	TRI
3	EA	SILENCER	GJ64	GRY	GJ

## VON DUPRIN PANIC HARDWARE GROUPs 22 & 99 - INTERIOR AND EXTERIOR BUILDING HARDWARE

### No. 22E - EXTERIOR PANIC DEVICE / NIGHT LATCH WITH HEX DOGGING

EACH OPENING TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	SD HINGE	BB1268 4.5 X 4.5 NRP (New Construction)	626	HAG
1	EA	CONTINUOUS HINGE	HD-780 (Modernization)	CLEAR	HAG
1	EA	PANIC HARDWARE	AX22-210NL SP28-299 Hex-Key dogging-GBK	626	VON
1	EA	RIM CYLINDER HOUSING	20-079 WITHOUT CORE	626	SCH
1	EA	CONSTRUCTION CORE	SUPPLIED BY FUSD	-	SCH
1	EA	PERMANENT CYLINDER	SUPPLIED BY FUSD	626	SCH
1	EA	SURFACE CLOSER	OUTSWINGING 4111, 72, TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	DOOR BOTTOM	222APK	AL	PEM
1	EA	DOOR STOP	1209	626	TRI
1	SET	GASKETING	297AV	GRY	GJ
1	EA	THRESHOLD	196A-228A-195A (REFER TO DETAIL)	AL	PEM

# SPECIFICATIONS

FRESNO UNIFIED SCHOOL DISTRICT

HARDWARE GROUPS  
REV DATE: 01/22/2020

## No. 222E – EXTERIOR CORRIDOR DOORS + CLOSURE with HOLD-OPEN

EACH OPENING TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	SD HINGE	BB1268 4.5 X 4.5 NRP (New Construction)	626	HAG
2	EA	CONTINUOUS HINGE	HD-780 (Modernization)	CLEAR	HAG
1	EA	KEYED REMOVABLE MULLION	KR4954-STABILIZERS-MT54	SP28	VON
1	EA	CYLINDER BODY	30-137- 0-Bitted Keyway	626	SCH
1	EA	PANIC HARDWARE	AX-22-DT SP28-299 -GBK	626	VON
1	EA	PANIC HARDWARE	AX22-210NL SP28-299 Hex-Key dogging-GBK	626	VON
2	EA	RIM CYLINDER HOUSING	20-079 WITHOUT CORE (NL & MULLION)	626	SCH
2	EA	CONSTRUCTION CORE	SUPPLIED BY FUSD	-	SCH
3	EA	PERMANENT CYLINDER	SUPPLIED BY FUSD	626	SCH
2	EA	SURFACE CLOSER	OUTSWINGING 4111, 72, TBWMS	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	DOOR BOTTOM	222APK	AL	PEM
2	EA	DOOR STOP / HOLDER	1209	626	TRI
1	SET	GASKETING	297AV	GRY	GJ

## VON DUPRIN PANIC DEVICE - SITE GATE HARDWARE

## No. 222G – EXTERIOR GATE - PANIC DEVICE / NIGHT LATCH WITH HEX DOGGING

EACH OPENING TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	HINGE	LOXINOX MAMOTH 180	SILVER	LOX
1	EA	PANIC HARDWARE	AX22-210NL SP28-299 Hex-Key dogging-GBK	626	VON
1	EA	RIM CYLINDER HOUSING	20-079 WITHOUT CORE	626	SCH
1	EA	CONSTRUCTION CORE	SUPPLIED BY FUSD	-	SCH
1	EA	PERMANENT CYLINDER	SUPPLIED BY FUSD	626	SCH
1	EA	DOOR STOP	1209	626	TRI

## SECTION 10 21 13 – TOILET PARTITIONS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Provide all material, labor, equipment and services necessary to completely install all SCRC (Solid Color Reinforced Composite) with GraffitiOff™ Toilet Partition materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
  - 1. ALL DIVISION 00 SPECIFICATION SECTIONS.
  - 2. ALL DIVISION 01 SPECIFICATION SECTIONS.
  - 3. 03 30 00 CAST-IN-PLACE CONCRETE
  - 4. 04 22 00 CONCRETE MASONRY UNITS
  - 5. 06 10 00 ROUGH CARPENTRY
  - 6. 08 11 00 METAL DOORS AND FRAMES
  - 7. 08 34 73 ACOUSTICAL DOORS AND FRAMES
  - 8. 09 22 16 METAL FRAMING
  - 9. 09 24 00 CEMENT PLASTER
  - 10. 09 29 00 GYPSUM BOARD
  - 11. 09 30 13 TILE
  - 12. 09 91 00 PAINTING
  - 13. 10 28 13 TOILET ACCESSORIES
  - 14. ALL SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.

#### 1.2 REFERENCES

- A. In accordance with the following:
  - 1. AWS American Welding Society

#### 1.3 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
  - 1. Product Data:
    - a. Submit manufacturer's full color range (including any standard and premium colors) for selection by the Architect.
    - b. Submit manufacturer's technical data.
  - 2. Shop Drawings:
    - a. Submit shop drawings showing fabrication and installation of the work of this section including plans, elevations, sections, details of components, and attachment to other units of work.
  - 3. Samples:
    - a. Provide two (2) 4 inch square samples of each color selected.
    - b. Provide hardware samples on request.
  - 4. Certificates:
    - a. Provide certification that all products comply with NFPA 286.
  - 5. Closeout Submittals in accordance with the following:

- a. Maintenance Data in accordance with Specification Section - PROJECT CLOSEOUT.
- b. Project Documents in accordance with Specification Section - PROJECT DOCUMENTS.
- c. Warranty in accordance with Specification Section - WARRANTIES and the article in this section titled "Special Warranty".

#### 1.4 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Installer Qualifications:
    - a. Engage an experienced Installer who is certified in writing by the manufacturer listed herein as qualified to install manufacturer's product in accordance with manufacturer's warranty requirements.
  - 2. Manufacturer Qualifications:
    - a. Firm experienced in successfully producing products similar to that indicated for this Project, with sufficient production capacity to supply required units without causing delay in the work.
- B. Regulatory Requirements:
  - 1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
    - a. CARB Materials and equipment used for this Project shall comply with the current applicable regulations of the California Air Resources Board (CARB) and the Environmental Protection Agency (EPA), in the area where the project is located.
    - b. Furnish Door Hardware for each accessible stall to comply with ANSI A 117.1 and the CBC Section 11B.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packing, shipping, handling, and unloading:
  - 1. Products shall be individually wrapped.
  - 2. Products shall be handled in such a manner as to assure that they are free from dents, scratches and other damage.
- B. Acceptance at Site:
  - 1. Products must be in manufacturer's original unopened containers with labels indicating brand name and model.
  - 2. Damaged products will not be accepted.
- C. Storage and protection:
  - 1. Products shall be stored in a locked, dry and protected area.

#### 1.6 PROJECT CONDITIONS

- A. Existing Conditions:
  - 1. Examine the project and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.

## 1.7 WARRANTY

- A. Contractor's General Warranty:
  - 1. In accordance with Specification Section - WARRANTIES.
- B. Manufacturer's Warranty:
  - 1. In accordance with manufacturer's written standard warranty:
    - a. Warranty Period for SCRC with GraffitiOff Systems: Twenty-five (25) Years.
    - b. Material shall be warrantied against breakage, delamination and corrosion when materials are properly installed, and normally used.
    - c. Upon project completion and acceptance, the manufacturer shall issue the Owner a Limited Warranty from date of purchase.
- C. Installer's Warranty:
  - 1. In accordance with the terms of the Specification Section - WARRANTIES:
    - a. Warranty period One (1) Year.
    - b. Upon project completion and acceptance, the subcontractor shall issue Owner a warranty against defective workmanship and materials.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Products specified are from companies listed below, or approved equivalent. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers listed as acceptable alternative manufacturers must still comply with the requirements of the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
  - 1. Specified SCRC Toilet Partition product manufacturer:
    - a. BOBRICK "Sierra Series"
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

### 2.2 MATERIALS

- A. Provide SCRC with GraffitiOff™ surface thermoset and integrally fused into one homogenous material all edges eased. Surface, edge, core are to be the same color, tested in accordance with CBC 803.1.2, 803.12, CBC Class II or NFPA Class B, and ASTM E84 standards as follows:
  - 1. ASTM E 84 "Standard Test Method for Surface Burning Characteristics of Building Materials".
    - a. Flame Spread: 69.
    - b. Smoke Density: 93.
  - 2. Heat Sinc: Provide continuous aluminum edging strips fastened to the bottom edge at full width of doors, screens and panels.
  - 3. Provide concealed mounting - no exposed screw heads on exterior.
    - a. Model Number suffix: .67.

### 2.3 COMPONENTS

- A. Unless otherwise stated below, all materials shall be Stainless Steel.
- B. Hardware:
  - 1. All hardware to be 18-8, type-304 stainless steel with satin-finish.
  - 2. All hardware shall be concealed inside compartments with the exception of outswing doors, utilizing brass threaded inserts.
  - 3. Hardware of chrome-plated "Zamak" and aluminum are unacceptable.
- C. Vandal-Resistant Hardware (.67P)
  - 1. Door latch shall require less than 5-lb force to operate. Twisting or grasping latch operation will not be acceptable.
  - 2. Latch handle shall have rubber bumper to act as door stop.
  - 3. Metal-to-metal connection shall withstand a direct pull of over 1,500 lb. per screw.
  - 4. Accessible Stalls: Door Pull in accordance with CBC Section 11B-404.2.7:
    - a. Provide pull equipped with a loop or "U" Shaped door pull immediately below the latch on both sides of the door conforming to the Americans with Disabilities Act. The latch shall be the sliding, or other hardware not requiring the user to grasp, twist or pinch.
    - b. Hand-activated hardware shall be mounted between 34" to 44" AFF.
- D. Hinges
  - 1. Hinge shall be 14 gage pin & barrel hinges.
  - 2. All doors shall be equipped with self-closing hinge.
  - 3. Pin and barrel hinge shall be attached to door and stile by theft-resistant, one-way, stainless steel machine screws into threaded brass inserts.
  - 4. Door shall be furnished with two 11-gage (3mm) vinyl-coated door stops to resist door from being kicked out of compartment.
  - 5. Door stops and keeper shall be secured with stainless steel, one-way, machine screws from inside of compartment to threaded brass inserts.
- E. Clothes Hook shall be constructed of stainless steel and shall project no more than 1-1/8" (29mm) from face of door. Clothes hook shall be secured by theft-resistant, one-way stainless steel screws.
- F. Mounting brackets shall be 18-gage (1.2mm) stainless steel and extend full height of panel. U-channels shall be furnished for panel to stile mounting. Angle brackets shall be furnished for stile-to-wall and stile-to-panel mounting. Angle brackets shall be furnished for panel-to-wall mounting.
- G. Leveling Device shall be 3/16" (5mm) hot rolled steel bar; chromate-treated and zinc-plated; through-bolted to base of SCRC stile.
- H. Stile Shoe shall be one-piece, 4" (102mm) high, type-304, 22-gage (0.8mm) stainless steel with satin-finish. Top shall have 90° return to stile. Patented one-piece shoe capable of adapting to 3/4" or 1" stile thickness and capable of being fastened (by clip) to stiles starting at wall line.
- I. Headrail (Overhead-Braced) shall be satin finish, extruded anodized aluminum (.065" / 1.65mm thick) with anti-grip profile.

## 2.4 ACCESSORIES

- A. Fasteners:
  - 1. Provide manufacturer's standard stainless steel exposed fasteners finished to match hardware, with theft-resistant heads and nuts. For concealed anchors, use hot-dip

galvanized, or other rust-resistant protective coated steel.

## 2.5 FABRICATION

- A. Toilet Partition Design shall be as follows:
  - 1. Floor-Anchored and Overhead-Braced.
- B. Furnish standard doors, panels, screens, and pilasters fabricated for toilet partition system. Units shall be furnished with cutouts, drilled holes, and reinforcement to receive partition-mounted hardware, accessories, and grab bars, as indicated on the drawings. Coordinate with Specification Section - TOILET ACCESSORIES, and schedule reinforcements for products actually provided for this project.
  - 1. Doors, panels, and screens shall be 55 inches high and mounted 12 inches above finished floor.
  - 2. Pilasters shall be 82 inches high.
  - 3. Unless otherwise indicated, furnish 24 inch wide in-swinging doors for non-accessible stalls, and 34 inch wide out-swinging doors for front opening accessible stalls.
    - a. 36 inch for side opening accessible stalls.
  - 4. Furnish galvanized steel supports and leveling bolts at pilasters as recommended in writing by manufacturer to suit floor conditions. Provide Stainless Steel Pilaster Shoes to conceal anchorage.
  - 5. Secure floor-anchored-overhead braced pilasters by providing continuous Head Rails with Head Rail brackets, and Head Rail Endcaps.
  - 6. All floor anchoring requires a solid two inches thick of solid flooring for proper anchorage.
- C. Urinal Screens: "Floor-Anchored and Overhead-Braced" of the same construction and finish as toilet partitions.

## 2.6 FINISHES

- A. Color shall be selected from the manufacturer's full color range including standard and premium colors.
- B. One color will be selected per room.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Site verification of conditions:
  - 1. Prior to the execution of the work under this specification section, inspect the installed work executed under other sections of this Project Manual which affect the execution of work under this specification section.
  - 2. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
  - 3. Execution of work under this specification section shall constitute acceptance of existing conditions.

### 3.2 PREPARATION

- A. Coordination:

1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.
2. Coordinate the blocking required in all walls with approved shop drawings.

B. Protection:

1. Protect all adjacent surfaces from drips, spray, air pollution of surrounding environment, and other damage from work under this specification section.

C. Surface preparation:

1. Prepare surface in accordance with manufacturer's written instructions and recommendations.
2. Clean substrates of substances (oil, grease, rolling compounds, incompatible primers, loose mill scale, etc.) that could impair bond of materials specified within this section.

### 3.3 INSTALLATION

A. General:

1. In accordance with manufacturer's written instructions and recommendations unless specifically noted otherwise.
2. In accordance with approved submittals.
3. In accordance with Regulatory Requirements.
4. Set plumb, level, and square.
5. Structurally reinforce and anchor work as required.
6. Panels that contain patched holes not utilized for attachment to walls and pilasters will be rejected by the Architect.

B. Layout:

1. Lines shall be straight and true.
2. Stalls:
  - a. Provide clearances of not less than 1/2 inch between pilasters and panels, and not more than 1 inch between pilasters/panels and walls.
  - b. Secure panels to walls with continuous brackets.
  - c. Secure panels to pilasters with continuous brackets. Brackets are to align with continuous brackets at walls.
  - d. Locate wall brackets so that holes for wall anchorages occur in masonry or tile joints.
  - e. Secure panels to pilasters with not less than two stirrup brackets located to align with stirrup brackets at wall.
  - f. Secure panels in position with manufacturer's written recommended anchoring devices.
  - g. Secure pilasters to floor and level and plumb, and tighten installation with devices furnished.
  - h. Secure head rails to each pilaster with not less than two fasteners.
  - i. Hang doors and adjust so that tops of doors are parallel with head rail when doors are in a closed position. Clearance at vertical edge of doors shall be uniform top and bottom and shall not exceed 1/4 inch.
  - j. When wainscoting prevents the uninterrupted use of a continuous bracket, secure panels to walls with a continuous bracket to the top of the wainscoting and secure the top of the panels to the wall with a stirrup bracket.
3. Screens:
  - a. Secure panels to walls with continuous brackets.
  - b. Provide clearances of not more than 1 inch between panels and walls.
  - c. Secure panels in position with manufacturer's written recommended anchoring devices to suit supporting structure.
  - d. Set units to provide support and to resist lateral impact.

### 3.4 ADJUSTING

- A. Adjust and lubricate for proper operation.
- B. Doors:
  - 1. Adjust and set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched.
  - 2. Adjust and set hinges on out-swinging doors (and entrance swinging doors) to return fully closed positions.
  - 3. Adjust and set hinges on doors at accessible stalls to return to fully closed positions.

### 3.5 CLEANING

- A. Clean in accordance with Specification Section - PROJECT CLOSEOUT.
  - 1. Clean exposed surfaces using materials and methods recommended in writing by manufacturer.
  - 2. Protect as necessary to prevent damage during the remainder of the construction period.

END OF SECTION

BUILDING AUTOMATION  
SYSTEM (BAS)

1725

SECTION 230923 - BUILDING AUTOMATION SYSTEM (BAS) – F.U.S.D.

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The intent of this document is to describe a system that is complete in every respect without further cost to the Owner. Anything not shown on the drawings or indicated in the specifications, and required for complete operating systems, shall be included as part of this Work. This will also include all connections to new services.
- B. All parts of the plans and specifications fully apply when applicable to work of this Division. No attempt has been made to divide the work between the various trades or subcontractors.
- C. OPERATION: The entire Building Automation System (BAS) shall be comprised of a network of interoperable, stand-alone digital controls communicating on the Niagara N4 open protocol communication network to a host computer communicating via the internet to the FUSD host computer. The BAS shall communicate to third party systems such as chillers, boilers, air handling systems, energy metering systems, other energy management systems, access control systems, fire-life safety systems and other building management related devices with open, inter operable communication capabilities.
- D. Work specified by others:
  - 1. HVAC Subcontractor:
    - a. Installation of automatic control dampers, smoke control dampers, and necessary blank off plates.
    - b. Access doors where required.
    - c. Installation of impression wells and pressure taps.
    - d. Installation of flow switches.
    - e. Installation of automatic control valves.
    - f. Installation of pressure taps and associated shut-off cocks. Pete's plugs shall be installed next to each temperature and pressure sensor.
  - 2. Electrical Subcontractor:
    - a. Electrical work shall, in general, comply with the following:
      - 1) Electrical work may include both line-voltage and low-voltage wiring, as required.
      - 2) All electrical work shall comply with the latest California Electrical Code and local electrical codes.
      - 3) All safety devices shall be wired through both hand and auto positions of motor starting device to insure 100% safety shut-off.

## BUILDING AUTOMATION SYSTEM (BAS)

1725

- 4) All magnetic starters for mechanical equipment shall be furnished with integral 120V control transformers, sized to handle the additional VA needed for the controls - pilots, EP valves, etc. All motor starters to be NEMA rated; no IEC rated starters.
- 5) The motor starter supplier shall provide auxiliary contacts as required for interlock by BAS Contractor; the supplier shall estimate an allowance of at least one auxiliary contact per starter. All interlock and control wiring shown on the electrical prints is by the electrical subcontractor.

### 1.2 QUALITY ASSURANCE

#### A. Minimum Contractor Qualifications:

1. BAS Contractor; programs software and ensures network compatibility with all hardware as specified within, and the following requirements:
  - a. Hold a Niagara N4 Framework Certification for at least two years, obtained from a Tridium certified training facility, no exceptions.
  - b. Shall have installed a minimum of three functioning networked systems.
  - c. Must provide a list of at least three projects of similar scope and cost, list to include:
    - 1) Project name / School District.
    - 2) Contact name and phone number.
2. Controls Contractor: Installs all hardware controls as specified within, and the following requirements:
  - a. A minimum of three installed and operational Building Automation Systems (BAS) with the Niagara N4 Framework within the last five years.
  - b. A minimum of five years' experience in servicing a networked BAS.
  - c. Must provide a list of at least three projects of similar scope and cost, list to include:
    - 1) Project name / School District.
    - 2) Contact name and phone number.

- B. Response Requirements: The BAS Contractor shall provide a 24-hour emergency response service with a dedicated telephone number. The BAS contractor shall guarantee a 2-hour maximum response time by a Niagara N4 certified service technician. Fresno Unified reserves the right to obtain services and repairs from any BAS company when the 2-hour response time has been exceeded. The BAS contractor agrees by submittal of his/her bid to pay a late penalty to the District at a rate of \$75 per every half-hour interval exceeding the 2-hour response limit. The District reserves the right to implement a late penalty on a call-by-call basis, depending on the nature of the emergency service call, at the District's discretion.

## BUILDING AUTOMATION SYSTEM (BAS)

1725

- C. Accountability: The District intends to document all service calls to ensure service provided has met the District's expectations as specified. Substandard service or conduct may result in the District certifying the Contractor as non-responsive and potentially eliminate the Contractor from bidding on future projects. During the warranty period, if the BAS is not fully functional and requires a service call, the District shall not be limited by any exclusivity arrangement between the BAS or Controls Contractor at any time.

### 1.3 CODES, STANDARDS, ORDINANCES AND REGULATIONS

- A. All work and materials shall be in full accordance with the latest rules and regulations of applicable codes as amended and adopted by any governmental agency which has jurisdiction over this work. Nothing in these Plans or Specifications is to be construed to permit work not conforming to these codes. Should the Plans or Specifications call for material, methods, or construction of a higher quality or standard than required by the above rules, the higher quality shall govern.
  - 1. When not contradicting the above, the manufacturers' recommendations along with applicable parts of the following documents shall be the basis for quality and technique of installation.
    - a. Title 24, California Administrative Code, all parts.
    - b. Applicable publications of the National Fire Protection Association (NFPA), and the National Electrical Code (NEC).
    - c. Applicable publications of the American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE).

### 1.4 SITE CONDITIONS AND LOCATIONS

- A. The general location and arrangement of system hardware is shown on the drawings. Information on the drawings relative to existing services is approximate only. Minor adjustments required to conform to actual locations shall be made without additional cost to Owner. The Controls Contractor shall, as work progresses, verify the dimensions of the spaces available for the installation of the work and he shall assume full responsibility for the proper locations of each portion thereof.
- B. The construction documents are generally diagrammatic and the locations indicated may be approximate only. They do not show every offset, bend, or elbow required for installation in the space provided. The Controls Contractor, therefore, shall install all equipment, conduit runs and the like as follows:
  - 1. Adhere to the location indicated as near as possible.
  - 2. Maintain ample head room and access in all passageways, clearance around all equipment and under conduit runs for unrestricted passage and for easy servicing of all apparatus, equipment, devices and the like.
  - 3. Provide access for maintenance of all equipment.

### 1.5 SUBMITTALS

## BUILDING AUTOMATION SYSTEM (BAS)

1725

- A. Control Submittal: Within 30 calendar days after award of the contract, and before any materials of this Section are delivered to the job site, submit:
  - 1. The BAS Contractor shall submit .caf files for each device, and a description of operation and schematic drawings of the System to the Architect/Engineer/Owner for approval before starting work on-site. At least two sets of submittals shall be sent through channels.
  - 2. Product data submittals must be complete and in a single bound document for all items supplied in this Division. Each document shall be bound with an index and marked with the equipment identification as specified in the Plans and Specifications.
  - 3. Provide complete control shop drawing including equipment, control devices, point to point connections with terminal numbers, and any details necessary for a complete control drawing.
  - 4. List of name plates to be engraved, showing each name plate wording and location.

### 1.6 REMOVAL AND SALVAGE

- A. Pre-Demolition conference: Contractor shall schedule a walk-through meeting with Energy Management Department to conduct an inventory on items to be removed and salvaged from the existing building under construction.
- B. Inventory List: The Contractor shall complete and submit an inventory list of items that have been removed and salvaged to the Energy Management Department and store items in a cool dry and protected area.
- C. Delivery: Delivery of the salvaged items shall be determined by the Energy Management Department and the Contractor.
- D. Remove and Reinstall: Detach items from existing location and store them for re-installation in a strategic area of operation to be determined.
  - 1. Identify areas of occupancy to remain in-use and functional.
  - 2. If existing BAS is required to be removed, relocated, or abandoned, before proceeding with the demolition provide temporary power and communication that bypasses the area of demolition and that maintains the continuity of the BAS to other occupied parts of the site or building construction.
- E. Schedule of Demolition Activities: Indicate the following:
  - 1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity. Ensure on-site operations of the occupied areas of the BAS are not interrupted.
  - 2. If there is to be an interruption in the operation of the existing BAS, Contractor shall notify Architect & District Project Manager and indicate how long the services will be interrupted in writing.

### 1.7 CLOSE-OUT DOCUMENTS

## BUILDING AUTOMATION SYSTEM (BAS)

1725

### A. Record Documents:

1. At completion of project, BAS Contractor shall provide to the Architect/Engineer all As-Built drawings, communications and controller map, wiring diagrams, equipment specifications, Operations and Maintenance Manuals and other documentation as required to describe the system. At least two sets of operations and maintenance manuals with "as-built" drawings, parts lists, etc. shall be provided at job completion.
  - a. Hard copies shall be stamped with "Record Drawings".
  - b. Provide all Record Documents on a cloud-based drive or physical drive; including pdf files and CAD files using AutoCAD 2008 or latest version.
2. During progress of the work, maintain an accurate record of all changes made in the systems from those shown on the drawings, specifications and submittals.
3. Revise Shop Drawings and provide on reproducible media and in DWG format compatible Windows operating systems and AutoCAD 2008 or latest version.

### B. Communications and Controller Map: To include the following;

1. A detailed communication routing map showing entering and exiting locations
2. A detailed list of controller locations by room number and location.
3. Permanently attach the communication routing map and controller locations inside the NAC control panel.

### C. Operations and Maintenance Manuals: Upon completion of the work, a complete bound book containing the following information shall be submitted to the Architect/ Engineer:

1. Complete catalog and performance data on all control devices, including all documents included in submittals.
2. Complete manufacturers' operating and maintenance instructions on all control devices.
3. Complete wiring and control diagrams for all equipment and systems, including list of materials, description of operation and system flow diagrams.
4. Manufacturers' warranty certificates on all equipment.
5. Contractor's warranty letter.

## 1.8 GUARANTEE

- A. The Contractor shall warrant in writing all work performed under this contract for a period of two years from the date of notice of completion.
- B. When notified of a system failure relating to the work performed under this contract, the Contractor will be responsible for all investigation, diagnoses, repair, revision or replacement necessary to correct the condition.

## BUILDING AUTOMATION SYSTEM (BAS)

1725

### PART 2 - PRODUCTS

#### 2.1 GENERAL PRODUCT DESCRIPTION

- A. The Building Automation System (BAS) shall be capable of integrating multiple building functions, including equipment supervision and control, alarm management, energy management, and trend data collection. System shall be Johnson Controls FX-80 Web based front end with Johnson Controls devices and controllers. BACnet, N4 must reside in controller and Open licensing shall be included in each FX-80 device. Programming of the FX-80 and creating all required dynamic graphics shall be included in this section.
- B. The BAS shall consist of the following:
  - 1. Local Display Devices – PC Touchscreen.
  - 2. Portable Operator Terminals – Laptop with required software installed.
  - 3. Distributed User Interfaces.
  - 4. Network processing, data storage and communications equipment.
  - 5. DC Controllers (HVAC etc).
  - 6. Other components required for a complete and working BAS.
- C. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, ASCs, and operator devices. Controllers shall be provided a 10% spare point capacity for all necessary applications.
- D. System architectural design shall eliminate dependence upon any single device for alarm generation and control execution. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.
- E. Acceptable Systems:
  - 1. Facility Explorer by Johnson Controls is the District Standard using the BACnet MSTP protocol to integrate into the District's existing server (JCI).
  - 2. No substitutions allowed.

#### 2.2 CONDUIT AND WIRING

- A. Control Contractor shall provide and install all low voltage conduit and wiring for DDC system as required for a complete and operating system. Conduit and wiring shall conform to Division 16 requirements.
- B. Wiring:
  - 1. BACnet communications cable shall be Connect Air: W223C-2144FCBJC 22-3C (Blue Jacketed). Install per manufacturer's recommendations. No splices, Tee's, or cuts of any kind will be allowed. Identify both ends at terminal blocks, field devices, and sensors.

## BUILDING AUTOMATION SYSTEM (BAS)

1725

All wiring that is routed below grade shall be W221P-1003PE (Outdoor Polyethylene BACnet-Black).

- a. Communication Loop and sensors must be run in separate conduits and junction boxes.
  - b. The outside air sensor must be brought into the NAC I/O at all times. An outside air sensor brought into a controller is not acceptable.
2. Sensor wire shall be: Connectair Part # W181P-2040PRB 18-2 (Purple).
  3. Analog Output shall be: W184C2059PINK 18-4 (Pink).
  4. Thermostat wire shall be Connect Air: W224C-2020WHT 22-4C (White Jacketed).
  5. Cable routed in accessible ceiling spaces shall comply with EIA/TIA standards for communications cabling. Communication bus wire shall be W223C-2144FCBJC 22 3C (Blue Jacketed) Connect Air, blue jacketed shielded cable.
- C. Conduit: Conduit shall be minimum 1 inch diameter except that minimum conduit size for 120 volt power shall be 3/4-inch. For underground conduit, provide 100% spare capacity by installing a second conduit (empty) along all conduit routes. All conduits shall be sized as follows: Size per the CEC (NEC with California Amendments) and then oversize by one size. All conduits shall be RGSC (Rigid galvanized steel conduit) only. All fittings shall be steel/not malleable or aluminum.

### 2.3 BAS ARCHITECTURE

#### A. Automation Network

1. The automation network shall be configured as a Client/Server network with a web server operating on the Clients LAN/WAN. The web browser interface is extended over the LAN/ WAN. Monitoring and control of the BAS is available using the web browser interface.
2. The automation network shall include the option of a PC industry standard of Ethernet TCP/IP. Where used, LAN controller cards shall be standard “off the shelf” products available through normal PC vendor channels.
3. The BAS shall network multiple user interface clients, system controllers and systems supervisors(s) as required for systems operation.
4. The automation network option shall be capable of operating at a communication speed of at least 100 Mbps or more.
5. The automation network option will be compatible with other enterprise-wide networks. Where indicated, the automation network shall be connected to the enterprise network and share resources with it by way of standard networking devices and practices.

#### B. Control Network:

## BUILDING AUTOMATION SYSTEM (BAS)

1725

1. Control networks shall provide either "Peer-to-Peer," Master-Slave, or Supervised Token Passing communications, and shall operate at a minimum communication speed of 9600 to 76,800baud.
2. Digital Controllers shall reside on the control network via BACnet MSTP.

### C. Integration:

1. Hardwired
  - a. Analog and digital signal values shall be passed from one system to another via hardwired connections.
  - b. There will be one separate physical point on each system for each point to be integrated between the systems.
2. Direct Protocol (Integrator Panel)
  - a. The BAS system shall include appropriate hardware equipment and software to allow bi-directional data communications between the BAS system and 3<sup>rd</sup> party manufacturers' control panels. The BAS shall receive, react to, and return information from multiple building systems, including but not limited to the chillers, boilers, variable frequency drives, and power monitoring system.
  - b. All data required by the application shall be mapped into the BAS system, and shall be transparent to the operator.
  - c. Point inputs and outputs from the controllers shall have real-time interoperability with BAS software features such as: Control Software, Energy Management, Custom Process Programming, Alarm Management, Historical Data and Trend Analysis, Totalization, and Local Area Network Communications.

## 2.4 USER INTERFACE

### A. Browser Based Interface

1. The system shall be capable of supporting an unlimited number of clients using standard Web browser such as Internet Explorer<sup>TM</sup>, Google Chrome and Mozilla Firefox. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, or manufacture-specific browsers shall not be acceptable.
2. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the Building Automation System (BAS), shall not be acceptable.
3. The Web browser client shall support at a minimum, the following functions:
  - a. User log-on identification and password shall be required. If an unauthorized user attempts access, notice of access failure shall be displayed. Security using

BUILDING AUTOMATION  
SYSTEM (BAS)

1725

authentication and encryption techniques to prevent unauthorized access shall be implemented.

- b. HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.
- c. Storage of the graphical screens shall be in the Network Area Controller (NAC), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.
- d. Real-time values displayed on a Web page shall update automatically without requiring a manual “refresh” of the Web page.
- e. Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:
  - 1) Modify common application objects, such as schedules and setpoints in a graphical manner.
  - 2) Commands binary objects to start and stop.
  - 3) View logs and charts.
  - 4) View alarms.
- f. Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

4. Alarms

- a. Alarm feature shall allow user configuration of criteria to create, route, and manage alarms and events. It shall be possible for specific alarms from specific points to be routed to specific alarm recipients. The alarm management portion of the user interface shall, at the minimum, provide the following functions:
  - 1) Allow configuration to generate alarms on any numeric, binary, or data point in the system.
  - 2) Generate alarm records that contain a minimum of a timestamp, original state, acknowledged state, alarm class and priority.
  - 3) Allow the establishment of alarm classes that provide the routing of alarms with similar characteristics to common recipients.
  - 4) Allow a user, with the appropriate security level, to manage alarms - including sorting, acknowledging, and tagging alarms.

5. Reports and Summaries

BUILDING AUTOMATION  
SYSTEM (BAS)

1725

- a. Reports and Summaries shall be generated and directed to the user interface displays, with subsequent assignment to printers, or disk. As a minimum, the system shall provide the following reports:
    - 1) All points in the BAS
    - 2) All points in each BAS application
    - 3) All points in a specific controller
    - 4) All points in a user-defined group of points
    - 5) All points currently in alarm
    - 6) All BAS schedules
    - 7) All user defined and adjustable variables, schedules, interlocks and the like.
  - b. Reports shall be exportable to .pdf, .txt, or .csv formats.
  - c. The system shall allow for the creation of custom reports and queries.
6. Schedules
- a. A graphical display for time-of-day scheduling and override scheduling of building operations shall be provided. At a minimum, the following functions shall be provided:
    - 1) Regular schedules
    - 2) Repeating schedules
    - 3) Exception schedules
  - b. Weekly schedules shall be provided for each group of equipment with a specific time use schedule.
  - c. It shall be possible to define one or more exception schedules for each schedule including references to calendars.
  - d. Monthly calendars shall be provided that allow for simplified scheduling of holidays and special days. Holidays and special days shall be user-selected with the pointing device or keyboard.
7. Password
- a. Multiple-level password access protection shall be provided to allow the user/manager to user interface control, display, and database manipulation capabilities deemed appropriate for each user, Based on an assigned password.
  - b. Each user shall have the following: a user name, a password, and access levels.

BUILDING AUTOMATION  
SYSTEM (BAS)

1725

- c. The system shall provide the capability to require a password of minimum length and require a combination of characters and numerical or special characters.
  - d. When entering or editing passwords, the system shall not echo the actual characters for display on the monitor.
  - e. The system shall provide unlimited flexibility with access rights. A minimum of four levels of access shall be provided along with the ability to customize the system to provide additional levels.
  - f. A minimum of 100 unique passwords shall be supported.
  - g. Operators shall be able to perform only those commands available for their respective passwords. Display of menu selections shall be limited to only those items defined for the access level of the password used to log-on.
  - h. The system shall automatically generate a report of log-on/log-off and system activity for each user.
  - i. All log data shall be available in .pdf, .txt, and .csv formats.
8. Historical Data Collection
- a. All numeric, binary or data points in the system database shall allow their values to be logged over time (trend log). Each historical record shall include the point's name, a time stamp including time zone, and the point's value.
  - b. The Network Area Controller (NAC) shall have the ability to store its historical data records locally and periodically to a remote server on the network (archiving).
  - c. The configuration of the historical data collection shall allow for recording data based on change of value or on a user-defined time interval.
  - d. The configuration of the historical data collection shall allow for the collection process to stop or rollover when capacity has been reached.
  - e. A historical data viewing utility shall be provided with access to all history records. This utility shall allow historical data to be viewed in a table or chart format.
  - f. The history data table view shall allow the user to hide/show columns and to filter data based on time and date. The history data table shall allow exporting to .txt, .csv, or .pdf file formats.
  - g. The historical data chart view shall allow different point histories to be displayed simultaneously, and also provide panning and zooming capabilities.
9. Audit Log
- a. For each log entry, provide the following data:

## BUILDING AUTOMATION SYSTEM (BAS)

1725

- 1) Time and date.
- 2) User ID
- 3) Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.

### 10. Database Backup and Storage

- a. The user shall have the ability to back up the System Controller databases.

## 2.5 AUTOMATION NETWORK

### A. Network Server (NIC)

1. F.U.S.D. District N4 server is existing, BAS Contractor shall have the responsibility of bringing the firmware to current revisions. Any structures on the site with existing BAS that require this to match shall also be included in this project.
2. It shall be possible to provide access to all Network Area Controllers via a single connection to the server. In this configuration, each Network Area Controller can be accessed from the Graphical User Interface (GUI) or from a standard Web browser (WBI) by connecting to the server.
  - a. Distributed Control: The server shall provide the ability to execute global control strategies based on control and data objects in any NAC in the network, local or remote.
  - b. The server shall provide scheduling for all Network Area Controllers and their underlying field control devices.
  - c. The server shall implement the BACnet Command Prioritization scheme (16 levels) for safe and effective contention resolution of all commands issued to Network Area Controllers. Systems not employing this prioritization shall not be accepted.
  - d. Each Network Area Controller supported by the server shall have the ability to archive its log data, alarm data and database to the server, automatically. Archiving options shall be user-defined including archive time and archive frequency.
  - e. The server provides central alarm management for all Network Area Controllers supported by the server. Alarm management shall include:
    - 1) Routing of alarms to display, printer, email and email compatible pagers
    - 2) View and acknowledge of alarms
    - 3) Query alarm logs based on user-defined parameters

BUILDING AUTOMATION  
SYSTEM (BAS)

1725

- f. The server shall provide central management of log data for all Network Area Controllers supported by the server. Log data shall include process logs, runtime and event counter logs, audit logs and error logs.

B. Network Area Controller (NAC) or JACE

- 1. The NAC must provide the following hardware features as a minimum:

- a. Communications

- 1) One 10/100 Mb Ethernet Port – RJ-45 connection
- 2) Digital controllers that are hardwired shall reside on the BACnet MSTP control network.
- 3) Two RS-485 ports (up to 57,600 baud) shall be standard. Gateways or non-Johnson drivers not allowed.
- 4) All required protocol drivers are included. BACnet, Modbus and N4 shall be resident as standard without additional costs, additional hardware External gateways shall not be acceptable.

- b. Inputs/Outputs

- 1) Four form C SPDT relay outputs rated for 24 VAC/DC @ 2Amps resistive each with individual LED indicators
- 2) Six Universal Inputs for 10K NYC, 4-20 mA, 1-10 V, Dry contact
- 3) Additional I/O modules shall be allowed if needed

- c. Battery Backup

- 1) Battery backup provided for all on board functions including I/O
- 2) Battery is monitored and trickle charged
- 3) Battery maintains processor operation through power failures for a pre-determined interval, and then writes all data to flash memory, shuts the processor down, and maintains the clock for five years.

- d. Environment

- 1) Must be capable of operation over a temperature range of 0°F to 122°F.
- 2) Must be capable of withstanding storage temperatures of between 0°F and 150°F.
- 3) Must be capable of operation over a humidity range of 5% to 95% RH, non-condensing.

- e. Device License

## BUILDING AUTOMATION SYSTEM (BAS)

1725

- 1) FX80 shall be licensed for 100 devices with a one year Software Maintenance Agreement (SMA).
  2. The Network Area Controller (NAC) shall be a fully user-programmable device capable of providing all of the capability described in Section 2.3 Part A.
  3. Automation network – The Network Area Controller (NAC) shall reside on the automation network. Each NAC shall support one or more sub-networks of controllers.
  4. User Interface – Each Network Area Controller (NAC) shall have the ability to deliver a web based user interface as previously described. All computers connected physically or virtually to the automation network shall have access to the web based UI.
  5. Power Failure – In the event of the loss of normal power, The Network Area Controller (NAC) shall continue to operate for a defined period after which there shall be an orderly shutdown of all programs to prevent the loss of database or operating system software. Flash memory shall be incorporated for all critical controller configuration data.
    - a. Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.
    - b. Certification – All controllers shall be listed by Underwriters Laboratories (UL).
- C. Application Specific Controllers (ACS's)
1. The ASC devices must provide the following hardware features as a minimum:
    - a. Communications:
      - 1) General and expansion controllers, and sensors by Johnson controls, shall be installed where specified and shown on portable classroom installations.
      - 2) BACnet/IP MS/TP Router to be used in area as needed.
    - b. Environment:
      - 1) Must be capable of operation over a temperature range of 0°F to 122°F.
      - 2) Must be capable of withstanding storage temperatures of between 0°F and 158°F.
      - 3) Must be capable of operation over a humidity range of 5% to 95% RH, non-condensing.

### 2.6 SOFTWARE PROGRAMMING/TOOLS

#### A. Network Area Controller Toolset

1. Device embedded toolset shall provide the following capabilities in a graphical environment using a standard Web browser:

BUILDING AUTOMATION  
SYSTEM (BAS)

1725

- a. Device and point management
  - b. Scheduling, alarming and trending setup
  - c. Creation and binding of graphics
  - d. Time management
  - e. User management
2. Toolset provides additional engineering capabilities including:
- a. Editable table based point listings.
  - b. Automatically generated graphics for standard applications.

B. Device Program Editor

1. Definition of application and logic and display operation shall be available in a completely graphic environment.
2. Definition of operator device characteristics, Digital Controllers (DC) panels, individual points, applications, and control sequences shall be performed in a drag and drop programming environment.
3. All temperature and equipment control strategies, energy management routines, scheduled operations and local device status indicators shall be definable by the operator. User password access and language options shall be definable by the operator.
4. Event definition, prioritization, logging and reporting options are definable by the operator.
5. Application logic shall provide for stand-alone applications as well as distributed applications that are automatically downloaded from master controllers to a network of controllers.
6. The programming environment shall provide help menus and instructions for each operation and/or application performed, for all programming library functions, and for the programming language itself.
7. Libraries of standard application modules shall be provided, such as temperature, humidity, and flow control. These modules may be used as “building blocks” in defining or creating new control sequences. In addition, the user shall have the capability to easily create and archive new modules and control sequences.

2.7 LOCAL CONTROL PANELS

- A. All control panels shall be factory constructed, incorporating the BAS manufacturer’s standard designs and layouts. All control components shall be UL inspected and listed. Control panels shall be fully enclosed, with sub-panel, hinged door, and slotted flush latch. Control panels shall exist on all equipment specified and shall be UL listed as a complete fabricated system. UL listings shall be shown on final drawings.

## BUILDING AUTOMATION SYSTEM (BAS)

1725

- B. In general, the control panels shall consist of the DDC controller(s), display module as specified and indicated on the plans, and I/O devices—such as relays, transducers, and so forth—that are not required to be located external to the control panel due to function. Where specified the display module shall be flush mounted in the panel face unless otherwise noted.
- C. All I/O connections on the DDC controller shall be provide via removable or fixed screw terminals.
- D. Low and line voltage wiring shall be segregated. All provided terminal strips and wiring shall be UL listed, 300-volt service and provide adequate clearance for field wiring.
- E. All wiring shall be neatly installed in plastic trays or tie-wrapped.
- F. A convenience 120 VAC duplex receptacle shall be provided in each enclosure, fused on/off power switch, and required transformers.

### PART 3 - EXECUTION

#### 3.1 PREPARATIONS

- A. Prior to Installation: Inspect the installed work executed under other Sections which affect the installation of the controls. Report unacceptable conditions to the Engineer. Do not begin work until unacceptable conditions have been corrected. Installation of the controls shall constitute acceptance of existing conditions.
- B. Coordination: Coordinate work with work specified under other Sections to ensure proper and adequate interface of work. Equipment and systems drawings are generally diagrammatic unless dimensions are indicated. Drawings and details shall be checked for interference's with structural and other conditions prior to performing work.
- C. The Contractor shall be responsible for safety and good condition of his materials and equipment until final acceptance by the Owner. He shall erect and maintain suitable barriers, protective devices, lights and warning signs where required.

#### 3.2 INSTALLATION

- A. General:
  - 1. When applicable installation procedures are shown or specified in other sections, those procedures shall be followed.
  - 2. Provide all supports and hangers, etc., as required to install the equipment as specified or shown on the drawings. All equipment shall be supported, braced and cross-braced to comply with current CBC and CMC.
  - 3. Sealing: Wherever any part of the control system has to pierce the roofing, openings through the roof shall be flashed absolutely watertight.
  - 4. Arrange and support piping and equipment so that vibration is at a minimum and is not transmitted to or through building structure.

#### 3.3 CONDUIT AND WIRING

## BUILDING AUTOMATION SYSTEM (BAS)

1725

- A. Control wiring and conduit shall be the responsibility of this section and be installed as follows:
1. In equipment rooms/attics – Conductors shall be run in conduit. Final connection to equipment shall be flexible conduit.
  2. Concealed in new building construction (wall/inaccessible ceilings) - Conductors shall be run in conduit.
  3. Roof mounted/exterior equipment yards - Conductors shall be in conduit. All flexible conduit shall be seal-tite with weatherproof connections. Equipment on grade and detached from the building a distance greater than 36" shall have underground control conduit routed to equipment.
  4. Above accessible ceiling spaces - Control cable will be allowed to be installed without conduit in accessible areas above ceilings as follows:
    - a. Plenum rated cable is an approved type for the application.
    - b. Cable is bundled/organized in management devices routed square with building lines (no diagonals) and kept clear of electrical devices (i.e., ballasts, transformers, etc.) that could cause interference.
    - c. Conduit sleeves are provided between accessible ceiling spaces (i.e., across soffits, gypboard ceilings, etc.) as required to maintain future access to cable.

### 3.4 CONTROL PANELS AND DEVICE LOCATIONS

- A. All controllers, relays, switches, etc., for equipment located within equipment rooms shall be mounted in enclosed UL listed control panels with hinged locking doors. All control devices equipment located in exposed areas subject to outside weather conditions shall be mounted inside weatherproof enclosures.
- B. Location of each panel is to be convenient for adjustment and service. Submit locations of all panels to the engineer with shop drawings.

### 3.5 IDENTIFICATION

- A. The label wording shall match that used on the drawings and provide clearly readable printed labels for each control component inside a panel. When applicable, additional identification needed shall be documented on the Shop Drawings.
- B. Engraved nameplates shall be provided on the face of each panel and beneath each actuator and control device not in a panel describing its use.
- C. All electrical devices within the panel shall be wired to a terminal strip within the panel. An "electric terminal" numbering system shall be applied to all terminals with aforementioned numbers matching terminals shown on Shop Drawings.

### 3.6 CLOSING-IN OF UNINSPECTED WORK

## BUILDING AUTOMATION SYSTEM (BAS)

1725

- A. General: Do not allow or cause any of the Work of this Section to be covered up or enclosed until it has been inspected, tested, and approved by the Mechanical Engineer and by all other authorities having jurisdiction.
- B. Uncovering: Should any of the Work of this Section be covered up or enclosed before it has been completely inspected, tested, or approved, do all things necessary to uncover all such work. After the Work has been completely inspected, tested, and approved, provide all materials and labor necessary and make all repairs necessary to restore the Work to its original and proper condition at no additional cost to the Owner.

### 3.7 PROGRAMMING

- A. The Direct Digital Control (DDC) operational program will be provided by the BAS Contractor. The Contractor shall provide any testing program he feels necessary to fully test the operation of the various components.

### 3.8 SYSTEM INSTRUCTION AND RECORD DRAWINGS

- A. The BAS Contractor shall schedule a minimum of 40 hours of training to train the District's Energy Management Department in the use and care of the system. This training shall occur after all commissioning of the control system is completed.
- B. Instruction period shall be started after instruction books, service manuals and record drawings have been submitted to and approved by the Architect/Engineer and shall be at hours (regular and non-regular) arranged by the Architect/Engineer.
- C. Service manuals shall include oiling, cleaning and servicing data, compiled in clearly and easily understood form and in a durable binder. Data shall show all serial numbers of every piece of equipment and complete list of replacement parts.

### 3.9 TESTING AND ACCEPTANCE

- A. The commissioning period starts when the following conditions are met:
  - 1. The BAS system and all involved HVAC equipment have been installed, connected to the EMS system and ready to operate.
  - 2. A commissioning meeting has been conducted with representatives of contractors involved, Fresno Unified School District Energy Management Department Technician & HVAC Supervisor/Mechanic, General Contractor, Mechanical Contractor, and the Control System Contractor.
  - 3. Consensus is reached, by the representatives at the above referenced meeting that it is appropriate for the commissioning process to start. The operational program shall be loaded into the DDC system by the Control Systems Contractor.
- B. During the commissioning period, the Control System Contractor will maintain a commissioning file of the printed reports from the building. The District shall verify all commissioning tests.

## BUILDING AUTOMATION SYSTEM (BAS)

1725

- C. During the commissioning period all mechanical equipment with filters shall have new filters installed. The static pressure across the fan shall be accurately measured and documented if installed. System balance, if required, shall have been completed.
- D. The Contractor shall furnish a complete and operating system. The Contractor shall also verify, in the presence of the District, the system accuracy and proper function of each controlled device and sensor. The following items shall be successfully demonstrated prior to acceptance by the District:
  - 1. All system outputs, including controllers, relays and other control devices, shall be addressed and start/stop functions demonstrated.
  - 2. All inputs shall be displayed and all event-initiated functions shall be demonstrated.
  - 3. Demonstrate program integrity and power restore sequence during and after a power failure and restoration.
  - 4. Deliver all As-Built drawings, wiring diagrams, equipment specifications, As- Built communications routing map, Operation and Maintenance Manuals and other documentation as required to describe the system.
  - 5. A wiring schematic shall be permanently attached to the inside door panel of each control device.
  - 6. A detailed As-Built communications wiring loop routing map shall be permanently attached to the front end door panel and a copy shall be provided to the Maintenance Department.
  - 7. Complete operator training in the use, programming and operation of the system.
  - 8. The system will not be considered complete until all system graphics are operational and accurate.

### 3.10 COMMISSIONING THE SYSTEM

- A. The District reserves the right to employ a third party commissioner at the District's expense.
- B. During the commissioning period all mechanical equipment with filters shall have new filters installed. The static pressure across the fan shall be accurately measured and documented if installed.
- C. The commissioning process will be completed and the training process shall start when the following conditions are met:
  - 1. No "alarm" or "condition reports" are being generated by the DDC system for seven (7) calendar days (168 hours) due to incomplete or inaccurate installation, program, or programming.
  - 2. All adjustments and "fine tuning" of the system shall also be included in the training process.

BUILDING AUTOMATION  
SYSTEM (BAS)

1725

3. The system has been approved by the General Contractor, and accepted by the Mechanical Engineer and District.
- D. The Training Process: Shall consist of the following:
1. System use, operation and field trouble shooting to be provided to the District's Energy Management Department's personnel. Training must be a total of 40 hours of hands on, as well as phone support when needed. The 40 hour training can be used in any time allotment agreed upon by the Controls Contractor and the District EMS Control Center until hours are depleted.
  2. The District reserves the right to stop the clock at any time during the training process if there has been a discovery that impedes the complete full and accurate operation of the BAS installed. This includes the software programming, hardware components, sensors, or mechanical equipment and issues therein until they have been resolved.

END OF SECTION

## INTRUSION DETECTION

1813

## B. Area Access Control:

1. The system shall be capable of integrating area access control capability where specified into the same control panel with the ability to have up to 10,000 user credentials. User access is limited to custom profiles and/or schedules. Anti-passback shall be available. The networked version shall support a Two-Man Rule feature. The system shall support up to sixteen (16) access doors, connected to the system using a manufacturer-approved interface module.
2. Area door access products shall meet or exceed features offered by the following products:
3. Keypad reader/administration device – DMP Model 7063/7063A, 7073/7073A, 7163, 7173.
4. Wiegand Interface – DMP Model 733, 734.
5. Reader – DMP Model PP-6005B, Model PR-5455, Model MP-5365.
6. Cards or credentials – DMP Model 1326, DMP Model 1306P, DMP Model 1346, DMP Model 1386.

## C. Access Control Equipment:

1. Access Control equipment shall communicate to the system by way of the control panel keypad bus.

## 2.10 COMPILED DETECTION EQUIPMENT LISTING

## A. Hard-wired:

1. Hard-wired detection equipment shall communicate to the system by way of the control panel loop expansion bus. The equipment shall have a three (3) year warranty as stated in the current DMP Product Catalog and meet or exceed features offered in the following products:
  - a. Motion Detector – Optex Model FX-360 (360° Ceiling Mount)
  - b. Glass Break Detector – Honeywell Model FG-1625
  - c. Door Contact – GE 1078C-N Recessed Contact
  - d. Door Contact – GE 1038T Surface Mount Contact
  - e. Zone Expansion Module – DMP Model 714-18T
  - f. Bus Splitter/Repeater Module – DMP Model 710
  - g. Output Expansion Module - DMP Model 716
  - h. Graphic Annunciator Module - DMP Model 717

## B. Power Supplies and Transformers:

1. Power supply, transformer, and battery devices shall maintain system operation. The batteries shall be checked and replaced every three to five years. The equipment shall

## ELECTRONIC SURVEILLANCE

1813

## FRESNO UNIFIED SCHOOL DISTRICT

## SECTION 28 20 00 – ELECTRONIC SURVEILLANCE

## PART 1 – GENERAL

## 1.01 DESCRIPTION:

- A. This specification describes the design, installation, testing, and documentation of all necessary elements required to install an HDcctv HD-SDI Security Camera System.
- B. The Security Camera System shall consist of HDcctv HD-SDI DVRs and Video Redistribution Servers, which will be monitored 24 hours a day at a remote Central Monitoring Station within FUSD.
- C. All camera activity will be recorded via HDcctv HD-SDI Digital Video Recorder (DVR) on-site.
- D. All camera control and viewing shall be accessible via the Districts existing data infrastructure.
- E. All proposed HDcctv HD-SDI Equipment and Software shall be compatible and interoperable with FUSD existing HDcctv HD-SDI Equipment and Software currently used by FUSD Central Monitoring Station.
- F. The proposed HDcctv HD-SDI Security Camera System shall have no recurring costs for software or hardware licensing or other fees.
- G. All HDcctv HD-SDI DVRs shall be certified by the Manufacture of the CMS Central Monitoring Software and Site Video Distribution Software to be compatible and supported with current versions of the Manufacture's Software.
- H. The FUSD Central Monitoring Station currently uses the Webgate WinRDS Professional CMS Central Monitoring Software.
- I. The Site Video Distribution Software currently uses the Webgate WinRDS Server Software.

## 1.02 RELATED WORK:

- 1. Section 260000 – Electrical
- 2. Section 280500 – Basic Electronic Safety and Security System Requirements

## 1.03 SCOPE OF WORK:

- A. The Contractor shall configure the system as described and shown.
- B. All HDcctv HD-SDI equipment shall conform to EIA 170 specifications.

**ELECTRONIC SURVEILLANCE****1813**

- C. To include all labor, material, and equipment for installation of Security Camera System cabling, cabling pathways, and pan/tilt/zoom power feeds.
- D. Contractor shall provide all equipment, labor, supervision, tooling, miscellaneous mounting hardware, consumables, HDcctv HD-SDI Security Camera System cabling, cabling pathways, RS-485 Serial Data cable, and pan/tilt/zoom power feeds and any other necessary items even if not listed in these specifications.
- E. Cabling, cabling pathways, and power feeds will be routed in such a way to provide HDcctv HD-SDI cameras and HDcctv HD-SDI camera equipment connectivity while minimizing the visual impact on the school's structure both interior and exterior.
- F. FUSD will approve all locations where the HDcctv HD-SDI camera equipment is to be mounted and the corresponding termination point prior to work commencing.
- G. This may include locations such as the main office, hallway common areas and targeted high-risk areas.
- H. The exact position and placement of HDcctv HD-SDI Cameras, and HDcctv HD-SDI DVRs shall be determined by Site conditions, as designated by FUSD Representative.
- I. Final numbers will be determined by Site needs and other considerations as designated by FUSD Representative.
- J. Shall include HDcctv HD-SDI Cameras and HD Spot Monitors for Main Office Areas.
- K. Interconnection of all HDcctv HD-SDI Cameras and HDcctv HD-SDI DVRs shall be by Coaxial Cable or Fiber Optical Cable as described in these Specifications, and as Site Conditions determined by designated FUSD Representative require.
- L. Salvage, inventory, and return existing Site Security Camera Systems to FUSD.
- M. Existing Coaxial Cabling shall not be reused for the new Security Camera System.

**1.04 SUBMITTALS:****A. General:**

- 1. Submit the following per Conditions of the Contract and Division Specifications.
  - a. Product Data:
    - i. Manufacturer's literature and specifications for each component of the system.
  - b. Site Survey:
    - i. Site Survey shall have complete plot plans of area.
    - ii. Internal areas shall be identified on separate sheets.
    - iii. All camera, power supplies, Security Enclosures, HDcctv HD-SDI DVRs, Servers, and related equipment locations shall be clearly identified.

**ELECTRONIC SURVEILLANCE****1813**

- iv. All camera view area zones shall be clearly identified.
  - v. HDcctv HD-SDI DVR installation location shall be clearly identified.
  - vi. All MDF/IDF cabinets used to connect system shall be clearly identified.
  - vii. Any additional relevant information shall be included.
- c. All Site Surveys shall be bound and supplied as follows:
- i. Two (2) hard copies in size "B" (11" x 17") format.
  - ii. Two (2) hard copies in size "D" (30" x 42") format.
  - iii. One (1) electronic storage media (USB V3.0 stick) with one (1) version each in AutoCAD Lite, PDF, and WebGate Control Center Professional (4.x).
  - iv. Larger drawings shall be rolled and secured in storage carriers.
- d. Shop Drawings:
- i. System diagram showing location of all devices.
  - ii. Provide complete design calculations showing signal losses, signal gain settings, equipment settings, equipment locations, and related items.
  - iii. Provide complete system diagram showing selection of all devices.
  - iv. Provide all system diagrams in standard industry format.
2. Contractor shall submit for approval by FUSD the make, model, and performance specifications of all test equipment to be used in adjusting and certifying system parameters.
3. Contractor shall submit for FUSD approval the proposed test set-up and procedure for adjusting and checking system performance.

**1.05 QUALITY ASSURANCE:**

- A. Contractor shall have successful experience in executing projects of this type and scope.
1. Submit with Bid, a list of projects to provide proof of required experience, including the following:
    - a. Description of project.
    - b. Name, address and phone number of Owner.
    - c. Name and phone number of Owner's contact person having knowledge of the project.
    - d. Approximate cost of the data cabling and associated electrical work for the project.
  2. The Proposal shall include a list of all workmen the contractor proposes to use for the data-cabling portion of this project.
  3. This list shall include:
    - a. Name of worker.
    - b. Worker's resume showing training and experience.

**ELECTRONIC SURVEILLANCE****1813**

- c. List of contact persons and their telephone numbers.
- 4. Each worker proposed for work in the cabling portion of this work shall present a Certificate of Completion of Training in Fiber Optic and Security Camera Systems.
  - a. Only workers with experience in Fiber Optic installation may perform work in that area.
  - b. Only workers with experience in Security Camera Systems may perform work in that area.
- 5. The District Inspector or Project Manager may ask any or all workers to demonstrate their skill level before performing any work or continuing work.
- 6. If, in the opinion of the District, any worker is found to be deficient in this area, the Contractor must immediately provide necessary training to remove the deficiency or replace the worker with one having the required skills.
- 7. The Contractor shall use adequate numbers of skilled workmen who are thoroughly trained and experienced on the necessary crafts and completely familiar with the specified requirements and methods needed for the proper performance of the work.
- 8. The Contractor must provide a Project Manager who has demonstrated the ability to supervise an HDcctv HD-SDI Security Camera project.
- 9. The Project Manager must be available to be interviewed by FUSD and/or their representative and must be deemed acceptable by FUSD and/or their representative.
- 10. Acceptance will not be unreasonably withheld.
- 11. The Project Manager must be available to attend meetings as required.
- 12. The work of this section shall conform to California Code of Regulations, Part 3, and all other applicable codes and standards.
- 13. Only a qualified Contractor holding licenses required by legally constituted authorities having jurisdiction over the work shall do work.
- 14. Contractor shall have completed similar projects of equal scope to systems described herein and shall have been engaged in business of supplying and installing specified type of systems for at least five years.
- 15. Use equipment manufacturers certified contractors.
- 16. Manufacturer shall warranty availability of spare parts common to proposed system for a period no less than that stipulated within the California Multiple Award Schedule (CMAS) terms and conditions.
- 17. If no time period is contractually stipulated, the Contractor shall provide a warranty of five years.

**ELECTRONIC SURVEILLANCE****1813**

18. Contractor shall warranty that all work executed and materials furnished shall be free from defects of material and workmanship for a period of five years from acceptance date of Contract Completion, excluding specific items of work that require a warranty of a greater period as set forth in this Specification.
  19. Immediately upon receipt of written notice from the District, the Contractor shall repair or replace, at no expense to the District, any defective material or work that may be discovered before final acceptance of work or within warranty period; any material or work damaged thereby; and adjacent material or work that may be displaced in repair or replacement.
  20. Examination of or failure to examine work by the District shall not relieve Contractor from these obligations.
  21. Contractor shall have a service organization capable of responding to warranty service requests within 24 hours of receipt of written notification and resolution within five working days.
  22. If Contractor fails to repair or replace material or work indicated above within 15 days of receiving written notice, the District, with its own personnel or by Contract, may proceed with repair or replacement and assess cost against Contractor, if Contractor does not respond accordingly.
  23. Persons skilled in trade represented by work, and in accordance with all applicable building codes, shall install system in accordance with best trade practice.
  24. Contractor shall include in the Material List Submission copies of the manufacturer's certifications that the Contractor is an authorized distributor of the submitted manufacturers' products and has been adequately trained in the installation of those products.
  25. This applies to all fiber optic components and fiber optic cable.
  26. Contractor shall include in the Material List Submission a list of five projects of similar scope acceptable to the District and shall have a service organization capable of responding to warranty service requests within 24 hours of receipt of written notification and resolution within five working days.
  27. Contractor shall include the telephone number of the customer's client contact for each project and a letter signed by a corporate officer, partner, or Owner of the contracting company describing the service capability of the company and stating the company's commitment to maintain that service capability through the warranty period.
- B. All work and materials shall be in full accordance with the latest rules and regulations of the following codes, industry standards and references:
1. State of California:
    - a. Title 24, Building Standards, State of California.

**ELECTRONIC SURVEILLANCE****1813**

- b. Occupational Safety and Health Act (OSHA).
  - c. Title 8, Electrical Safety, State of California.
  - d. Title 19, California Code of Regulations.
- 2. Telecommunications Industry Association/Electronics Industry Association (TIA/EIA).
    - a. ANSI/TIA/EIA-STD-RS455, Standard Test Procedures for Fiber Optic Fibers, Transducers, Connecting and Terminating Devices (latest issue).
    - b. Telecommunications Industry Association/Electronic Industry Association (TIA/EIA) Standard 569, Commercial Building Standard for Telecommunications Pathways and Spaces (latest issue).
  - 3. BICSI-Telecommunications Distribution Methods Manual, Volumes #1 and 2 (latest issue).
  - 4. Underwriters Laboratories Inc. (UL): Applicable listings and ratings.
  - 5. UL LAN Cable Certification Level 5.
  - 6. National Electric Code (Articles 770, 800, latest issue).
  - 7. National, State, and Local Occupational Safety and Health Administration (OSHA) building and fire codes.
  - 8. ANSI/TIA/EIA Telecommunications Building Wiring Standards.
  - 9. ANSI/TIA/EIA-568-A, Commercial Building Telecommunications Cabling Standard (latest issue).
  - 10. ANSI/TIA/EIA-568-B-3, Optical Fiber Cabling Components Standard (latest issue).
  - 12. ANSI/TIA/EIA-569-A, Commercial Building Standard for Telecommunications Pathways and Spaces (latest issue).
  - 13. ANSI/TIA/EIA-569-A-1, Commercial Building Standard for Telecommunications Pathways and Spaces Addendum 1 - Surface Raceways (latest issue).
  - 14. ANSI/EIA/TIA-598-A, Optical Fiber Cable Color Coding (latest issue).
  - 15. ANSI/TIA/EIA-606, The Administration Standard for the Telecommunications Infrastructure of Commercial Building (latest issue).
  - 16. ANSI/TIA/EIA-607, Commercial Building Grounding and Bonding Requirements for Telecommunications (latest issue).
  - 17. ANSI/TIA/EIA-758, Customer-Owned Outside Plant Telecommunications Cabling Standard (latest issue).

**ELECTRONIC SURVEILLANCE****1813**

18. ANSI/TIA/EIA-758-1, Addendum No. 1 to TIA/EIA-758, Customer-Owned Outside Plant Telecommunications Cabling Standard (latest issue).
  19. TIA/EIA TSB-72, Centralized Optical Fiber Cabling Guidelines (latest issue).
  20. BICSI Telecommunications Distribution Methods Manual (latest issue).
  21. FCC Part 68.50.
  22. National Electrical Manufacturer's Association (NEMA).
  23. National Fire Protection Association (NFPA), NFPA-70.
  24. CCR Part 3 - California Electrical Code.
  25. CCR Part 2 - Uniform Building Code.
  26. HDcctv Alliance (HDcctv) HDcctv or current)
  27. Society of Motion Picture and Television Engineers (SMPTE) SMPTE-292
- C. Nothing in the drawings or specifications is to be construed to permit work not conforming to the codes or standards.
  - D. These codes or standards are to be considered minimum requirements.
  - E. Should the plans or specifications call for material, methods or construction of a higher standard, the plans or specifications shall govern.

**1.05 EXISTING CONDITIONS:**

- A. Contractor shall be held to have visited the site prior to submitting proposal to determine existing conditions, nature of materials to be encountered and to evaluate other information affecting the work to be performed.
- B. Protect and maintain all existing pipelines, conduits, and structures.
- C. Do not interfere with their safe operation.
- D. Should damage occur notify the appropriate utility and the District at phone number 559-457-3000.
- E. Damage costs are the responsibility of the contractor.
- F. Existing Security Camera System shall remain functional until new Security Camera System is fully operational.
- G. Existing Coaxial Cabling shall not be reused for the new Security Camera System.

**ELECTRONIC SURVEILLANCE****1813****PART 2 – PRODUCTS****2.01 DISTRICT STANDARDIZATION**

The district has standardized by means of a board resolution pursuant to Public Contract Code, Article 4, Section 3400, certain equipment specified herein. Refer to FUSD Resolution 18-08 and exhibits for exact manufacturers and models which are to be sole sourced.

**2.02 SYSTEM COMPONENTS, no substitution for Clinton Electronics parts.****A. Camera RG 6/U 18/2 Coax Wire:**

1. Wire shall be RG 6/U 18/2 Composite Coaxial Cable.
2. Cable shall comply with UL 1666 Vertical Shaft Flame Test.
3. Center conductor shall be # 18 AWG solid 1.016 mm Bare Copper Conductor.
4. Twisted Pair Cable Component shall be one (1) pair 18 AWG Bare Copper with Red and Black Polypropylene Insulation Jacket.
5. Dielectric shall be gas injected, FHDPE Foam High Density Polyethylene, with 95% Tinned Copper Braid coverage, PVC jacket.
6. Nominal Attenuation/ 100 feet:
  - a. 1.476dB at 5MHz.
  - b. 14.108dB at 400MHz.
  - c. 23.295dB at 1000MHz.
7. Velocity of Propagation shall be: 82% minimum.
8. Nominal Impedance shall be: 75 Ohms.
9. Nominal cable O.D. shall be: 12.319mm.
10. Cable shall be 100% sweep tested: 1MHz to 1GHz.
11. Minimum Bend Radius/Minor Axis: 69.850mm.
12. Belden, 539945 RG 6/U 18/2 Composite Coaxial Cable meets this requirement.

**B. RS-485 Control Wire:**

1. RS-485 Control Wire shall terminate to RS-485 16 Port Serial Data Distribution Buss located next to the HDcctv HD-SDI Multi-Video Digital Video Recorder for that camera.

**ELECTRONIC SURVEILLANCE****1813**

2. Each RS-485 Control Wire shall have no breaks or splices from camera to distribution buss.
3. Each RS-485 Control Wire shall be labeled and numbered correlating to camera.
4. Each RS-485 Control Wire shall be installed on the RS-485 16 Port Serial Data Distribution Buss in sequential number correlating to port number on HDcctv HD-SDI Multi-Video Digital Video Recorder for that camera. (ie number one camera shall be installed on port one of the DVR and its control wire shall be installed on port one of the distribution buss.)
5. HD-SDI PTZ Cameras are not to share RS-485 Control Wires.
6. Standard Category 5e Twisted Pair Cabling meets with this requirement.

C. Fiber Optical Cable:

1. Shall use Multi-mode fiber cable for Ethernet connections.
2. Shall use Single-mode fiber for HD-SDI Video connections.
3. Shall be rated for indoor/outdoor use in both vertical and horizontal applications.
4. Shall meet the requirements of NEC for OFNR cables.
5. Shall comply with Bellcore, FDDI, EIA/TIA-568, and Insulated Cable Engineers Association (ICEA) standards.
6. Shall be constructed using a water blocking technology to inhibit water from affecting the fibers.
7. Shall be reinforced with Aramid yarn and also meet the following additional criteria:
  - a. Physical specifications:

Multi-mode:

62.5 micrometer core  
 125 micrometer cladding  
 250 micrometer coating  
 900 micrometer buffering  
 0.275 numeric aperture  
 Graded Index

Single-mode:

8.3 micrometer core  
 125 micrometer cladding  
 250 micrometer coating  
 900 micrometer buffering  
 0.13 numeric aperture

8. Fiber Count:

- a. Multi-mode: 6 Fibers
- b. Single-mode: 6 Fibers

9. Shall have Maximum Tensile Load during Installation: 1600 N

**ELECTRONIC SURVEILLANCE****1813**

10. Shall have Maximum Tensile Load Operating: 525 N

11. Shall have Cable minimum bending radius:

- a. During installation: 20 times the cable diameter
- b. After installation: 10 times the cable diameter

12. Shall have Buffered Fiber minimum bend radius: 0.75 inches

13. Shall have operating temperature: -40 to +85 degrees C

14. Shall Have Wavelength/attenuation:

	Multi-mode:		Single-mode:	
Wavelength	850 nm	1300 nm	1300 nm	1550 nm
Attenuation	3.0 db/km	1.0 db/km	.5 db/km	.5 db/km
Bandwidth	400 MHz/km		600 MHz/km	

Zero Dispersion Slope: 0.092 ps/(nm<sup>2</sup>-km)

15. The following Documents of the latest issue form a part of this specification to the extent specified herein:

- a. ANSI/TIA/EIA-STD-RS-455: Standard Test Procedures for Fiber Optic Fibers, Cables Transducers, Connecting and Terminating Devices.
- b. ANSI/TIA/EIA-STD-RS-359: Standard Colors for Color Identification and Coding.
- b. ANSI/TIA/EIA-STD-598A: Optical Fiber Cable Color Coding.
- c. MIL-STD-202: Test Methods for Electronic and Electrical Equipment.
- d. MIL-HDBK-454: Standard General Requirements for Electronic Equipment.
- e. MIL-STD-810: Environmental Test Methods and Engineering Guidelines.
- f. UL Subject 1666: Standard Flame Test for Flame Propagation Height of Electrical and Optical Cable Installed Vertically in Shafts.
- g. NFPA 70-1999: National Electric Code Article 770, Optical Fiber Cable.

16. All Fiber Ends shall be terminated in SC Style Connection Ends.

17. All Fiber Ends shall be securely mounted in a FUSD approved Fiber Light Guide Box.

18. All Fiber and Fiber Connections shall be clearly Labeled and Identified.

19. Optical Cable Corporation, DX006DSLA9KR (Single-mode), and DX006DWLS9KR (Multi-mode); meets this requirement.

**ELECTRONIC SURVEILLANCE****1813****D. HD-SDI Camera RG 6/U 18/2 Coax Wire BNC Connectors:**

1. Shall be designed for RG6 coax cable.
2. Shall have BNC type connector.
3. Shall have permanent 360-degree water-tight seal on coax cable.
4. Shall provide superior pull-out strength of coaxial cable.
5. Shall provide reduced signal ingress and egress.
6. Shall have one-piece design.
7. Shall have advanced design to eliminate loose pins and sleeves.
8. Shall be designed to reduce installation time.
9. Shall have non-blind entry.
10. Shall use professional compression tool specially designed for connector.
11. Belden PPC Double Bubble Universal Compression BNC Connector, DB6U, and Cable Pro Double Bubble Compression Tool, CPLCRBC-BR; meets with this requirement.

**E. Transceivers:**

1. Clinton Electronics, CE-HD2FO-TX1, HD-SDI & RS485 to Fiber Transmitter.
2. Clinton Electronics, CE-HD2FO-RX1, HD-SDI & RS485 to Fiber Receiver.
3. Clinton Electronics, CE-PS200, Power Supply for HD2FO.

**F. Signal Extenders:**

1. Clinton Electronics, CE-EXSDI-T, EXSDI Signal and Power Extender.
2. Clinton Electronics, CE-T12VDC500, 12VDC Power Supply for Extender.

**G. DVR, 16 Channel, EX/SDI 2.0:**

1. Clinton Electronics, CE-FXVR16/30TB.  
16GB default DVR, qty. 1, unless noted otherwise or additional storage needed to meet performance requirements.

**H. Monitors:**

1. Clinton Electronics, CE-VT320-C, 32" LCD Monitor.

**ELECTRONIC SURVEILLANCE****1813**

2. Clinton Electronics, CE-VT420, HD, 42" LCD Monitor.  
Default Monitor, qty. 1, unless noted otherwise.
3. Clinton Electronics, CE-VT50, 50" LCD Monitor.
4. Clinton Electronics, CE-9500B, Wall Mount for LCD Monitors.
5. Clinton Electronics, CE-EX2HDMI, HD-SDI to HDMI Converter.
6. Clinton Electronics, CE-PS200, Power Supply for Monitors.

**I. Cameras:**

1. EX-SDI 2.0 HD Mounted to deep box with 1-1/2" center punch:  
Clinton Electronics, CE-VX2HD (MOD)
2. Long Range, EX-SDI 2.0 HD Mounted to deep box with 1-1/2" center punch:  
Clinton Electronics, CE-VX3HD (MOD)
3. PTZ, 1080p, with appropriate Wall or Ceiling Mount:  
Clinton Electronics, CE-PTZ30XHDS PTZ camera, and  
Clinton Electronics, PTZ-KEYB, 3-axis controller/keyboard.
4. Fixed 2MEG, Camera Only:  
Clinton Electronics, CE-VX2HD.  
Default INDOOR camera, qty. per plans, unless noted otherwise.
5. Fixed 2MEG, Long Range, Camera Only:  
Clinton Electronics, CE-VX3HD.
6. Fixed 4MEG, Camera Only:  
Clinton Electronics, CE-VX2QHD.
7. Fixed 2MEG, Indoor:  
Clinton Electronics, CE-BZ1HD.
8. Fixed 4MEG, Indoor:  
Clinton Electronics, CE-BZ1QHD.  
Default OUTDOOR camera, qty. per plans, unless noted otherwise.

**J. Mounts/Brackets/Adapters:**

1. Vandal X Bracket:  
Clinton Electronics, CD-VXWB.
2. Vandal X Top Cover:  
Clinton Electronics, CE-VXTWIRS.
3. Universal Corner Mount Adapter:  
Clinton Electronics, CE-UCB-CRNR.

**ELECTRONIC SURVEILLANCE****1813**

4. Universal Pipe/Pole Mount Adapter:  
Clinton Electronics, CD-UCB-POLE.
5. Adapter Plate for Vandal X Cameras:  
Clinton Electronics, CE-VXAP.

**K. Security Enclosure:**

1. All HDcctv HD-SDI DVRs, Video Distribution Servers, RS-485 Serial Data Distribution Buss, Fiber Converters, Ethernet Converters, Audio Amplifiers, Encoders/Decoders, Fiber Optical Cables, Twisted Pair, Coaxial Cables, and other related material shall be installed in wall mounted Security Lockboxes.
2. Shall be constructed of fully welded 16-gauge steel.
3. Shall have dimensions of 23.87" W x 11.34" H x 28.24".
4. Shall be installed with FUSD Approved Locks. FUSD shall inform contractor, before project begins, type of locks to be used.
5. Shall have internal Rack Rail to support standard 19" mounted equipment.
6. Internal Rack Rail shall have 1/2", 3/4" 1" and 1-1/2" Electrical Knockouts and 2" x 4" Knockouts for Cable Pass-through on Back, Bottom, and Sides.
7. Shall come with two (2) 4-1/2" Fans, and Fan Cover Plate for effective thermal management.
8. Shall have Grommet Material installed on all Cable Pass-thru Openings to protect cable from damage.
9. Shall be installed with Internal Quad Outlet, 110V, 20 amps.
10. All cabling connections between Cameras/Fiber Converters/Power Supplies/DVRs shall be made in EMT conduit.
11. No exposed cabling is allowed.
12. Middle Atlantic, DLBX Lockbox with DLBX-RR5 Rail Rack meets this requirement.

**L. RS-485 16 Port Serial Data Distribution Bus (PTZ only):**

1. Shall be installed with every HDcctv HD-SDI DVR.
2. Shall have Two (2) RS-485 Serial Data Input Ports.
3. Shall have Sixteen (16) RS-485 Serial Data Output Ports.
4. Shall have One (1) RS-232 Serial Data Input Port.
5. Shall be powered with External Power Supply.

**ELECTRONIC SURVEILLANCE****1813**

6. Each HDcctv HD-SDI PTZ Camera shall be connected to RS-485 Serial Data Distribution Buss with Standard CAT 5e Twisted-Pair Cable.
7. All HD-SDI PTZ Cameras that run to the HDcctv HD-SDI DVR shall have the RS-485 Serial Data Inputs connected through this RS-485 Serial Data Distribution Buss.
8. Vitec, VT-DD16 with Standard CAT 5e Twisted-Pair Cabling meets this requirement.

**M. Site Audio Encoder:**

1. Shall be installed at all sites that have Swimming Pools.
2. Connection between Encoder and Decoder shall be Fiber Optic Cable.
3. Shall use standard Fiber Optic Cable to Twisted Pair 1Gig Ethernet Converters.
4. Shall be installed in Security Enclosure.
5. Shall be connected to Audio Output of the DVR that controls the HDcctv Security Cameras for the Swimming Pool Areas.
6. Shall have the following Audio Input Specifications:
  - RCA connectors, unbalanced, 2k Ohm impedance.
  - Clipping level 5.3 dBu, 4 Vpp.
  - Frequency response (-3dB) 20 -- 20'000 Hz.
  - Signal to Noise Ratio 89dB, THD <0.03%.
  - Stereo crosstalk -89dB.
  - Input signal attenuable by software setting (-3 -- +19.5dB).
7. Shall have RS-232 Serial Interface.
8. Shall have the following Audio Formats Specifications:
  - MP3, encoding/decoding up to 192/320kbps.
  - VBR and CBR support.
  - PCM 16bit @8, 16, 22.05, 24, 32, 44.1, 48 kHz.
  - G.711, uLaw, aLaw (sample rates same as PCM).
9. Shall have aluminum case construction.
10. Barix Instreamer, 2012.9123 with Fiber Optic to Twisted Pair 1Gig Ethernet converter meets this requirement.

**N. Site Audio Decoder:**

1. Shall be installed at all sites that have Swimming Pools.
2. Connection between Encoder and Decoder shall be Multi-Mode Fiber Optic Cable, as detailed in Section 16790, Part 2, C, 1-15.
3. Shall use Multi-Mode Fiber Optic Cable to Twisted Pair 1Gig Ethernet Converters.

## ELECTRONIC SURVEILLANCE

1813

4. Shall be installed in Security Enclosure as detailed in Section 16790, Part 2, H, 1-13.
  5. Shall be connected to Site Audio Speaker.
  6. Shall have the following Analog Output Specifications:
    - 2 x 25 W (RMS @ 8 Ohm) speaker outputs.
    - 3.5 mm (1/8 inch) headphone jack.
    - S/P DIF out (optical).
    - Output level software controllable.
    - Frequency response (-3 dB) 19 Hz -- 20 kHz.
    - Dynamic range 94 dB.
    - SNR/THD -94 dB, <0.05%).
  7. Shall have RS-232 Serial Interface.
  8. Shall have the following Audio Formats Specifications:
    - MP3, encoding/decoding up to 192/320kbps.
    - VBR and CBR support.
    - PCM 16bit @8, 16, 22.05, 24, 32, 44.1, 48 kHz.
    - G.711, uLaw, aLaw (sample rates same as PCM).
  9. Shall have built-in IR receiver, with IR remote control included.
  10. Shall have aluminum case construction.
  11. Barix Exstreamer 200, 2005.9055 with Fiber Optic to Twisted Pair 1Gig Ethernet converter meets this requirement.
- O. Site Audio Speaker:
1. Shall be installed at all sites that have Swimming Pools.
  2. Shall be connected to Site Audio Decoder.
  3. Shall use #304 Stainless Steel for Exterior Enclosure.
  4. Shall have Output Rating of 30 Watts Nominal/ 50 Watts Peak.
  5. Shall have Impedance of 8 Ohms.
  6. Shall have Frequency Response of: 500 to 7000 Hz.
  7. Shall have High Fidelity Voice Coil.
  8. Shall have Heavy Duty 1.8lb Magnet.
  9. Shall be rated for Exterior Installation.
  10. Elk Products Inc., ELK-1RT meets this requirement.

**ELECTRONIC SURVEILLANCE****1813****P. Video Redistribution Servers:**

1. Contractor shall supply for each site One (1) Video Redistribution Server, located in the Central MDF Room.
2. Shall be installed Turn-Key Functional on Mini-ITX Form Factor, XeonE3 Processor Based, Industrial Server.
3. Shall have no recurring costs for software or hardware licensing or other fees.
4. Shall have Windows 10 Professional Installed.
5. Shall have Dual Gigabyte Ethernet Ports on Server Board.
6. Shall have 16 Gigabyte Ram memory.
7. Shall have 1TB Solid State Hard Drive (SSD) storage.
8. Shall have Low Profile, Wall Mountable, and Motherboard Case.
9. Shall be installed in Security Enclosure as detailed in Section 16790, Part 2, H, 1-13.
10. Shall have two (2) Gigabit Ethernet LAN Ports.
11. Gigabit Ethernet LAN Ports shall be Physically Separated and Independent of each other.
12. Shall connect to Site HDcctv DVRs through one Independent Gigabit Ethernet LAN Port.
13. Shall connect to Site LAN through second Independent Gigabit Ethernet LAN Port.
14. Shall have 80 1080p/15fps Input Stream Channels.
15. Shall have 80 1080p/15fps Output Stream Channels.
16. Shall have 100 Users Support.
17. Shall have Local Network DVR Auto-Detection Support.
18. Shall have Batch Registration of Auto-Detected DVRs Support.
19. Shall have Batch Registration of Multi Users Support.
20. Shall have Power Adapter with Input 100/240 Volts AC 50-60 Hz, and Output 12V DC 10 Amp (12V, 10A DC).
21. Asus P9D-I Mini-ITX Server board; with Intel XeonE3 Processor, E3v3 E3-1275V3; 16Gig Ram; Samsung 1TB SSD, 840Evo; Windows 10 Professional; Black Habey Low Profile Mountable Mini-ITX Case, EMC-800BL; Diamond AMD Radeon HD 7750 PCIE 1G GDDR5 Video Graphics Card, 60mm x 10mm PWM Fan, 12V DC 10 Amp Power Supply, and WebGate Redistribution Server Software, WinRDS; meets with this requirement.

**ELECTRONIC SURVEILLANCE****1813****Q. NTP Servers:**

1. Contractor shall supply for each site One (1) NTP Server, located in the Central MDF Room.
2. Shall be installed Turn-Key Functional on Mini-ITX Form Factor, Intel Celeron Processor Based, Industrial Server.
3. Shall have no recurring costs for software or hardware licensing or other fees.
4. Shall have Windows 10 Professional Installed.
5. Shall have Dual Gigabyte Ethernet Ports on Server Board.
6. Gigabit Ethernet LAN Ports shall be Physically Separated and Independent of each other.
7. Shall have 16 Gigabyte Ram 1333MHz / 1600MHz DDR3L SO-DIMM memory.
8. Shall support mSATA SSD and 2.5" HDD SATA 3.0 (6Gb/s).
9. Shall have 1TB Solid State Hard Drive (SSD) storage.
10. Shall have Low Profile, Wall Mountable, and Motherboard Case.
11. All servers shall be powered with 550W battery back-up (UPS). UPS to be mounted inside security enclosure. Minimum 550W meets this requirement.
12. Shall be installed in Security Enclosure as detailed in Section 16790, Part G 1-13.
13. Shall have two (2) Gigabit Ethernet LAN Ports.
14. Shall connect to Site LAN through second Independent Gigabit Ethernet LAN Port.
15. Shall have Intel Celeron Processor J1900 Quad-Core 2M Cache, 2.41 GHz.
16. Shall have one USB 3.0 port.
17. Shall have one HDMI port.
18. Shall have one RS-232 Serial port.
19. Shall have VESA Mount Bracket (75mm x75mm).
20. Shall have Power Adapter with Input 100/240 Volts AC 50-60 Hz, and Output 12V DC 10 Amp (12V, 10A DC).
21. QoTom Q190, Bay Trail Mini PC, Q190-S02; 16Gig Ram; Samsung 1TB SSD, 840Evo; Windows 10 Professional; and 12V DC 10 Amp Power Supply; meets with this requirement.

## PART 3 – EXECUTION

## 3.01 INSTALLATION

Upon receipt of all materials on this job site, but prior to beginning any installation. Contractors shall schedule a pre-installation meeting with FUSD Camera shop to review all materials proposed for use and mounting locations of all components.

## A. Installation of RG 6/U 18/2 Coaxial Cable:

1. Wire shall be RG 6/U coaxial cable with two 18-gauge conductors to provide effective transmission over assigned runs.
2. The two 18-gauge cables shall be used for power.
3. All cable & wire runs shall be continuous between components or wire. No splicing of any cable installed under this section is allowed.
4. Shall be connected to HDcctv HD-SDI DVR thru BNC Connection Panel with RG 6 BNC Jumper Wires.
5. See HDcctv HD-SDI Camera and Cable Manufactures minimum specifications for cable distance.
6. At no time shall coaxial cable runs exceed 600 feet.
7. Except as otherwise indicated by FUSD Representative, install wiring in raceway.
8. Conceal raceway, except in unfinished spaces and as indicated by FUSD Representative.
9. All cabling connections between HDcctv HD-SDI Cameras and HDcctv HD-SDI DVRs shall be made in appropriate conduit runs.
10. No exposed cabling is allowed.
11. Install cable without damaging conductors or jacket.
12. Do not bend cable to a smaller radius than minimum recommended by manufacturer.
13. Do not exceed manufacturers recommended pulling tensions.
14. Pull cables simultaneously where more than one is being installed in the same raceway or at the same location.
15. Compound/Lubricant shall be used.
16. Compound/Lubricant used must not damage conductor insulation.
17. Use pulling methods that will not damage cable or raceway, including fish tape, cable, rope, break-a ways, and wire-cable grips.

**ELECTRONIC SURVEILLANCE****1813**

18. All wire installed on the exterior of FUSD School Sites shall be in galvanized conduit or liquid-tight conduit a minimum of 2" in size.
  19. Individual and group cable runs in accessible ceiling spaces shall be open cable runs supported by "J" hooks attached to the building structure.
  20. Refer to Fresno Unified Master Specifications, section 16700 3.06-3.18 and Details E2-1 - E2.80 for more information on proper installation requirements.
  21. RG 6/U BNC Connector Ends shall be terminated with manufacturer's approved methods and tools.
  22. RG 6/U BNC Connector Ends shall be terminated with uniformed pressure to insure a secure vapor barrier around the diameter of the outer cable.
  23. RG 6/U BNC Connector Ends shall be terminated to withstand stress when pulled by hand.
- B. RS-485 Control Wire:
1. Each HD-SDI PTZ Camera shall have individual RS-485 Control Wire run with the RG 6/U 18/2 Coax Cable.
  2. All cable runs shall be from the cameras to the nearest HDcctv HD-SDI DVR as identified by FUSD.
  3. Each RS-485 Control Wire shall have no breaks or splices from camera to distribution buss.
  4. Each RS-485 Control Wire shall be labeled and numbered correlating to camera.
  5. Each RS-485 Control Wire shall be installed on the RS-485 16 Port Serial Data Distribution Buss in sequential number correlating to port number on HDcctv HD-SDI Multi-Video Digital Video Recorder for that camera. (ie number one camera shall be installed on port one of the DVR and its control wire shall be installed on port one of the distribution buss.)
  6. Each HD-SDI PTZ Camera shall have a dedicated RS-485 Control Wire.
  7. Cameras are not to share RS-485 Control Wires.
  8. At no time shall coaxial cable runs exceed 600 feet.
  9. All cabling connections shall be made in appropriate conduit runs.
  10. No exposed cabling is allowed.
  11. Install cable without damaging conductors or jacket.
  12. Do not bend cable to a smaller radius than minimum recommended by manufacturer.

**ELECTRONIC SURVEILLANCE****1813**

13. Do not exceed manufacturers recommended pulling tensions.
14. Pull cables simultaneously where more than one is being installed in the same raceway or at the same location.
15. Compound/Lubricant shall be used on all cable pulls.
16. Compound/Lubricant used must not damage conductor insulation.
17. Use pulling methods that will not damage cable or raceway, including fish tape, cable, rope, break-a ways, and wire-cable grips.
18. All wire installed on the exterior of FUSD School Sites shall be in galvanized conduit or liquid-tight conduit a minimum of 2" in size.
19. Individual and group cable runs in accessible ceiling spaces shall be open cable runs supported by "J" hooks attached to the building structure.
20. Refer to section 16700 3.06-3.18 and Details E2-1 - E2.80 for more information on proper installation requirements.

**C. Installation of Fiber Optical Cable:**

1. Fiber Optical Multi-Mode Cable for Ethernet Data shall be used to connect HDcctv HD-SDI DVRs to Video Distribution Server when distance exceeds Twisted-Pair Specifications.
2. Fiber Optical Multi-Mode Cable for Ethernet Data Connections shall be used with FUSD approved 1Gig Ethernet Twisted Pair to Multi-Mode Fiber Optic Transceivers.
3. Fiber Optical Single-Mode Cable for HDcctv HD-SDI Video shall be used to connect HDcctv HD-SDI DVRs to HDcctv HD-SDI Cameras when distance exceeds 200 Meters.
4. Fiber Optical Single-Mode Cable for HDcctv HD-SDI Video shall be used with FUSD approved HDcctv HD-SDI Single-Mode Fiber Optic Transceivers
5. Fiber Optical Cable shall be terminated in FUSD approved Light Guide Boxes.
6. Fiber Optical Cable shall be installed in Security Enclosure.
7. All cable runs shall be from the Site HDcctv HD-SDI DVRs to Site Video Redistribution Server.
8. Except as otherwise indicated by FUSD Representative, install wiring in raceway.
9. Conceal raceway, except in unfinished spaces and as indicated by FUSD Representative.
10. All cabling connections between HDcctv HD-SDI DVRs and Video Redistribution Server shall be made in conduit runs.

**ELECTRONIC SURVEILLANCE****1813**

11. No exposed cabling is allowed.
12. Install Fiber Optical Cable without damaging conductors or jacket.
13. Do not bend Fiber Optical Cable to a smaller radius than minimum recommended by manufacturer.
14. Do not exceed manufacturers recommended pulling tensions.
15. Pull Fiber Optical Cable simultaneously where more than one is being installed in the same raceway or at the same location.
16. Pulling Compound/Lubricant shall be used.
17. Compound/Lubricant used must not damage conductor insulation.
18. Use pulling methods that will not damage Fiber Optical Cable or raceway, including fish tape, cable, rope, break-a ways, and wire-cable grips.
19. All Fiber Optical Cable installed on the exterior of FUSD School Sites shall be in galvanized conduit or liquid-tight conduit a minimum of 2" in size.
20. Individual and group cable runs in accessible ceiling spaces shall be open cable runs supported by "J" hooks attached to the building structure.
21. Refer to section 16700 3.06-3.18 and Details E2-1 - E2.80 for more information on proper installation requirements.

**D. Mounting of HDcctv HD-SDI Static Cameras:**

1. All mounting hardware and installation practices shall be approved by FUSD personnel before proceeding with installation.
2. Camera mounting locations shall be between 12' to 14' above finished floor. Contractor shall insure that camera locations are not blocked or have the cameras view impaired by any other building components.
3. Mounting of HDcctv HD-SDI Camera Equipment shall be on permanent surfaces only.
4. HDcctv HD-SDI Camera Equipment is NOT to be mounted on removable or non-permanent surfaces such as removable ceiling tiles.
5. Shall be connected to HDcctv HD-SDI DVR thru BNC Distribution Panel using RG 6 Coax Cabling and RG 6 Coax Jumper Cabling.
6. All cabling connections between HDcctv HD-SDI Cameras, Power Supplies, RS-485 Serial Data Distribution Buss, and HDcctv HD-SDI DVRs shall be made in appropriate conduit runs.
7. No exposed cabling is allowed.

## ELECTRONIC SURVEILLANCE

1813

8. All HDcctv HD-SDI camera cabling and conduit systems shall be routed so that it is tamper proof.
9. **HDcctv HD-SDI Camera locations are to be approved by FUSD Representative before work is to begin.**

## E. Mounting of HDcctv HD-SDI Pan/Tilt/Zoom Cameras:

1. All mounting hardware and installation practices shall be approved by FUSD personnel before proceeding with installation.
2. Mounting locations shall be placed as high as the maximum viewing area allows.
3. Mounting of HDcctv HD-SDI Camera Equipment shall be on permanent surfaces only.
4. HDcctv HD-SDI Camera Equipment is NOT to be mounted on removable or non-permanent surfaces such as removable ceiling tiles.
5. Shall be connected to HDcctv HD-SDI DVR thru BNC Distribution Panel using RG 6 Coax Cabling and RG 6 Coax Jumper Cabling.
6. Shall be connected to RS-485 Serial Data Distribution Buss with Standard CAT 5e Twisted-Pair Cabling.
7. All cabling connections between HDcctv HD-SDI Cameras, Power Supplies, RS-485 Serial Data Distribution Buss, and HDcctv HD-SDI DVRs shall be made in appropriate conduit runs.
8. Shall be installed no further than 200m total distance between HDcctv HD-SDI PTZ Camera and HDcctv HD-SDI DVR.
9. No exposed cabling is allowed.
10. All HDcctv HD-SDI camera cabling and conduit systems shall be routed so that it is tamper proof.
11. **HDcctv HD-SDI Camera locations are to be approved by FUSD Representative before work is to begin.**

## F. Installation of HDcctv HD-SDI DVRs:

1. HDcctv HD-SDI DVRs shall be secured in an individual wall mounted Security Enclosures.
2. Shall be installed in multiple locations on each Site.
3. Shall be installed in locations that do not exceed 200m total distance between HDcctv HD-SDI DVR and furthest Camera.
4. Shall be connected to RS-485 Serial Data Distribution Buss with Standard CAT 5e Twisted-Pair Cabling.

**ELECTRONIC SURVEILLANCE****1813**

5. All cabling connections between HDcctv HD-SDI Cameras and HDcctv HD-SDI DVRs shall be made in appropriate conduit runs.
6. Dedicated 110 volt 20-amp circuit and Power Outlets shall be mounted inside each Security Lockbox and Power Supply.
7. Shall be installed in accordance to FUSD Master Specifications for Electrical Installations Sections 16010 – 16610.
8. No exposed cabling is allowed.

**G. Installation of Security Enclosures:**

1. All HDcctv HD-SDI DVRs, Video Distribution Servers, RS-485 Serial Data Distribution Buss, Fiber Converters, Ethernet Converters, Audio Amplifiers, Encoders/Decoders, Fiber Optical Cables, Twisted Pair, Coaxial Cables, and other related material shall be installed in wall mounted Security Lockboxes.
2. Shall be installed with FUSD Approved Locks.
3. FUSD shall inform contractor, before project begins, type of locks to be used.
4. Shall be installed with minimum 2" conduit for all camera cables.
5. Number of 2" and larger conduits shall be determined by site conditions.
6. Shall be installed with internal Rack Rail to support standard 19" mounted equipment.
7. Internal Rack Rail shall have 1/2", 3/4" 1" and 1 1/2" Electrical Knockouts and 2" x 4" Knockouts for Cable Pass-through on Back, Bottom, and Sides.
8. Shall be installed with two (2) 4 1/2" Fans, and Fan Cover Plate for effective thermal management.
9. Shall be installed with Grommet Material installed on all Cable Pass-Thru Openings to protect cable from damage.
10. Shall be installed with Dedicated Double Duplex 110voltAC 20-amp Power Outlets within each enclosure.
11. All cabling connections between Cameras/Fiber Converters/Power Supplies/DVRs shall be made in EMT conduit.
12. Shall be installed in accordance to FUSD Master Specifications for Electrical Installations Sections 16010 – 16610 & per FUSD standard drawing "DLBX Lockbox" revised on 11/26/14.
13. Shall be installed with BNC Patch Panel for each Video Feed, for service and testing of video signal.

**ELECTRONIC SURVEILLANCE****1813**

14. Shall be installed with two (2) Ethernet jacks connected Site LAN.
15. When Two (2) Enclosures are installed in same area, they shall be mounted side by side as diagrammed in Detail 16790-02.
16. See Detail 16790-02 for Layout and Mounting Diagrams.
17. No exposed cabling is allowed.

**H. Installation of HD Spot Monitors:**

1. Shall be used to monitor single or multiple HDcctv HD-SDI Spot Cameras.
2. Shall be installed as Site conditions require and with approval from FUSD Representative.
3. Shall be installed with HDcctv HD-SDI to HDMI Converter (See Section 16790, Part 2, J, 1-9.
4. Shall be installed with wall mounted Monitor mount.
5. Signal shall be feed from appropriate HDcctv HD-SDI Camera HDMI Converter with an appropriate length HDMI Cable.
6. Shall be installed with Duplex 110voltAC 20-amp Power Outlet.
7. Power and Signal feed shall be terminated in appropriate wall boxes.
8. Power and Signal feed shall have corresponding outlets for 110v and HDMI connection.
9. Signal feed shall connect to Spot Monitor with a short, small diameter HDMI Cable.
10. Shall be installed in accordance to FUSD Master Specifications for Electrical Installations Sections 16010 – 16610.
11. Final placement of spot monitor will be determined by site needs, site conditions, and approval of FUSD representative.
12. No exposed cabling is allowed.

**I. Mounting of HDcctv HD-SDI Camera Power Supplies:**

1. All mounting hardware and installation practices shall be approved by FUSD personnel before proceeding with installation.
2. All cabling connections between HDcctv HD-SDI Cameras/Fiber Converters/Power Supplies/HDcctv HD-SDI DVRs shall be in conduit. Per FUSD Electrical specified run
3. No exposed cabling is allowed.

**ELECTRONIC SURVEILLANCE****1813**

4. All HDcctv HD-SDI camera cabling and conduit systems shall be routed so that it is tamper proof.

**J. Installation of Audio System:**

1. Shall be used at sites where one-way communication from the Central Station to site is required.
2. Shall be installed in Security Enclosure.
3. Shall be feed from the site HDcctv HD-SDI DVR audio output.
4. Dedicated and Isolated Fiber Optical Cable with Ethernet Converters shall be used to interconnect Audio Encoder to Audio Decoder.
5. High Temp Power Supplies shall be used with all Audio Equipment.
6. Dedicated 110 volt 20-amp Power Outlets shall be mounted inside each Security Lockbox and Power Supply.
7. Outdoor Speaker shall be installed as close to area intended for coverage as is physically possible.
8. Final placement of Outdoor Speaker will be determined by site needs, site conditions, and approval of FUSD Representative.
9. No exposed cabling is allowed.

**K. Installation of Video Redistribution Servers:**

1. Each Site shall have one Video Redistribution Server installed in a central location.
2. Video Redistribution Servers shall be installed in a Security Enclosure.
3. Shall be installed with FUSD Approved Locks.
4. FUSD shall inform contractor, before project begins, type of locks to be used.
5. Dedicated and Isolated Fiber Optical Cable with Ethernet Converters shall be used to interconnect Video Redistribution Server to Site HDcctv HD-SDI DVRs.
6. Video Redistribution Servers shall have dedicated twisted pair Category 6 cabling or Isolated Fiber Optical Cable with Ethernet Converters (dependent upon site conditions) connected to local site LAN.
7. Dedicated 110 volt 15-amp Power Outlets shall be mounted inside each Security Lockbox, to supply power to Video Redistribution Server.
8. No exposed cabling is allowed.

**ELECTRONIC SURVEILLANCE****1813****L. Installation of NTP Servers:**

1. Each Site shall have one NTP Server installed in a central location.
2. NTP Servers shall be installed in a Security Enclosure.
3. Shall be installed with FUSD Approved Locks.
4. FUSD shall inform contractor, before project begins, type of locks to be used.
5. NTP Servers shall have dedicated twisted pair Category 6 cabling or Isolated Fiber Optical Cable with Ethernet Converters (dependent upon site conditions) connected to local site LAN.
6. Dedicated 110 volt 20-amp Power Outlets shall be mounted inside each Security Lockbox to supply power to NTP Server.
7. No exposed cabling is allowed.

**M. Wiring in Wire Closets and Cabinets:**

1. Install conductors parallel to and at right angles to walls, bundle, lace, and train the conductors to terminal points with no excess.
2. Use wire distribution spools at points where cables are fanned or conductors turned.
3. Label each terminal with designations approved by the equipment supplier.

**N. HD-SDI Camera, RS-485 Control Wire, RG 6/U 18/2 Coax Cable, and Fiber Optical Cable Labeling:**

1. Labels shall be machine printed on appropriately sized vinyl or other approved material.
2. Lettering shall be black and printed on white frosted surface and covered by a minimum of two wraps of clear protective material.
3. One-piece label is required.
4. Labels shall be placed on each end of the cable and at other weather-protected places where the cable is visible.
5. Sample labels shall be provided for approval before installation.
6. Label information shall be included on the "as-built" drawings.
7. HD-SDI Camera Labeling:
  - a. Shall be labeled internal to HDcctv HD-SDI DVR System.
  - b. Shall be labeled to represent the area being viewed.

## ELECTRONIC SURVEILLANCE

1813

8. RS-485 Control Wire Labeling:
  - a. Shall be labeled indicating "Camera Source" and "Destination" of cable.
  - b. Label shall read: *FROM Camera X to Room X.*

9. RG 6/U 18/2 Coax Cable Labeling:
  - a. Shall be labeled indicating "Camera Source" and "Destination" of cable.
  - b. Label shall read: *FROM Camera X to Room X.*

10. Fiber Cable Labeling:
  - a. Shall be labeled indicating "Source" and "Destination" of cable.
  - b. Label shall read: *FROM MDF (Room X) to Room X.*

O. New construction pathway:

1. In new construction, a 2" minimum conduit system terminated to 6" or larger square box with single gang or larger plaster rings minimum must be installed to each of the camera locations that are located on an inside or outside wall.
2. Conduit and square box size shall be determined by site conditions.
3. The conduit system must be stubbed into the inside attic space of the building that will provide a clear pathway to the nearest data closet.
4. All exposed conduit and enclosures shall be painted to match existing wall color schemes.

P. Installation of Security Camera Viewer Software:

1. Security Camera Viewer Software shall be installed on designated Site computer terminals.
2. Contractor shall work with Site Personnel and FUSD Representative to identify all computer terminals that will be used to view Site Security Camera System.
3. Contractor shall develop an inventory list, by site, of all computer terminals to be used with Viewer Software.
4. Inventory List shall include Make, Model, OS Version, Serial Number, DPN Number, and Name of Site Personnel computer terminal is assigned to.
5. All Site Personnel Computer Terminals shall be approved by FUSD Representative before installation of Viewer Software.
6. Inventory list shall be delivered to FUSD Representative in electronic format on USB V3.0 storage stick, and bound in printed paper format.

**ELECTRONIC SURVEILLANCE****1813****Q. Salvage of Existing Security Camera System Equipment:**

1. All existing Security Camera System Equipment shall be salvaged in working order and returned to FUSD.
2. All existing Security Camera System Equipment shall be left functional and in place until new System is fully functional.
3. Contractor shall take care to not damage Equipment when being salvaged.
4. Contractor shall inventory all Equipment salvaged.
5. Contractor shall pack all Equipment in secure protective packaging.
6. Packaging shall be labeled to indicate Contents and Site from which Equipment was salvaged.
7. Contractor shall deliver packaged Equipment to a location designated by FUSD Representative.

**3.02 PROJECT FINALIZATION:****A. Coax Cable Testing and Certification:**

1. All Coax cable and shall be tested following installation.
2. Testing shall include continuity of coax and 18 gauge wires as needed.
3. Impedance of coax shall be tested to assure compliance of manufacture specification in relation to total footage installed.
4. Use commercially manufactured field tester with hard copy of test results.
5. Three copies (hard copy) of the test results shall be delivered to the F.U.S.D. personnel prior to project acceptance.
6. Mechanical testing of BNC connectors shall be done by apply quick pulling pressure to insure proper seal of connector onto coax cabling.

**B. Fiber Optic Cable Testing and Certification:**

1. All Fiber Optic Cable shall be tested using an approved Optical Power Meter.
2. Power Meter measurements shall be made from both ends of the cable.
3. Measured results shall be within cable manufacturer's specifications.
4. Cable shall be tested at both 850 nm and 1300 nm for Multi-mode fiber and at 1300 and 1550 nm for Single-mode fiber.

## ELECTRONIC SURVEILLANCE

1813

5. Any cable or termination, which does not meet manufacturer's specifications, shall be replaced and retested.
  6. Provide three copies (hard copy), bounded, of the test results for Owner's approval before project acceptance.
  7. All Power Meter Testing shall be done in the presence of a District appointed Observer.
- C. Over-all System Testing:
1. Contractor shall test each camera location utilizing a method which tests the functionality of the camera, the DVR recording capability, and quality of images captured.
  2. The method employed shall use real time images and clearly indicate area of view.
  3. Any adjustments needed to equipment will be finalized with this test.
  4. District personal will approve all final quality of image and areas of coverage before project will be accepted.
- D. All Testing shall be done in the presence of a District appointed Observer.
- E. As-Built Drawings:
1. Before project will be accepted, the contractor will provide as-built drawings.
  2. The as-built record documents shall include edited drawings and specifications, accurately reflecting field conditions, **inclusive** of all project revisions, change orders, and modifications.
  3. Drawings shall be three (3) hard copies, full size, same as bid documents.
  4. Finalized form shall also be submitted electronically on an USB V3.0 stick drive in three (3) formats: (1) AutoCAD 2013, (2) PDF, and (3) WebGate Control Center Professional (4.x).
  5. Drawings shall show only one level per page of sites that have multiple levels.
  6. Maps shall indicate location of cameras, nearest wiring cabinet that cameras connect to, and verified area of view for each camera.
  7. HDcctv HD-SDI Cameras will be clearly labeled and correspond to labeling in DVR system.
  8. A sample As-Built Drawing shall be provided as an example of expected final format, on request.

END OF SECTION

## SECTION 32 31 13 – CHAIN LINK FENCING

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes

1. Provisions of constructing chain link fence at locations shown on the Construction Documents, including but not limited to:
  - a. Site chain link fencing and gates.

## B. RELATED SECTIONS

1. Contract General Conditions and Division 1 Specifications.
2. Section 312000 – Earthwork: Excavation, Filling, and Grading
3. Section 321313 – Site Concrete Improvements.

## 1.2 QUALITY ASSURANCE

## A. Qualifications of Installer

1. Throughout the progress of installation of the work of this Section, provide at least one person who shall be thoroughly familiar with the specified requirements, completely trained and experienced in the necessary skills, and who shall be present at the site and shall direct all work performed under this Section.
2. In actual installation of the work of this Section, use adequate numbers of skilled workmen to insure installation in strict accordance with the contract documents.
3. In acceptance or rejection of work performed under this Section, the Engineer will make no allowance for lack of skill on the part of the workmen.

## 1.3 PRODUCT HANDLING

## A. Protection

1. Use all means necessary to protect the materials of this Section before, during and after installation, and to protect the work of other trades.

## B. Replacements

1. In the event of damage, immediately make all repairs and replacements necessary to the satisfaction of the Engineer and at no additional cost to the Owner.

## PART 2 - PRODUCTS

## 2.1 MATERIALS

- A. The materials and fabrication of chain link fabric shall conform to these specifications, and as shown on the plans and details.
- B. All ferrous materials shall be new and galvanized. Imperfectly galvanized material or material upon which serious abrasions of the galvanizing occur shall not be used.
- C. Height - all fencing shall stand at the heights shown on the plans.
- D. Fabric
  - 1. Chain link fabric shall conform to the specifications of ASTM, designation: A392, Class 1
    - a. The wire used in the manufacture of the fabric shall be 9-gauge. All chain link fabric shall be woven into approximately 2-inch mesh. Fabric shall be furnished with knuckling at all selvages. The knuckled selvage shall be used along all corners and edges. Fabric shall be GBW, galvanized before weaving.
- E. Posts, braces and gate frames
  - 1. The base material for the manufacture of steel pipe used for posts and braces shall conform to the specifications of ASTM, designation: A53 Type A, standard weight, Schedule 40, and the base material for the manufacture of other steel sections used for posts and braces shall be good commercial quality weldable steel.
  - 2. All posts, braces and gate frames shall conform to the size and weight designations shown on the plans.
  - 3. All posts shall be fitted with rainproof caps designed so as to fit securely over the top of the posts.
  - 4. All posts shall be of a total length of not less than the depth of the concrete footing as shown on the plans, plus the length required above ground.
  - 5. Posts and braces shall be galvanized in accordance with specifications of ASTM, designation: A123.
  - 6. All horizontal braces shall be attached to posts by approved steel fixtures.
- F. Stretcher bars and other required fittings and hardware shall be steel and shall be galvanized in accordance with the specifications of ASTM, designation: A153.
- G. All swinging gates and walk gates shall be installed with a gate holdback, Trimco 1209HOHA-626. Holdbacks shall be installed in the concrete mowstrip, unless otherwise noted.
- H. Concrete mowstrip shall be in accordance with Section 321313 SITE CONCRETE IMPROVEMENTS.
- I. Walk gates shall be constructed as per detailed drawings and in accordance with CBC sections 11B-206.5 and 11B-404.
- J. Backstop shall be constructed as per detail drawing.

- K. Drive gate, roll gate and walk gate shall be constructed as per detail drawing.
- L. Non-accessible swinging gates shall comply with the following:
  - 1. Have a lockable fork latch.
  - 2. Have heavy-duty malleable iron hinges
- M. Accessible walk gates on an accessible path-of-travel shall comply with the following:
  - 1. Gate lever handle latch hardware shall be an accessible lever type that requires a maximum of 5 pounds of pressure to operate, Von Duprin AX22-210L SP28-299 Hex-Key Dogging – GBK.
  - 2. Gate night latch hardware, Von Duprin AX22-210NL SP28-299 Hex-Key Dogging – GBK.
  - 3. Accessible gates shall have a minimum 10 inch high steel bottom kick plates on both sides of the gate.
  - 4. Accessible gates with night latch lever or at a security perimeter (e.g. at the site perimeter or through a security fence) shall have two self-closing hinges Locinox Mammoth 180 and shall comply with CBC 11B-404.2.8.1. Install steel angles to round posts and gate for mounting self-closing hinges.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. All posts shall be set in concrete footings as shown on the plans to within 3 inches of bottom.
- B. All vertical line and end posts shall be braced to the nearest adjacent vertical post with galvanized horizontal braces as shown on the plans.
- C. Welding
  - 1. All welding shall conform to the requirements of the Uniform Building Code, UBC, Chapter 22.
  - 2. Where the galvanized surface has been burned by welding, all surfaces of the welded connections shall be thoroughly cleaned by wire brushing and all traces of the welding flux and loose or cracked galvanizing removed. The damaged area and weld shall then be painted in accordance with the following details.
    - a. All galvanized, welded, or damaged surfaces that are to be painted shall first be cleaned by washing with mineral spirit solvent sufficient to remove any oil, grease or other materials foreign to the galvanized coating.
    - b. After washing, all areas shall be roughened by abrasive blasting using an abrasive that is no larger than 30-mesh. Galvanizing shall not be removed by this operation.
    - c. After preparation, all galvanized surfaces that are to be painted shall be covered with one application of zinc dust-zinc oxide primer, federal specification TT-P-641, Type II. The zinc dust-zinc oxide paint shall be applied by spraying to produce a complete covering of the galvanized surface.

## CHAIN LINK FENCING

1725

- d. After the application of the zinc dust-zinc oxide paint, one application of pre-treatment, vinyl wash primer, Section 91-2.7 of the state Standard Specifications, shall be applied to such surfaces. The vinyl wash primer shall be applied by spraying to produce a uniform wet film on the surface.
  - e. Such surfaces shall then be covered with two separate applications of white tint base vinyl finish coat, Section 91-2.22 of the state standard specifications, sufficient to completely cover the preceding color. Paint for the first application shall be tinted with a compatible coloring agent to slightly contrast with the color of the second application. After drying for 24 hours, one application of aluminum paint, finish coat, Section 91-2.8 of the state standard specifications, shall be painted on the welded areas.
- D. Perimeter fencing chain link fabric shall be fastened to the outside of the fence.
- E. All fabric shall be stretched and securely fastened to the posts, as follows:
- F. The fabric shall be fastened to end, corner and gate posts with 3/16 inch by 5/8 inch stretcher bars and not less than 1/8 inch by 3/4 inch stretcher bar bands spaced at one foot intervals for whatever widths of fabric are supplied. The fabric shall be fastened to line posts with tie wires or post clips. Tie wires shall be at least 9-gauge (0.148 inch diameter) steel. Post clips shall be at least 6-gauge (0.192 inch diameter) steel. The wire or clip fasteners shall be spaced at approximately 14 inches on line posts, with a minimum of 5 fasteners per 6 foot high post. Top and bottom edges of the fabric shall be secured to each horizontal brace with tie wires or fastened to tension wire with hog rings spaced at 15 inch maximum intervals. Hog rings shall be at least 9-gauge (0.148 inch diameter) steel. Wire ties shall be given at least one complete turn. Hog rings shall be closed with ends overlapping. The distance from the selvage to the braces or top rails shall be 2 inch maximum and shall be fastened to the brace or rail by wire fasteners spaced at approximately 14 inches with a minimum of 8 fasteners per each 10 foot horizontal span.
- G. Construct concrete mowstrip at the width as shown on the plans.

END OF SECTION

**APPENDIX 'A'**  
**STORM WATER PROTECTION PLAN**

# STORMWATER POLLUTION PREVENTION PLAN

for

Addams Elementary School

## RISK LEVEL 1

### Legally Responsible Person (LRP):

Fresno Unified School District  
4600 N. Brawley Ave.  
Fresno, CA, 93722  
Derek Vendenoff  
(559) 457-3055

### Project Address:

2117 W McKinley Ave  
Fresno, CA 93728

### SWPPP Prepared by:

**Cassie Scholz, PE, QSD**  
Blair, Church & Flynn Consulting Engineers  
451 Clovis Ave. Suite 200  
Clovis, CA 93612  
(559) 326 – 1400

### SWPPP Preparation Date

June 4, 2021

WDID # \_\_\_\_\_

### Estimated Project Dates:

---

Start of Construction    **08/18/21**

Completion of Construction

**08/17/23**

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# TABLE OF CONTENTS

<b>Table of Contents .....</b>	<b>i</b>
<b>Qualified SWPPP Developer.....</b>	<b>1</b>
<b>Legally Responsible Person.....</b>	<b>2</b>
<b>Amendment Log.....</b>	<b>3</b>
<b>Section 1 SWPPP Requirements .....</b>	<b>4</b>
1.1 Introduction.....	4
1.2 Permit Registration Documents .....	4
1.3 SWPPP Availability and Implementation.....	5
1.4 SWPPP Amendments.....	5
1.5 Retention of Records.....	6
1.6 Required Non-Compliance Reporting .....	7
1.7 Annual Report.....	7
1.8 Changes to Permit Coverage.....	7
1.9 Notice of Termination.....	7
<b>Section 2 Project Information .....</b>	<b>9</b>
2.1 Project and Site Description.....	9
2.1.1 Site Description.....	9
2.1.2 Existing Conditions.....	9
2.1.3 Existing Drainage.....	9
2.1.4 Geology and Groundwater .....	9
2.1.5 Project Description.....	9
2.1.6 Developed Condition .....	10
2.2 Permits and Governing Documents .....	11
2.3 Stormwater Run-On from Offsite Areas .....	11
2.4 Findings of the Construction Site Sediment and Receiving Water Risk Determination	11
2.5 Construction Schedule .....	12
2.6 Potential Construction Activity and Pollutant Sources.....	12
2.7 Identification of Non-Stormwater Discharges .....	12
2.8 Required Site Map Information .....	13
<b>Section 3 Best Management Practices .....</b>	<b>15</b>

3.1	Schedule for BMP Implementation .....	15
3.1.1	Project Specific BMP Descriptions .....	15
3.2	Erosion and Sediment Control .....	17
3.2.1	Erosion Control .....	17
3.2.2	Sediment Controls.....	20
3.3	Non-Stormwater Controls and Waste and Materials Management .....	23
3.3.1	Non-Stormwater Controls.....	23
3.3.2	Materials Management and Waste Management .....	25
3.4	Post construction Stormwater Management Measures .....	28
<b>Section 4</b>	<b>BMP Inspection, and Maintenance .....</b>	<b>29</b>
4.1	BMP Inspection and Maintenance .....	29
4.2	Rain Event Action Plans .....	29
<b>Section 5</b>	<b>Training .....</b>	<b>30</b>
<b>Section 6</b>	<b>Responsible Parties and Operators .....</b>	<b>31</b>
6.1	Responsible Parties .....	31
6.2	Contractor List .....	32
<b>Section 7</b>	<b>Construction Site Monitoring Program.....</b>	<b>33</b>
7.1	Purpose.....	33
7.2	Applicability of Permit Requirements .....	33
7.3.	Weather and Rain Event Tracking.....	33
7.3.1	Weather Tracking.....	33
7.3.2	Rain Gauges .....	33
7.4	Monitoring Locations.....	34
7.5	Sample Collection Safety, Monitoring, and Monitoring Exemptions .....	34
7.6	Visual Monitoring.....	35
7.6.1	Routine Observations and Inspections.....	36
7.6.1.1	Routine BMP Inspections .....	36
7.6.1.2	Non-Stormwater Discharge Observations .....	37
7.6.2	Rain-Event Triggered Observations and Inspections .....	37
7.6.2.1	Visual Observations Prior to a Forecasted Qualifying Rain Event.....	37
7.6.2.2	BMP Inspections During an Extended Storm Event.....	37
7.6.2.2	Visual Observations Following a Qualifying Rain Event.....	38
7.6.3	Visual Monitoring Procedures .....	38

7.6.4	Visual Monitoring Follow-Up and Reporting.....	38
7.6.5	Visual Monitoring Locations .....	39
7.7	Water Quality Sampling and Analysis.....	39
7.7.1	Sampling and Analysis Plan for Non-Visible Pollutants in Stormwater Runoff Discharges.....	39
7.7.1.2	Sampling Locations – Not Required for Risk Level 1 Projects.....	40
7.7.1.3	Monitoring Preparation.....	40
7.7.1.4	Analytical Constituents.....	41
7.7.1.5	Sample Collection.....	42
7.7.1.6	Sample Analysis.....	42
7.7.1.7	Data Evaluation and Reporting.....	45
7.7.2	Sampling and Analysis Plan for pH and Turbidity in Stormwater Runoff Discharges.....	45
7.7.3	Additional Monitoring Following an NEL Exceedance .....	45
7.7.4	Sampling and Analysis Plan for Non-Stormwater Discharges .....	45
7.7.5	Sampling and Analysis Plan for Other Pollutants Required by the Regional Water Board	45
7.7.6	Training of Sampling Personnel .....	45
7.7.7	Sample Collection and Handling .....	46
7.7.7.1	Sample Collection.....	46
7.7.7.2	Sample Handling.....	47
7.7.7.3	Sample Documentation Procedures .....	48
7.11	Quality Assurance and Quality Control.....	48
7.11.1	Field Logs .....	48
7.11.2	Clean Sampling Techniques .....	48
7.11.3	Chain of Custody .....	49
7.11.4	QA/QC Samples.....	49
7.11.4.1	Field Duplicates.....	49
7.11.4.2	Equipment Blanks .....	49
7.11.4.3	Field Blanks.....	50
7.11.4.4	Travel Blanks .....	50
7.11.5	Data Verification.....	50
7.12	Records Retention.....	51

**CSMP Attachment 1: Weather Reports..... 52**

**CSMP Attachment 2: Monitoring Records ..... 53**

**CSMP Attachment 3: Example Forms..... 54**

**Section 8 References..... 63**

*Appendix A: Calculations..... 64*

*Appendix B: Site Maps ..... 65*

*Appendix C: Permit Registration Documents..... 66*

*Appendix D: SWPPP Amendment Certifications ..... 67*

*Appendix E: Submitted Changes to PRDs..... 69*

*Appendix F: Construction Schedule ..... 71*

*Appendix G: Construction Activities, Materials Used, and Associated Pollutants ..... 72*

*Appendix H: CASQA Stormwater BMP Handbook Portal: Construction Fact Sheets ..... 74*

*Appendix I: BMP Inspection Form ..... 75*

*Appendix J: Training Reporting Form ..... 82*

*Appendix K: Responsible Parties ..... 84*

*Appendix L: Contractors and Subcontractors..... 88*

*Appendix M: Construction General Permit ..... 89*

## QUALIFIED SWPPP DEVELOPER

---

Approval and Certification of the Stormwater Pollution Prevention Plan

Project Name:

Addams Elementary School

---

Project Number/ID:

217-0215

---

“This Stormwater Pollution Prevention Plan and Attachments were prepared under my direction to meet the requirements of the California Construction General Permit (SWRCB Orders No. 2009-009-DWQ as amended by Order 2010-0014-DWQ). I certify that I am a Qualified SWPPP Developer in good standing as of the date signed below.”



*QSD Signature*

---

05-26-2021

*Date*

---

Cassie Scholz

*QSD Name*

---

24295

*QSD Certificate Number*

---

Project Engineer, QSD

*Title and Affiliation*

---

(559) 326 – 1400

*Telephone Number*

---

[cscholz@bcf-engr.com](mailto:cscholz@bcf-engr.com)

*Email*

---

## LEGALLY RESPONSIBLE PERSON

---

### Approval and Certification of the Stormwater Pollution Prevention Plan

Project Name: Addams Elementary School

Project Number/ID: 217-0215

"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 who 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."

Derek Vendenoff

Legally Responsible Person

Signature of Legally Responsible Person or Approved Signatory

Date

(559) 457-3055

Name of Legally Responsible Person or Approved Signatory

Telephone Number

## AMENDMENT LOG

---

Project Name:

Addams Elementary School

Project Number/ID

217-0215

Amendment No.	Date	Brief Description of Amendment, include section and page number	Prepared and Approved By
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#

## SECTION 1 SWPPP REQUIREMENTS

---

### 1.1 INTRODUCTION

The Jane Addams Elementary School Addition and Modification project comprises approximately 5.8 acres and is located at 2117 W McKinley Ave Fresno, CA 93728, about 0.15 miles West of CA-99, 1-mile North of CA-180, and 0.17 miles Northeast of a Fresno Metropolitan Flood Control District (FMFCD) Basin XX. The property is owned and being developed by Fresno Unified School District (FUSD). The project location is shown on the Site Map in Appendix B.

This Stormwater Pollution Prevention Plan (SWPPP) is designed to comply with California's General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (General Permit) Order No. 2009-0009-DWQ as amended by Order No. 2010-0014-DWQ (NPDES No. CAS000002) issued by the State Water Resources Control Board (State Water Board). This SWPPP has been prepared following the SWPPP Template provided on the California Stormwater Quality Association Stormwater *Best Management Practice Handbook Portal: Construction* (CASQA, 2012). In accordance with the General Permit, Section XIV, this SWPPP is designed to address the following:

- Pollutants and their sources, including sources of sediment associated with construction, construction site erosion and other activities associated with construction activity are controlled;
- Where not otherwise required to be under a Regional Water Quality Control Board (Regional Water Board) permit, all non-stormwater discharges are identified and either eliminated, controlled, or treated;
- Site BMPs are effective and result in the reduction or elimination of pollutants in stormwater discharges and authorized non-stormwater discharges from construction activity to the Best Available Technology/Best Control Technology (BAT/BCT) standard;

Calculations and design details as well as BMP controls for are complete and correct, Appendix A.

### 1.2 PERMIT REGISTRATION DOCUMENTS

Required Permit Registration Documents (PRDs) shall be submitted to the State Water Board via the Stormwater Multi Application and Report Tracking System (SMARTS) by the Legally Responsible Person (LRP), or authorized personnel (i.e., Approved Signatory) under the direction of the LRP. The project-specific PRDs include:

1. Notice of Intent (NOI);
2. Risk Assessment (Construction Site Sediment and Receiving Water Risk Determination);
3. Site Map;
4. Annual Fee;

5. Signed Certification Statement (LRP Certification is provided electronically with SMARTS PRD submittal); and
6. SWPPP.

Site Maps can be found in Appendix B. A copy of the submitted PRDs shall also be kept in Appendix C along with the Waste Discharge Identification (WDID) confirmation.

Additional PRDs may be required depending on the construction type and location.

### **1.3 SWPPP AVAILABILITY AND IMPLEMENTATION**

The discharger shall make the SWPPP available at the construction site during working hours (see Section 7.5 of CSMP for working hours) while construction is occurring and shall make it available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone. (CGP Section XIV.C)

The SWPPP shall be implemented concurrently with the start of ground disturbing activities.

### **1.4 SWPPP AMENDMENTS**

The SWPPP should be revised when:

- There is a General Permit violation.
- There is a reduction or increase in total disturbed acreage (General Permit Section II Part C).
- BMPs do not meet the objectives of reducing or eliminating pollutants in stormwater discharges.

Additionally, the SWPPP shall be amended when:

- There is a change in construction or operations which may affect the discharge of pollutants to surface waters, groundwater(s), or a municipal separate storm sewer system (MS4);
- When there is a change in the project duration that changes the project's risk level; or
- When deemed necessary by the QSD. The QSD has determined that the changes listed in Table 1.1 can be field determined by the QSP. All other changes shall be made by the QSD as formal amendments to the SWPPP.

The following items shall be included in each amendment:

- Who requested the amendment;
- The location of proposed change;
- The reason for change;

- The original BMP proposed, if any; and
- The new BMP proposed.

Amendments shall be logged at the front of the SWPPP and certification kept in Appendix D. The SWPPP text shall be revised, replaced, and/or hand annotated as necessary to properly convey the amendment. SWPPP amendments must be made by a QSD. The following changes have been designated by the QSD as "to be field determined" and constitute minor changes that the QSP may implement based on field conditions.

**Table 1.1 List of Changes to be Field Determined**

<b>Candidate changes for field location or determination by QSP<sup>(1)</sup></b>	<b>Check changes that can be field located or field determined by QSP</b>
Increase quantity of an Erosion or Sediment Control Measure	<input checked="" type="checkbox"/>
Relocate/Add stockpiles or stored materials	<input checked="" type="checkbox"/>
Relocate or add toilets	<input checked="" type="checkbox"/>
Relocate vehicle storage and/or fueling locations	<input checked="" type="checkbox"/>
Relocate areas for waste storage	<input checked="" type="checkbox"/>
Relocate water storage and/or water transfer location	<input checked="" type="checkbox"/>
Changes to access points (entrance/exits)	<input checked="" type="checkbox"/>
Change type of Erosion or Sediment Control Measure	<input checked="" type="checkbox"/>
Changes to location of erosion or sediment control	<input checked="" type="checkbox"/>
Minor changes to schedule or phases	<input checked="" type="checkbox"/>
Changes in construction materials	<input checked="" type="checkbox"/>
<i>(1) Any field changes not identified for field location or field determination by QSP must be approved by QSD</i>	

## 1.5 RETENTION OF RECORDS

Paper or electronic records of documents required by this SWPPP shall be retained for a minimum of three years from the date generated or date submitted, whichever is later, for the following items:

- The onsite SWPPP with NOI, COIs, Annual Reports, and NOT
- All inspection reports

These records shall be available at the Site until construction is complete. Records assisting in the determination of compliance with the General Permit shall be made available within a reasonable time, to the Regional Water Board, State Water Board or U.S. Environmental

Protection Agency (EPA) upon request. Requests by the Regional Water Board for retention of records for a period longer than three years shall be adhered to.

## **1.6 REQUIRED NON-COMPLIANCE REPORTING**

If a General Permit discharge violation occurs the QSP shall immediately notify the LRP and the LRP shall file a violation report electronically to the Regional Water Board within 30 days of identification of non-compliance using SMARTS. Corrective measures will be implemented immediately following the discharge or written notice of non-compliance from the Regional Water Board. Discharges and corrective actions will be documented on the NAL/NEL Exceedance Site Evaluation Report Form in CSMP Attachment 3 “Example Forms.”

The report to the LRP and to the Regional Water Board will contain the following items:

- The date, time, location, nature of operation and type of unauthorized discharge.
- The cause or nature of the notice or order.
- The control measures (BMPs) deployed before the discharge event, or prior to receiving notice or order.
- The date of deployment and type of control measures (BMPs) deployed after the discharge event, or after receiving the notice or order, including additional measures installed or planned to reduce or prevent re-occurrence.

## **1.7 ANNUAL REPORT**

The General Permit requires that permittees prepare, certify, and electronically submit an Annual Report no later than September 1<sup>st</sup> of each year. Reporting requirements are identified in Section XVI of the General Permit. Annual reports will be filed in SMARTS and in accordance with information required by the on-line forms.

## **1.8 CHANGES TO PERMIT COVERAGE**

The General Permit allows for the reduction or increase of the total acreage covered under the General Permit when: a portion of the project is complete and/or conditions for termination of coverage have been met; when ownership of a portion of the project is purchased by a different entity; or when new acreage is added to the project.

Modified PRDs shall be filed electronically within 30 days of a reduction or increase in total disturbed area if a change in permit covered acreage is to be sought. The SWPPP shall be modified appropriately, shall be logged at the front of the SWPPP and certification of SWPPP amendments are to be kept in Appendix D. Updated PRDs submitted electronically via SMARTS can be found in Appendix E.

## **1.9 NOTICE OF TERMINATION**

A Notice of Termination (NOT) must be submitted electronically by the LRP via SMARTS to terminate coverage under the General Permit. The NOT must include a final Site Map and representative photographs of the project site that demonstrate final stabilization has been achieved. The NOT shall be submitted within 90 days of completion of construction. The

Regional Water Board will consider a construction site complete when the conditions of the General Permit, Section II.D have been met.

## SECTION 2 PROJECT INFORMATION

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### 2.1 PROJECT AND SITE DESCRIPTION

#### 2.1.1 *Site Description*

The Jane Addams Elementary School Addition and Modification project site comprises approximately 5.8 acres and is located at 2117 W McKinley Ave in Fresno, California (36.764234, -119.836753). The project site is located approximately 0.15 miles west of CA-99, 1-mile north of CA-180, and 0.17 miles northeast of Fresno Metropolitan Flood Control District (FMFCD) Basin XX. The project location is identified on the Site Map in Appendix B.

#### 2.1.2 *Existing Conditions*

As of the initial date of this SWPPP, the project site is an existing elementary school facility. Most of the site is developed with hardscape, some landscaping, and a large turf play area in the Southeast corner of the site. There are no known historic sources of contamination at the site.

#### 2.1.3 *Existing Drainage*

The project site is relatively level with a slight slope from the northwest to southeast. The elevation of the project site ranges from about 283 to 289 feet above mean sea level (msl). Surface drainage at the site currently flows to on-site storm drain inlets or sheet flows off site to storm drain inlets on the Northeast corner of Hughes Ave near McKinley Ave. On site storm drains either connect directly to dry wells or to storm drain lines that deliver water to on-site dry wells. The existing on-site storm drain lines have no tie in to City of Fresno or Fresno Metropolitan Flood Control District storm drains. Stormwater is conveyed through both surface runoff and storm drain systems. Stormwater discharges, from the site, are not considered direct discharges, as defined by the State Water Board into the nearby FMFCD Basin XX. Existing site topography, drainage patterns, and stormwater conveyance systems are shown on Figure 2 in Appendix B.

The project discharges to FMFCD Basin XX which is not listed for water quality impairment on the most recent 303(d)-list.

#### 2.1.4 *Geology and Groundwater*

According to the Geotechnical Investigation Report, the soils encountered on the site were both fill and native soils. The native soil profiles included silty sand, sandy silt with clay in the upper 3 to 5 feet and underlain with laterally discontinuous layers of relatively clean sand, and clayey silt with sand up to a depth of 51 feet (RMA Geoscience 2018). The California Department of Water Resources *Lines of Equal Elevation in Water Wells* (Spring 2011) indicates that groundwater depths are approximately 190 to 200 feet below ground surface in the Project area. The Geotechnical Investigation Report indicates there are no anticipated impacts to construction due to groundwater or subsidence. There is also a low risk of liquefaction during a design level earthquake, and seismic settlement is estimated at less than 1/4 of an inch during a design level earthquake.

#### 2.1.5 *Project Description*

The project will include the following construction activities:

- The demolition of six existing classroom buildings

- Construction of a new ten-classroom building
- Removal and relocation of an existing baseball backstop
- Construction of a new drop-off on McKinley Avenue
- Removal and replacement of the existing parking lot on Hughes Avenue
- Addition of several planters and turf areas. The turf on the main playfield will be removed and replaced.

Grading will occur on approximately 5.35 acres of the project, which comprises approximately 92 percent of the total area. The limits of grading are shown on Figure 2 in Appendix B. Grading will include the removal of both hardscape and landscape in preparation of new construction and resurfacing of turf fields. Soil will be stockpiled as shown on Figure 2 in Appendix B. Construction activities will not be phased.

### **2.1.6      *Developed Condition***

Post construction surface drainage will be directed to the on-site storm drains or through sheet flow towards Hughes Avenue to the east of the site. All stormwater collected on the roofs of new buildings will be collected by roof drains connected to storm drain lines that lead to on-site dry wells for percolation into the ground. Other existing ground-level storm drains exist in concrete walkways or in planter areas. These storm drains lead into dry wells on-site for percolation into the ground. No storm drain lines on site tie into any storm drains owned by the City of Fresno or the Fresno Metropolitan Flood Control District. Sheet flow that will move offsite is anticipated to occur east of the newly developed administration and kindergarten buildings and will be discharged into existing curb and gutter along Hughes Avenue. All other sheet flow on site will be collected by on-site storm drains connected to dry wells for percolation.

Post construction drainage patterns and conveyance systems are presented on Figure 2 in Appendix B.

**Table 2.1 Construction Site Estimates**

<b>Project Status</b>	<b>Runoff Coefficient</b>	<b>Site Area (acres)</b>	<b>Average Annual Rainfall (inches)</b>	<b>Average Annual Runoff (acre-feet)</b>
Pre-Construction	0.43	5.76	11.5	2.36
Post-Construction	0.55	5.76	11.5	3.02

The project will convert 0.9 acres of developed and undeveloped land to building expansion, hardscape, including concrete sidewalk, curb and gutter, and asphalt concrete parking lots. The increase in imperviousness of the site will increase the Average Annual Runoff volume from the site by 0.66 acre-feet. This information is presented in Table 2.1.

## 2.2 PERMITS AND GOVERNING DOCUMENTS

In addition to the General Permit, the following documents have been taken into account while preparing this SWPPP

- Regional Water Board requirements
- Basin Plan requirements
- Contract Documents
- Air Quality Regulations and Permits

## 2.3 STORMWATER RUN-ON FROM OFFSITE AREAS

There is no anticipated offsite run-on to this construction site because the turf adjacent to the south side of the site is at a lower grade than the site, and the north, east, and west sides are surrounded by curb and gutter, preventing potential run on from entering the site.

## 2.4 FINDINGS OF THE CONSTRUCTION SITE SEDIMENT AND RECEIVING WATER RISK DETERMINATION

A construction site risk assessment has been performed for the project and the resultant risk level is Risk Level 1.

The risk level was determined through the use of the K, LS provided in SMARTS, a site-specific analysis. The risk level is based on project duration, location, proximity to impaired receiving waters and soil conditions. A copy of the Risk Level determination submitted on SMARTS with the PRDs is included in Appendix C.

Table 2.2 and Table 2.3 summarize the sediment and receiving water risk factors and document the sources of information used to derive the factors.

**Table 2.2 Summary of Sediment Risk**

<b>RUSLE Factor</b>	<b>Value</b>	<b>Method for establishing value</b>
R	49.12	US Environmental Protection Agency Rainfall Erosivity Factor Calculator
K	.32	SWRCB Map Risk Categories
LS	0.19	SWRCB Map Risk Categories
<b>Total Predicted Sediment Loss (tons/acre)</b>		<b>2.98</b>
<b>Overall Sediment Risk</b> Low Sediment Risk < 15 tons/ acre Medium Sediment Risk >= 15 and < 75 tons/acre High Sediment Risk >= 75 tons/acre		<input checked="" type="checkbox"/> <b>Low</b> <input type="checkbox"/> <b>Medium</b> <input type="checkbox"/> <b>High</b>

**Table 2.3 Summary of Receiving Water Risk**

Receiving Water Name	303(d) Listed for Sediment Related Pollutant <sup>(1)</sup>	TMDL for Sediment Related Pollutant <sup>(1)</sup>	Beneficial Uses of COLD, SPAWN, and MIGRATORY <sup>(1)</sup>
FMFCD Basin XX	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<b>Overall Receiving Water Risk</b>			<input checked="" type="checkbox"/> <b>Low</b> <input type="checkbox"/> <b>High</b>
(1) If yes is selected for any option the Receiving Water Risk is High			

Risk Level 1 sites are subject to the narrative effluent limitations specified in the General Permit. The narrative effluent limitations require stormwater discharges associated with construction activity to minimize or prevent pollutants in stormwater and authorized non-stormwater through the use of controls, structures, and best management practices. This SWPPP has been prepared to address Risk Level 1 requirements (General Permit Attachment C).

## 2.5 CONSTRUCTION SCHEDULE

The site sediment risk was determined based on construction taking place between 08/18/2021 and 08/18/2023. Modification or extension of the schedule (start and end dates) may affect risk determination and permit requirements. The LRP shall contact the QSD if the schedule changes during construction to address potential impact to the SWPPP. The estimated schedule for planned work can be found in Appendix F.

## 2.6 POTENTIAL CONSTRUCTION ACTIVITY AND POLLUTANT SOURCES

Appendix G includes a list of construction activities and associated materials that are anticipated to be used onsite. These activities and associated materials will or could potentially contribute pollutants, other than sediment, to stormwater runoff.

The anticipated activities and associated pollutants were used in Section 3 to select the Best Management Practices for the project. Location of anticipated pollutants and associated BMPs are shown on the Site Map in Appendix B.

For sampling requirements for non-visible pollutants associated with construction activity please refer to Section 7.7.1. For a full and complete list of onsite pollutants, refer to the Material Safety Data Sheets (MSDS), which are retained onsite at the construction trailer.

## 2.7 IDENTIFICATION OF NON-STORMWATER DISCHARGES

Non-stormwater discharges consist of discharges which do not originate from precipitation events. The General Permit provides allowances for specified non-stormwater discharges that do not cause erosion or carry other pollutants.

Non-stormwater discharges into storm drainage systems or waterways, which are not authorized under the General Permit and listed in the SWPPP, or authorized under a separate NPDES permit, are prohibited.

Non-stormwater discharges that are authorized from this project site include the following:

- None

These authorized non-stormwater discharges will be managed with the stormwater and non-stormwater BMPs described in Section 3 of this SWPPP and will be minimized by the QSP.

Activities at this site that may result in unauthorized non-stormwater discharges include:

- None

Steps will be taken, including the implementation of appropriate BMPs, to ensure that unauthorized discharges are eliminated, controlled, disposed, or treated on-site.

Discharges of construction materials and wastes, such as fuel or paint, resulting from dumping, spills, or direct contact with rainwater or stormwater runoff, are also prohibited.

## 2.8 REQUIRED SITE MAP INFORMATION

The construction project's Site Map(s) showing the project location, surface water boundaries, geographic features, construction site perimeter and general topography and other requirements identified in Attachment B of the General Permit is located in Appendix B. Table 2.6 identifies Map or Sheet Nos. where required elements are illustrated.

**Table 2.6 Required Map Information**

<b>Included on Map/Plan Sheet No. <sup>(1)</sup></b>	<b>Required Element</b>
Figure 1	The project's surrounding area (vicinity)
Figure 2	Site layout
Figure 2	Construction site boundaries
Figure 2	Sampling locations, if applicable
Figure 2	Areas of soil disturbance (temporary or permanent)
Figure 2	Active areas of soil disturbance (cut or fill)
Figure 2	Locations of runoff BMPs
Figure 2	Locations of erosion control BMPs
Figure 2	Locations of sediment control BMPs
Figure 2	Waste storage areas
Figure 2	Vehicle storage areas
Figure 2	Material storage areas
Figure 2	Entrance and Exits
Figure 2	Fueling Locations

Notes: (1) Indicate maps or drawings that information is included on (e.g., Vicinity Map, Site Map, Drainage Plans, Grading Plans, Progress Maps, etc.)



## SECTION 3 BEST MANAGEMENT PRACTICES

### 3.1 SCHEDULE FOR BMP IMPLEMENTATION

#### 3.1.1 Project Specific BMP Descriptions

**Table 3.1 BMP Implementation Schedule**

	<b>BMP</b>	<b>Implementation</b>	<b>Duration</b>
<b>Erosion Control</b>	EC-1, Scheduling	Prior to Construction	Entirety of project
	EC-2, Preservation of Existing Vegetation	Start of Construction	Entirety of project
	EC-3, Hydraulic Mulch	During Construction	As needed during on-going construction activities
	EC-4, Hydroseed	During Construction	As needed during on-going construction activities
	EC-6, Straw Mulch	During Construction	As needed during on-going construction activities
	EC-8, Wood Mulching	During Construction	As needed for on-going landscaping activities
	EC-15, Soil Preparation-Roughening	Prior to Stabilization	As needed during soil preparation activities
<b>Sediment Control</b>	SE-5, Fiber Rolls	During Construction	As needed during on-going construction activities
	SE-6, Gravel Bag Berm	During Construction	As needed during on-going construction activities
	SE-7, Street Sweeping	During Construction	Weekly, entirety of project
	SE-8, Sandbag Barrier	During Construction	As needed during on-going construction activities
	SE-10, Storm Drain Inlet Protection	Prior to Construction	As needed during on-going construction activities
	SE-14, Biofilter Bags	During Construction	As needed during on-going construction activities
<b>Tracking Control</b>	TC-1, Stabilized Construction Entrance and Exit	Start of Construction	Locations change as needed during on-going construction activities
	TC-2, Stabilized Construction Roadway	Start of Construction	Locations change as needed during on-going construction activities
<b>Wind Erosion</b>	WE-1, Wind Erosion Control	Start of Construction	Entirety of project

**Table 3.1 BMP Implementation Schedule**

	<b>BMP</b>	<b>Implementation</b>	<b>Duration</b>
<b>Non-Stormwater Control</b>	NS-1, Water Conservation Practices	During Construction	As needed during on-going construction activities
	NS-2, Dewatering Operation	During Construction	As needed during on-going construction activities
	NS-3, Paving and Grinding Operation	During Construction	As needed during on-going construction activities
	NS-6, Illicit Connection-Illegal Discharge Connection	During Construction	As needed during on-going construction activities
	NS-7, Potable Water Irrigation Discharge Detection	During Construction	As needed during on-going construction activities
	NS-8, Vehicle and Equipment Cleaning	During Construction	As needed during on-going construction activities
	NS-9, Vehicle and Equipment Fueling	During Construction	As needed during on-going construction activities
	NS-10, Vehicle and Equipment Maintenance	During Construction	As needed during on-going construction activities
	NS-12, Concrete Curing	During Construction	As needed during on-going construction activities
	NS-13, Concrete Finishing	During Construction	As needed during on-going construction activities
<b>Waste Management</b>	WM-1, Material Delivery and Storage	During Construction	Entirety of project
	WM-2, Material Use	During Construction	Entirety of project
	WM-3, Stockpile Management	During Construction	Entirety of project
	WM-4, Spill Prevention and Control	During Construction	Entirety of project
	WM-5, Solid Waste Management	During Construction	Entirety of project
	WM-6, Hazardous Waste Management	During Construction	Entirety of project
	WM-7, Contaminated Soil Management	During Construction	Entirety of project
	WM-8, Concrete Waste Management	During Construction	Entirety of project
	WM-9, Sanitary-Septic Waste Management	During Construction	Entirety of project
	WM-10, Liquid Waste Management	During Construction	Entirety of project

## 3.2 EROSION AND SEDIMENT CONTROL

Erosion and sediment controls are required by the General Permit to provide effective reduction or elimination of sediment related pollutants in stormwater discharges and authorized non-stormwater discharges from the Site. Applicable BMPs are identified in this section for erosion control, sediment control, tracking control, and wind erosion control.

### 3.2.1 *Erosion Control*

Erosion control, also referred to as soil stabilization, consists of source control measures that are designed to prevent soil particles from detaching and becoming transported in stormwater runoff. Erosion control BMPs protect the soil surface by covering and/or binding soil particles.

This construction project will implement the following practices to provide effective temporary and final erosion control during construction:

1. Preserve existing vegetation where required and when feasible.
2. The area of soil disturbing operations shall be controlled such that the Contractor is able to implement erosion control BMPs quickly and effectively.
3. Stabilize non-active areas within 14 days of cessation of construction activities or sooner if stipulated by local requirements.
4. Control erosion in concentrated flow paths by applying erosion control blankets, check dams, erosion control seeding or alternate methods.
5. Prior to the completion of construction, apply permanent erosion control to remaining disturbed soil areas.

Sufficient erosion control materials shall be maintained onsite to allow implementation in conformance with this SWPPP.

The following temporary erosion control BMP selection table indicates the BMPs that shall be implemented to control erosion on the construction site. Fact Sheets for temporary erosion control BMPs are provided in Appendix H.

**Table 3.2 Temporary Erosion Control BMPs**

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement <sup>(1)</sup>	BMP Used		If not used, state reason
			YES	NO	
EC-1	Scheduling	✓	✓		
EC-2	Preservation of Existing Vegetation	✓	✓		
EC-3	Hydraulic Mulch	✓ <sup>(2)</sup>	✓		
EC-4	Hydroseed	✓ <sup>(2)</sup>	✓		
EC-5	Soil Binders	✓ <sup>(2)</sup>		✓	Not needed.
EC-6	Straw Mulch	✓ <sup>(2)</sup>	✓		
EC-7	Geotextiles and Mats	✓ <sup>(2)</sup>		✓	Not needed.
EC-8	Wood Mulching	✓ <sup>(2)</sup>	✓		
EC-9	Earth Dike and Drainage Swales	✓ <sup>(3)</sup>		✓	Not needed.
EC-10	Velocity Dissipation Devices			✓	Not needed.
EC-11	Slope Drains			✓	Not needed.
EC-12	Stream Bank Stabilization			✓	Not needed.
EC-14	Compost Blankets	✓ <sup>(2)</sup>		✓	Not needed.
EC-15	Soil Preparation-Roughening		✓		
EC-16	Non-Vegetated Stabilization	✓ <sup>(2)</sup>		✓	Not needed.
WE-1	Wind Erosion Control	✓	✓		
<b>Alternate BMPs Used:</b>					<b>If used, state reason:</b>
<sup>(1)</sup> Applicability to a specific project shall be determined by the QSD. <sup>(2)</sup> The QSD shall ensure implementation of one of the minimum measures listed or a combination thereof to achieve and maintain the Risk Level requirements. <sup>(3)</sup> Run-on from offsite shall be directed away from all disturbed areas, diversion of offsite flows may require design/analysis by a licensed civil engineer and/or additional environmental permitting					

These temporary erosion control BMPs shall be implemented in conformance with the following guidelines and as outlined in the BMP Factsheets provided in Appendix H. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details in the Site Map prevail over standard details included in the Site Map. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

### **3.2.2            *Sediment Controls***

Sediment controls are temporary or permanent structural measures that are intended to complement the selected erosion control measures and reduce sediment discharges from active construction areas. Sediment controls are designed to intercept and settle out soil particles that have been detached and transported by the force of water.

The following sediment control BMP selection table indicates the BMPs that shall be implemented to control sediment on the construction site. Fact Sheets for temporary sediment control BMPs are provided in Appendix H.

**Table 3.3 Temporary Sediment Control BMPs**

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement <sup>(1)</sup>	BMP used		If not used, state reason
			YES	NO	
SE-1	Silt Fence	✓ <sup>(2) (3)</sup>		✓	Not needed.
SE-2	Sediment Basin			✓	Not needed.
SE-3	Sediment Trap			✓	Not needed.
SE-4	Check Dams			✓	Not needed.
SE-5	Fiber Rolls	✓ <sup>(2)(3)</sup>	✓		
SE-6	Gravel Bag Berm	✓ <sup>(3)</sup>	✓		
SE-7	Street Sweeping	✓	✓		
SE-8	Sandbag Barrier		✓		
SE-9	Straw Bale Barrier			✓	Not needed.
SE-10	Storm Drain Inlet Protection	✓ RL2&3	✓		
SE-11	ATS			✓	Not needed.
SE-12	Manufactured Linear Sediment Controls			✓	Not needed.
SE-13	Compost Sock and Berm	✓ <sup>(3)</sup>		✓	Not needed.
SE-14	Biofilter Bags	✓ <sup>(3)</sup>	✓		
TC-1	Stabilized Construction Entrance and Exit	✓	✓		
TC-2	Stabilized Construction Roadway		✓		
TC-3	Entrance Outlet Tire Wash			✓	
<b>Alternate BMPs Used:</b>					<b>If used, state reason:</b>
<sup>(1)</sup> Applicability to a specific project shall be determined by the QSD <sup>(2)</sup> The QSD shall ensure implementation of one of the minimum measures listed or a combination thereof to achieve and maintain the Risk Level requirements <sup>(3)</sup> Risk Level 2 & 3 shall provide linear sediment control along toe of slope, face of slope, and at the grade breaks of exposed slope					

These temporary sediment control BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix H. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details in the Site Map prevail over standard details included in the Site Map. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

### **3.3 NON-STORMWATER CONTROLS AND WASTE AND MATERIALS MANAGEMENT**

#### **3.3.1 *Non-Stormwater Controls***

Non-stormwater discharges into storm drainage systems or waterways, which are not authorized under the General Permit, are prohibited. Non-stormwater discharges for which a separate NPDES permit is required by the local Regional Water Board are prohibited unless coverage under the separate NPDES permit has been obtained for the discharge. The selection of non-stormwater BMPs is based on the list of construction activities with a potential for non-stormwater discharges identified in Section 2.7 of this SWPPP.

The following non-stormwater control BMP selection table indicates the BMPs that shall be implemented to control sediment on the construction site. Fact Sheets for temporary non-stormwater control BMPs are provided in Appendix H.

Non-stormwater BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix H. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details in the Site Map prevail over standard details included in the Site Map. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

**Table 3.4 Temporary Non-Stormwater BMPs**

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement <sup>(1)</sup>	BMP used		If not used, state reason
			YES	NO	
NS-1	Water Conservation Practices	✓	✓		
NS-2	Dewatering Operation		✓		
NS-3	Paving and Grinding Operation		✓		
NS-4	Temporary Stream Crossing			✓	Not needed.
NS-5	Clear Water Diversion			✓	Not needed.
NS-6	Illicit Connection- Illegal Discharge Connection	✓	✓		
NS-7	Potable Water Irrigation Discharge Detection		✓		
NS-8	Vehicle and Equipment Cleaning	✓	✓		
NS-9	Vehicle and Equipment Fueling	✓	✓		
NS-10	Vehicle and Equipment Maintenance	✓	✓		
NS-11	Pile Driving Operation			✓	Not needed.
NS-12	Concrete Curing		✓		
NS-13	Concrete Finishing		✓		
NS-14	Material and Equipment Use Over Water			✓	Not needed.
NS-15	Demolition Removal Adjacent to Water			✓	Not needed.
NS-16	Temporary Batch Plants			✓	Not needed.
Alternate BMPs Used:			If used, state reason:		

<sup>(1)</sup> Applicability to a specific project shall be determined by the QSD

### **3.3.2      *Materials Management and Waste Management***

Materials management control practices consist of implementing procedural and structural BMPs for handling, storing and using construction materials to prevent the release of those materials into stormwater discharges. The amount and type of construction materials to be utilized at the Site will depend upon the type of construction and the length of the construction period. The materials may be used continuously, such as fuel for vehicles and equipment, or the materials may be used for a discrete period, such as soil binders for temporary stabilization.

Waste management consist of implementing procedural and structural BMPs for handling, storing and ensuring proper disposal of wastes to prevent the release of those wastes into stormwater discharges.

Materials and waste management pollution control BMPs shall be implemented to minimize stormwater contact with construction materials, wastes and service areas; and to prevent materials and wastes from being discharged off-site. The primary mechanisms for stormwater contact that shall be addressed include:

- Direct contact with precipitation
- Contact with stormwater run-on and runoff
- Wind dispersion of loose materials
- Direct discharge to the storm drain system through spills or dumping
- Extended contact with some materials and wastes, such as asphalt cold mix and treated wood products, which can leach pollutants into stormwater.

A list of construction activities is provided in Section 2.6. The following Materials and Waste Management BMP selection table indicates the BMPs that shall be implemented to handle materials and control construction site wastes associated with these construction activities. Fact Sheets for Materials and Waste Management BMPs are provided in Appendix H.

**Table 3.5 Temporary Materials Management BMPs**

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement <sup>(1)</sup>	BMP used		If not used, state reason
			YES	NO	
WM-01	Material Delivery and Storage	✓	✓		
WM-02	Material Use	✓	✓		
WM-03	Stockpile Management	✓	✓		
WM-04	Spill Preservation and Control	✓	✓		
WM-05	Solid Waste Management	✓	✓		
WM-06	Hazardous Waste Management	✓	✓		
WM-07	Contaminated Soil Management		✓		
WM-08	Concrete Waste Management	✓	✓		
WM-09	Sanitary-Septic Waste Management	✓	✓		
WM-10	Liquid Waste Management		✓		
Alternate BMPs Used:				If used, state reason:	
<sup>(1)</sup> Applicability to a specific project shall be determined by the QSD.					

Material management BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix H. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details in the Site Map prevail over standard details included in the Site Map. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

### 3.4 POST CONSTRUCTION STORMWATER MANAGEMENT MEASURES

Post construction BMPs are permanent measures installed during construction, designed to reduce or eliminate pollutant discharges from the site after construction is completed.

This site is located in an area subject to a Phase I or Phase II Municipal Separate Storm Sewer System (MS4) permit approved Stormwater Management Plan. ☒ Yes ☐ No

Post construction runoff reduction requirements have been satisfied through the MS4 program, this project is exempt from provision XIII A of the General Permit. Additionally, onsite storm drains lead into dry wells on-site for percolation into the ground. None of the onsite storm drain lines will discharge from the site.

## **SECTION 4 BMP INSPECTION, AND MAINTENANCE**

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### **4.1 BMP INSPECTION AND MAINTENANCE**

The General Permit requires routine weekly inspections of BMPs, along with inspections before, during, and after qualifying rain events. A BMP inspection checklist must be filled out for inspections and maintained on-site with the SWPPP. The inspection checklist includes the necessary information covered in Section 7.6. A blank inspection checklist can be found in Appendix I. Completed checklists shall be kept in CSMP Attachment 2 “Monitoring Records.

BMPs shall be maintained regularly to ensure proper and effective functionality. If necessary, corrective actions shall be implemented within 72 hours of identified deficiencies and associated amendments to the SWPPP shall be prepared by the QSD.

Specific details for maintenance, inspection, and repair of Construction Site BMPs can be found in the BMP Factsheets in Appendix H.

### **4.2 RAIN EVENT ACTION PLANS**

Rain Event Action Plans (REAPs) are not required for Risk Level 1 projects.

## SECTION 5    TRAINING

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Appendix L identifies the QSPs for the project. To promote stormwater management awareness specific for this project, periodic training of job-site personnel shall be included as part of routine project meetings (e.g. daily/weekly tailgate safety meetings), or task specific trainings as needed.

The QSP shall be responsible for providing this information at the meetings, and subsequently completing the training logs shown in Appendix J, which identifies the site-specific stormwater topics covered as well as the names of site personnel who attended the meeting. Tasks may be delegated to trained employees by the QSP provided adequate supervision and oversight is provided. Training shall correspond to the specific task delegated including: SWPPP implementation; BMP inspection and maintenance; and record keeping.

Documentation of training activities (formal and informal) is retained in SWPPP Appendix J.

## SECTION 6 RESPONSIBLE PARTIES AND OPERATORS

### 6.1 RESPONSIBLE PARTIES

Approved Signatories who are responsible for SWPPP implementation and have authority to sign permit-related documents are listed below. Written authorizations from the LRP for these individuals are provided in Appendix K. The Approved Signatories assigned to this project are:

Name	Title	Phone Number

QSPs identified for the project are identified in Appendix K. The QSP shall have primary responsibility and significant authority for the implementation, maintenance and inspection/monitoring of SWPPP requirements. The QSP will be available at all times throughout the duration of the project. Duties of the QSP include but are not limited to:

- Implementing all elements of the General Permit and SWPPP, including but not limited to:
  - Ensuring all BMPs are implemented, inspected, and properly maintained;
  - Performing non-stormwater and stormwater visual observations and inspections;
  - Performing non-stormwater and storm sampling and analysis, as required;
  - Performing routine inspections and observations;
  - Implementing non-stormwater management, and materials and waste management activities such as: monitoring discharges; general Site clean-up; vehicle and equipment cleaning, fueling and maintenance; spill control; ensuring that no materials other than stormwater are discharged in quantities which will have an adverse effect on receiving waters or storm drain systems; etc.;
- The QSP may delegate these inspections and activities to an appropriately trained employee, but shall ensure adequacy and adequate deployment.
- Ensuring elimination of unauthorized discharges.
- The QSPs shall be assigned authority by the LRP to mobilize crews in order to make immediate repairs to the control measures.

- Coordinate with the Contractor(s) to assure all of the necessary corrections/repairs are made immediately and that the project complies with the SWPPP, the General Permit and approved plans at all times.
- Notifying the LRP or Authorized Signatory immediately of off-site discharges or other non-compliance events.

## 6.2 CONTRACTOR LIST

### Contractor

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

Phone Number: \_\_\_\_\_

Number (24/7): \_\_\_\_\_

## SECTION 7 CONSTRUCTION SITE MONITORING PROGRAM

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### 7.1 *Purpose*

This Construction Site Monitoring Program was developed to address the following objectives:

1. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives;
2. To determine whether immediate corrective actions, additional Best Management Practices (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in stormwater discharges and authorized non-stormwater discharges;
3. To determine whether BMPs included in the SWPPP are effective in preventing or reducing pollutants in stormwater discharges and authorized non-stormwater discharges.

### 7.2 *Applicability of Permit Requirements*

This project has been determined to be a Risk Level 1 project. The General Permit identifies the following types of monitoring as being applicable for a Risk Level 1 project.

Risk Level 1

- Visual inspections of Best Management Practices (BMPs);
- Visual monitoring of the site related to qualifying storm events;
- Visual monitoring of the site for non-stormwater discharges;
- Sampling and analysis of construction site runoff for non-visible pollutants when applicable; and
- Sampling and analysis of construction site runoff as required by the Regional Water Board when applicable.

### 7.3. *Weather and Rain Event Tracking*

Visual monitoring and inspections requirements of the General Permit are triggered by a qualifying rain event. The General Permit defines a qualifying rain event as any event that produces ½ inch of precipitation. A minimum of 48 hours of dry weather will be used to distinguish between separate qualifying storm events.

#### 7.3.1 **Weather Tracking**

The QSP should daily consult the National Oceanographic and Atmospheric Administration (NOAA) for the weather forecasts. These forecasts can be obtained at <http://www.srh.noaa.gov/>. Weather reports should be printed and maintained with the SWPPP in CSMP Attachment 1 “Weather Reports”.

#### 7.3.2 **Rain Gauges**

The QSP shall install a rain gauge(s) on the project site. Locate the gauge in an open area away from obstructions such as trees or overhangs. Mount the gauge on a post at a height of 3 to 5 feet with the gauge extending several inches beyond the post. Make sure that the top of the gauge is level. Make sure the post is not in an area where rainwater can indirectly splash from sheds, equipment, trailers, etc.

The rain gauge(s) shall be read daily during normal site scheduled hours. The rain gauge should be read at approximately the same time every day and the date and time of each reading recorded. Log rain gauge readings in CSMP Attachment 1 “Weather Records”. Follow the rain gauge instructions to obtain accurate measurements.

Once the rain gauge reading has been recorded, accumulated rain shall be emptied and the gauge reset.

For comparison with the site rain gauge, the nearest appropriate governmental rain gauge(s) is located at Fresno Yosemite International Airport, and can be accessed at the NOAA website.

#### **7.4                    *Monitoring Locations***

Monitoring locations are shown on the Site Maps in Appendix B. Monitoring locations are described in the Sections 7.6 and 7.7.

Whenever changes in the construction site might affect the appropriateness of sampling locations, the sampling locations shall be revised accordingly. All such revisions shall be implemented as soon as feasible and the SWPPP amended. Temporary changes that result in a one-time additional sampling location do not require a SWPPP amendment.

#### **7.5                    *Sample Collection Safety, Monitoring, and Monitoring Exemptions***

To maintain sample integrity and prevent cross-contamination, sampling collection personnel will:

- Wear a clean pair of surgical gloves prior to the collection and handling of each sample at each location.
- Not contaminate the inside of the sample bottle by not allowing it to come into contact with any material other than the water sample.
- Discard sample bottles or sample lids that have been dropped onto the ground prior to sample collection.
- Not leave the cooler lid open for an extended period of time once samples are placed inside.
- Not sample near a running vehicle where exhaust fumes may impact the sample.
- Not touch the exposed end of a sampling tube, if applicable.
- Avoid allowing rainwater to drip from rain gear or other surfaces into sample bottles
- Not eat, smoke, or drink during sample collection.
- Not sneeze or cough in the direction of an open sample bottle.
- Minimize the exposure of the samples to direct sunlight, as sunlight may cause biochemical transformation of the sample to take place.
- Decontaminate sampling equipment prior to sample collection using a TSP-soapy water wash, distilled water rinse, and final rinse with distilled water.
- Dispose of decontamination water/soaps appropriately; i.e., not discharge to the storm drain system or receiving water.

This project is not required to collect samples or conduct visual observations (inspections) under the following conditions:

- During dangerous weather conditions such as flooding and electrical storms.
- Outside of scheduled site business hours.

Scheduled site business hours are: Site Business Hours (M-F 7-5).

If monitoring (visual monitoring or sample collection) of the site is unsafe because of the dangerous conditions noted above, then the QSP shall document the conditions for why an exception to performing the monitoring was necessary. The exemption documentation shall be filed in CSMP Attachment 2 “Monitoring Records”.

## 7.6 *Visual Monitoring*

Visual monitoring includes observations and inspections. Inspections of BMPs are required to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Visual observations of the site are required to observe storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources.

Table 7.1 identifies the required frequency of visual observations and inspections. Inspections and observations will be conducted at the locations identified in Section 7.6.3.

**Table 7.1 Frequency of Visual Observations and Inspections**

Type of Inspection	Frequency
<i>Routine Inspections</i>	
BMP Inspections	
EC-01 Scheduling	Daily/Weekly
EC-02 Preservation of Vegetation	Daily/Weekly
EC-03 Hydro-Mulch	Daily/Weekly
EC-04 Hydro-Seed	Daily/Weekly
EC-06 Straw Mulch	Daily/Weekly
EC-07 Geotextiles, Plastic Covers, & Erosion Control	Daily/Weekly
EC-08 Wood Mulching	Daily/Weekly
EC-15 Soil Preparation/Roughening	Daily/Weekly
SE-01 Silt Fence	Daily/Weekly
SE-05 Fiber Rolls	Daily/Weekly
SE-06 Gravel Bag Berm	Daily/Weekly
SE-07 Street Sweeping and Vacuuming	Daily/Weekly
SE-08 Sandbag Barrier	Daily/Weekly
SE-10 Inlet Protection	Daily/Weekly
SE-14 Biofilter Bags	Daily/Weekly

WE-01 Wind Erosion Control	Daily/Weekly
TC-01 Stabilized entrance/exit	Daily/Weekly
TC-02 Stabilized Construction Roadway	Daily/Weekly
NS-01 Water Conservation Practices	Daily/Weekly
NS-02 Dewatering Operations	Daily/Weekly
NS-03 Paving & Grinding Operations	Daily/Weekly
NS-06 Illicit Connection/Discharge	Daily/Weekly
NS-07 Potable Water/Irrigation	Daily/Weekly
NS-08 Vehicle & Equipment Cleaning	Daily/Weekly
NS-09 Vehicle and Equipment Fueling	Daily/Weekly
NS-10 Vehicle & Equipment Maintenance	Daily/Weekly
NS-12 Concrete Curing	Daily/Weekly
NS-13 Concrete Finishing	Daily/Weekly
WM-01 Material Delivery and Storage	Daily/Weekly
WM-02 Material Use	Daily/Weekly
WM-03 Stockpile Management	Daily/Weekly
WM-04 Spill Prevention and Control	Daily/Weekly
WM-05 Solid Waste Management	Daily/Weekly
WM-06 Hazardous Waste Management	Daily/Weekly
WM-07 Contaminated Soil Management	Daily/Weekly
WM-08 Concrete Waste Management	Daily/Weekly
WM-09 Sanitary/Septic Waste Management	Daily/Weekly
WM-10 Liquid Waste Management	Daily/Weekly
Non-Stormwater Discharge Observations	Quarterly during daylight hours
<i>Rain Event Triggered Inspections</i>	
Site Inspections Prior to a QRE	Within 48 hours of a QRE <sup>1</sup>
BMP Inspections During an Extended Storm Event	Every 24-hour period of an extended storm event <sup>1</sup>
Site Inspections Following a QRE	Within 48 hours of a QRE <sup>1</sup>

## 7.6.1 Routine Observations and Inspections

Routine site inspections and visual monitoring are necessary to ensure that the project is in compliance with the requirements of the Construction General Permit.

### 7.6.1.1 Routine BMP Inspections

Inspections of BMPs are conducted to identify and record:

- BMPs that are properly installed;
- BMPs that need maintenance to operate effectively;
- BMPs that have failed; or
- BMPs that could fail to operate as intended.

#### 7.6.1.2 *Non-Stormwater Discharge Observations*

Each drainage area will be inspected for the presence of or indications of prior unauthorized and authorized non-stormwater discharges. Inspections will record:

- Presence or evidence of any non-stormwater discharge (authorized or unauthorized);
- Pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.); and
- Source of discharge.

### 7.6.2 **Rain-Event Triggered Observations and Inspections**

Visual observations of the site and inspections of BMPs are required prior to a qualifying rain event; following a qualifying rain event, and every 24-hour period during a qualifying rain event. Pre-rain inspections will be conducted after consulting NOAA and determining that a precipitation event with a 50% or greater probability of precipitation has been predicted.

#### 7.6.2.1 *Visual Observations Prior to a Forecasted Qualifying Rain Event*

Within 48-hours prior to a qualifying event a stormwater visual monitoring site inspection will include observations of the following locations:

- Stormwater drainage areas to identify any spills, leaks, or uncontrolled pollutant sources;
- BMPs to identify if they have been properly implemented;
- Any stormwater storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

Consistent with guidance from the State Water Resources Control Board, pre-rain BMP inspections and visual monitoring will be triggered by a NOAA forecast that indicates a probability of precipitation of 50% or more in the project area.

#### 7.6.2.2 *BMP Inspections During an Extended Storm Event*

During an extended rain event BMP inspections will be conducted to identify and record:

- BMPs that are properly installed;
- BMPs that need maintenance to operate effectively;
- BMPs that have failed; or
- BMPs that could fail to operate as intended.

If the construction site is not accessible during the rain event, the visual inspections shall be performed at all relevant outfalls, discharge points, downstream locations. The inspections should record any projected maintenance activities.

### 7.6.2.2 *Visual Observations Following a Qualifying Rain Event*

Within 48 hours following a qualifying rain event (0.5 inches of rain) a stormwater visual monitoring site inspection is required to observe:

- Stormwater drainage areas to identify any spills, leaks, or uncontrolled pollutant sources;
- BMPs to identify if they have been properly designed, implemented, and effective;
- Need for additional BMPs;
- Any stormwater storage and containment areas to detect leaks and ensure maintenance of adequate freeboard; and
- Discharge of stored or contained rain water.

### 7.6.3 **Visual Monitoring Procedures**

Visual monitoring shall be conducted by the QSP or staff trained by and under the supervision of the QSP.

The name(s) and contact number(s) of the site visual monitoring personnel are listed below and their training qualifications are provided in Appendix K.

Assigned inspector: \_\_\_\_\_ Contact phone: \_\_\_\_\_

Alternate inspector: \_\_\_\_\_ Contact phone: \_\_\_\_\_

Stormwater observations shall be documented on the *Visual Inspection Field Log Sheet* (see CSMP Attachment 3 “Example Forms”). BMP inspections shall be documented on the site-specific BMP inspection checklist. Any photographs used to document observations will be referenced on stormwater site inspection report and maintained with the Monitoring Records in Attachment 2.

The completed reports will be kept in CSMP Attachment 2 “Monitoring Records”.

### 7.6.4 **Visual Monitoring Follow-Up and Reporting**

Correction of deficiencies identified by the observations or inspections, including required repairs or maintenance of BMPs, shall be initiated and completed as soon as possible.

If identified deficiencies require design changes, including additional BMPs, the implementation of changes will be initiated within 72 hours of identification and be completed as soon as possible. When design changes to BMPs are required, the SWPPP shall be amended to reflect the changes.

Deficiencies identified in site inspection reports and correction of deficiencies will be tracked on the *Inspection Field Log Sheet* or *BMP Inspection Report* and shall be submitted to the QSP and shall be kept in CSMP Attachment 2 “Monitoring Records”.

Results of visual monitoring must be summarized and reported in the Annual Report.

### **7.6.5 Visual Monitoring Locations**

The inspections and observations identified in Sections 7.6.1 and 7.6.2 will be conducted at the locations identified in this section.

## **7.7 Water Quality Sampling and Analysis**

### **7.7.1 Sampling and Analysis Plan for Non-Visible Pollutants in Stormwater Runoff Discharges**

This Sampling and Analysis Plan for Non-Visible Pollutants describes the sampling and analysis strategy and schedule for monitoring non-visible pollutants in stormwater runoff discharges from the project site.

Sampling for non-visible pollutants will be conducted when (1) a breach, leakage, malfunction, or spill is observed; and (2) the leak or spill has not been cleaned up prior to the rain event; and (3) there is the potential for discharge of non-visible pollutants to surface waters or drainage system.

The following construction materials, wastes, or activities, as identified in Section 2.6, are potential sources of non-visible pollutants to stormwater discharges from the project. Storage, use, and operational locations are shown on the Site Maps in Appendix B.

- None

The following existing site features, as identified in Section 2.6, are potential sources of non-visible pollutants to stormwater discharges from the project. Locations of existing site features contaminated with non-visible pollutants are shown on the Site Maps in Appendix B.

- None

The following soil amendments have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil and will be used on the project site. Locations of soil amendment application are shown on the Site Maps in Appendix B.

- None

#### **7.7.1.1 Sampling Schedule**

Samples for the potential non-visible pollutant(s) and a sufficiently large unaffected background sample shall be collected during the first two hours of discharge from rain events that result in a sufficient discharge for sample collection. Samples shall be collected during the site's scheduled hours and shall be collected regardless of the time of year and phase of the construction.

Collection of discharge samples for non-visible pollutant monitoring will be triggered when any of the following conditions are observed during site inspections conducted prior to or during a rain event.

- Materials or wastes containing potential non-visible pollutants are not stored under watertight conditions. Watertight conditions are defined as (1) storage in a watertight container, (2) storage under a watertight roof or within a building, or (3) protected by

temporary cover and containment that prevents stormwater contact and runoff from the storage area.

- Materials or wastes containing potential non-visible pollutants are stored under watertight conditions, but (1) a breach, malfunction, leakage, or spill is observed, (2) the leak or spill is not cleaned up prior to the rain event, and (3) there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- A construction activity, including but not limited to those in Section 2.6, with the potential to contribute non-visible pollutants (1) was occurring during or within 24 hours prior to the rain event, (2) BMPs were observed to be breached, malfunctioning, or improperly implemented, and (3) there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- Soil amendments that have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil have been applied, and there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- Stormwater runoff from an area contaminated by historical usage of the site has been observed to combine with stormwater runoff from the site, and there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.

#### 7.7.1.2 *Sampling Locations – Not Required for Risk Level 1 Projects*

Sampling locations are based on proximity to planned non-visible pollutant storage, occurrence or use; accessibility for sampling, and personnel safety. Planned non-visible pollutant sampling locations are shown on the Site Maps in Appendix B and include the locations identified in Table 7.5 through 7.10.

If a stormwater visual monitoring site inspection conducted prior to or during a storm event identifies the presence of a material storage, waste storage, or operations area with spills or the potential for the discharge of non-visible pollutants to surface waters or a storm drain system that is at a location not listed above and has not been identified on the Site Maps, sampling locations will be selected by the QSP using the same rationale as that used to identify planned locations. Non-visible pollutant sampling locations shall be identified by the QSP on the pre-rain event inspection form prior to a forecasted qualifying rain event.

#### 7.7.1.3 *Monitoring Preparation*

Non-visible pollutant samples will be collected by:

Contractor	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Consultant	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Laboratory	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

Samples on the project site will be collected by the following:

Company Name:

Street Address:

City, State Zip:

Telephone Number:

Point of Contact:

Name of Sampler(s):

Name of Alternate(s):

The QSP or his/her designee will contact the sampling laboratory 24 hours prior to a predicted rain event or for an unpredicted event, as soon as a rain event begins if one of the triggering conditions is identified during an inspection to ensure that adequate sample collection personnel and supplies for monitoring non-visible pollutants are available and will be mobilized to collect samples on the project site in accordance with the sampling schedule.

#### 7.7.1.4 Analytical Constituents

Table 7.11 lists the specific sources and types of potential non-visible pollutants on the project site and the water quality indicator constituent(s) for that pollutant.

Potential Pollutant Source/ Applicable Construction Activity	Water Quality Indicator Constituent
<b>Adhesives</b>	COD, Phenols, SVOCs
<b>Asphalt Work</b>	VOCs
<b>Concrete/Masonry Work</b>	
Sealant (Methyl Methacrylate)	SVOC
Curing Compounds	VOCs, SVOCs, pH
Ash, Slag, Sand	pH, Al, Ca, Va, Zn
<b>Grading/Earthworks</b>	
Gypsum/Lime amendments	pH
Contaminated Soil	Constituents specific to known contaminants, check with Laboratory
<b>Landscaping</b>	
Pesticides/Herbicides	Product dependent, see label and check with Laboratory
Fertilizers	TKN, NO <sub>3</sub> , BOD, COD, DOC, Sulfate, NH <sub>3</sub> , Phosphate, Potassium
Aluminum Sulfate	Al, TDS, Sulfate
<b>Liquid Waste</b>	Constituents specific to materials, check with Laboratory
<b>Painting</b>	
Resins	COD, SVOCs
Thinners	COD, VOCs

<b>Potential Pollutant Source/ Applicable Construction Activity</b>	<b>Water Quality Indicator Constituent</b>
Paint strippers	VOCs, SVOCs, metals
Lacquers, varnishes, enamels	COD, VOCs, SVOCs
Sealants	COD
Adhesives	Phenols, SVOCs
<b>Planting/Vegetation Management</b>	
Vegetation Stockpiles	BOD
<b>Sanitary Waste</b> Sewer line breaks and portable toilets	BOD, Total/Fecal coliform
<b>Soil Preparation/Amendments/Dust Control</b>	
Polymer/Co-polymers	TKN, NO <sub>3</sub> , BOD, COD, DOC, Sulfate, Ni
Lignin Sulfate	TDS, alkalinity
Psyllium	COD, TOC
Guar/Plant Fums	COD, TOC, Ni
<b>Solid Waste (leakage)</b>	BOD
<b>Vehicle and Equipment Use</b>	
Batteries	Sulfuric acid; Pb, pH

#### 7.7.1.5 *Sample Collection*

Samples of discharge shall be collected at the designated non-visible pollutant sampling locations shown on the Site Maps in Appendix B or in the locations determined by observed breaches, malfunctions, leakages, spills, operational areas, soil amendment application areas, and historical site usage areas that triggered the sampling event.

Grab samples shall be collected and preserved in accordance with the methods identified in the Table, "Sample Collection, Preservation and Analysis for Monitoring Non-Visible Pollutants" provided in Section 7.7.1.6. Only the QSP, or personnel trained in water quality sampling under the direction of the QSP shall collect samples.

Sample collection and handling requirements are described in Section 7.7.7.

#### 7.7.1.6 *Sample Analysis*

Samples shall be analyzed using the analytical methods identified in the Table 7.12.

Samples will be analyzed by:

Laboratory Name:

Street Address:

City, State Zip:

Telephone Number:

Point of Contact:

ELAP Certification  
Number:

Samples will be delivered to the laboratory by:

Driven by Contractor	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Picked up by Laboratory Courier	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Shipped	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

**Table 7.12 Sample Collection, Preservation and Analysis for Monitoring Non-Visible Pollutants**

Constituent	Analytical Method	Minimum Sample Volume	Sample Containers	Sample Preservation	Reporting Limit	Maximum Holding Time
Lead Sulfate, Battery Acid	EPA 150.1 ph / EPA 300 Sulfate	500 ml	500 ml+ Plastic Container	Ice / refrigeration	10 ph / 10 Sulfate	14 days
Lead from Vehicle Batteries	EPA 6010b Lead	500 ml	500 ml+ Plastic Container	Nitric Acid	5 ppb	14 days
Solvents, VOC / SVOC	EPA 601/602 or EPA 624 Or EPA 625	40 ml	3 VOA	HCL	Several	14 days
Curing Compounds, non pigmented	SM 2310B/2320, EPA 150.1, 601, 602, 624, 625	1000 ml	500 ml Plastic	Ice / HCL	Several	ph 24 hrs / 14 Days
Sealants, COD	EPA 410.4	500 ml	500 ml Poly	H2SO4	10 mg/l	28 days
Fertilizer, Nitrates	EPA 300.0	100 ml	500 ml Poly	Non-Req	0,10	48 hrs
Notes:						

#### *7.7.1.7 Data Evaluation and Reporting*

The QSP shall complete an evaluation of the water quality sample analytical results.

Runoff/downgradient results shall be compared with the associated upgradient/unaffected results and any associated run-on results. Should the runoff/downgradient sample show an increased level of the tested analyte relative to the unaffected background sample, which cannot be explained by run-on results, the BMPs, site conditions, and surrounding influences shall be assessed to determine the probable cause for the increase.

As determined by the site and data evaluation, appropriate BMPs shall be repaired or modified to mitigate discharges of non-visible pollutant concentrations. Any revisions to the BMPs shall be recorded as an amendment to the SWPPP.

The General Permit prohibits the storm water discharges that contain hazardous substances equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4. The results of any non-stormwater discharge results that indicate the presence of a hazardous substance in excess of established reportable quantities shall be immediately reported to the Regional Water Board and other agencies as required by 40 C.F.R. §§ 117.3 and 302.4.

Results of non-visible pollutant monitoring shall be reported in the Annual Report.

#### **7.7.2 Sampling and Analysis Plan for pH and Turbidity in Stormwater Runoff Discharges**

Sampling and analysis of runoff for pH and turbidity is not required for Risk Level 1 projects.

#### **7.7.3 Additional Monitoring Following an NEL Exceedance**

This project is not subject to NELs.

#### **7.7.4 Sampling and Analysis Plan for Non-Stormwater Discharges**

This project is not subject to the non-stormwater sampling and analysis requirements of the General Permit because it is a Risk Level 1 project.

#### **7.7.5 Sampling and Analysis Plan for Other Pollutants Required by the Regional Water Board**

The Regional Water Board has not specified monitoring for additional pollutants.

#### **7.7.6 Training of Sampling Personnel**

Sampling personnel shall be trained to collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring program (SWAMP) 2008 Quality Assurance Program Plan (QAPrP). Training records of designated contractor sampling personnel are provided in Appendix J.

The stormwater sampler(s) and alternate(s) have received the following stormwater sampling training:

**Name****Training**


---

The stormwater sampler(s) and alternates have the following stormwater sampling experience:

**Name****Experience**


---

### **7.7.7 Sample Collection and Handling**

#### *7.7.7.1 Sample Collection*

Samples shall be collected at the designated sampling locations shown on the Site Maps and listed in the preceding sections. Samples shall be collected, maintained and shipped in accordance with the SWAMP 2008 Quality Assurance Program Plan (QAPrP).

Grab samples shall be collected and preserved in accordance with the methods identified in preceding sections.

To maintain sample integrity and prevent cross-contamination, sample collection personnel shall follow the protocols below.

- Collect samples (for laboratory analysis) only in analytical laboratory-provided sample containers;
- Wear clean, powder-free nitrile gloves when collecting samples;
- Change gloves whenever something not known to be clean has been touched;
- Change gloves between sites;
- Decontaminate all equipment (e.g. bucket, tubing) prior to sample collection using a trisodium phosphate water wash, distilled water rinse, and final rinse with distilled water. (Dispose of wash and rinse water appropriately, i.e., do not discharge to storm drain or receiving water). Do not decontaminate laboratory provided sample containers;
- Do not smoke during sampling events;
- Never sample near a running vehicle;
- Do not park vehicles in the immediate sample collection area (even non-running vehicles);
- Do not eat or drink during sample collection; and
- Do not breathe, sneeze, or cough in the direction of an open sample container.

The most important aspect of grab sampling is to collect a sample that represents the entire runoff stream. Typically, samples are collected by dipping the collection container in the runoff flow paths and streams as noted below.

- i. For small streams and flow paths, simply dip the bottle facing upstream until full.
- ii. For larger stream that can be safely accessed, collect a sample in the middle of the flow stream by directly dipping the mouth of the bottle. Once again making sure that the opening of the bottle is facing upstream as to avoid any contamination by the sampler.
- iii. For larger streams that cannot be safely waded, pole-samplers may be needed to safely access the representative flow.
- iv. Avoid collecting samples from ponded, sluggish or stagnant water.
- v. Avoid collecting samples directly downstream from a bridge as the samples can be affected by the bridge structure or runoff from the road surface.

Note, that depending upon the specific analytical test, some containers may contain preservatives. These containers should **never** be dipped into the stream, but filled indirectly from the collection container.

#### 7.7.7.2 *Sample Handling*

Turbidity and pH measurements must be conducted immediately. Do not store turbidity or pH samples for later measurement.

Samples for laboratory analysis must be handled as follows. Immediately following sample collection:

- Cap sample containers;
- Complete sample container labels;
- Sealed containers in a re-sealable storage bag;
- Place sample containers into an ice-chilled cooler;
- Document sample information on the *Effluent Sampling Field Log Sheet*; and
- Complete the CoC.

All samples for laboratory analysis must be maintained between 0-6 degrees Celsius during delivery to the laboratory. Samples must be kept on ice, or refrigerated, from sample collection through delivery to the laboratory. Place samples to be shipped inside coolers with ice. Make sure the sample bottles are well packaged to prevent breakage and secure cooler lids with packaging tape.

Ship samples that will be laboratory analyzed to the analytical laboratory right away. Hold times are measured from the time the sample is collected to the time the sample is analyzed. The General Permit requires that samples be received by the analytical laboratory within 48 hours of the physical sampling (unless required sooner by the analytical laboratory).

Laboratory Name:

Address:

City, State Zip:

Telephone Number:

Point of Contact:

### 7.7.7.3 *Sample Documentation Procedures*

All original data documented on sample bottle identification labels, *Effluent Sampling Field Log Sheet*, and CoCs shall be recorded using waterproof ink. These shall be considered accountable documents. If an error is made on an accountable document, the individual shall make corrections by lining through the error and entering the correct information. The erroneous information shall not be obliterated. All corrections shall be initialed and dated.

Duplicate samples shall be identified consistent with the numbering system for other samples to prevent the laboratory from identifying duplicate samples. Duplicate samples shall be identified in the *Effluent Sampling Field Log Sheet*.

Sample documentation procedures include the following:

Sample Bottle Identification Labels: Sampling personnel shall attach an identification label to each sample bottle. Sample identification shall uniquely identify each sample location.

Field Log Sheets: Sampling personnel shall complete the *Effluent Sampling Field Log Sheet* and *Receiving Water Sampling Field Log Sheet* for each sampling event, as appropriate.

Chain of Custody: Sampling personnel shall complete the CoC for each sampling event for which samples are collected for laboratory analysis. The sampler will sign the CoC when the sample(s) is turned over to the testing laboratory or courier.

## 7.11 **Quality Assurance and Quality Control**

An effective Quality Assurance and Quality Control (QA/QC) plan shall be implemented as part of the CSMP to ensure that analytical data can be used with confidence. QA/QC procedures to be initiated include the following:

- Field logs;
- Clean sampling techniques;
- CoCs;
- QA/QC Samples; and
- Data verification.

Each of these procedures is discussed in more detail in the following sections.

### 7.11.1 **Field Logs**

The purpose of field logs is to record sampling information and field observations during monitoring that may explain any uncharacteristic analytical results. Sampling information to be included in the field log include the date and time of water quality sample collection, sampling personnel, sample container identification numbers, and types of samples that were collected. Field observations should be noted in the field log for any abnormalities at the sampling location (color, odor, BMPs, etc.). Field measurements for pH and turbidity should also be recorded in the field log. A Visual Inspection Field Log, an Effluent Sampling Field Log Sheet, are included in CSMP Attachment 3 “Example Forms”.

### 7.11.2 **Clean Sampling Techniques**

Clean sampling techniques involve the use of certified clean containers for sample collection and clean powder-free nitrile gloves during sample collection and handling. As discussed in Section

7.7.7, adoption of a clean sampling approach will minimize the chance of field contamination and questionable data results.

### 7.11.3 Chain of Custody

The sample CoC is an important documentation step that tracks samples from collection through analysis to ensure the validity of the sample. Sample CoC procedures include the following:

- Proper labeling of samples;
- Use of CoC forms for all samples; and
- Prompt sample delivery to the analytical laboratory.

Analytical laboratories usually provide CoC forms to be filled out for sample containers. An example CoC is included in CSMP Attachment 3 “Example Forms”.

### 7.11.4 QA/QC Samples

QA/QC samples provide an indication of the accuracy and precision of the sample collection; sample handling; field measurements; and analytical laboratory methods. The following types of QA/QC will be conducted for this project:

- ☐ Field Duplicates at a frequency of 5% or 1 duplicate minimum per sampling event (Required for all sampling plans with field measurements or laboratory analysis)
- ☐ Equipment Blanks at a frequency of 1 duplicate (Only needed if equipment used to collect samples could add the pollutants to sample)
- ☐ Field Blanks at a frequency of 1 duplicate (Only required if sampling method calls for field blanks)
- ☐ Travel Blanks at a frequency of 1 duplicate (Required for sampling plans that include VOC laboratory analysis)

#### 7.11.4.1 Field Duplicates

Field duplicates provide verification of laboratory or field analysis and sample collection. Duplicate samples shall be collected, handled, and analyzed using the same protocols as primary samples. The sample location where field duplicates are collected shall be randomly selected from the discharge locations. Duplicate samples shall be collected immediately after the primary sample has been collected. Duplicate samples must be collected in the same manner and as close in time as possible to the original sample. Duplicate samples shall not influence any evaluations or conclusion.

#### 7.11.4.2 Equipment Blanks

Equipment blanks provide verification that equipment has not introduced a pollutant into the sample. Equipment blanks are typically collected when:

- New equipment is used;
- Equipment that has been cleaned after use at a contaminated site;
- Equipment that is not dedicated for surface water sampling is used; or
- Whenever a new lot of filters is used when sampling metals.

#### 7.11.4.3 *Field Blanks*

Field blanks assess potential sample contamination levels that occur during field sampling activities. De-ionized water field blanks are taken to the field, transferred to the appropriate container, and treated the same as the corresponding sample type during the course of a sampling event.

#### 7.11.4.4 *Travel Blanks*

Travel blanks assess the potential for cross-contamination of volatile constituents between sample containers during shipment from the field to the laboratory. De-ionized water blanks are taken along for the trip and held unopened in the same cooler with the VOC samples.

### 7.11.5 **Data Verification**

After results are received from the analytical laboratory, the QSP shall verify the data to ensure that it is complete, accurate, and the appropriate QA/QC requirements were met. Data must be verified as soon as the data reports are received. Data verification shall include:

- Check the CoC and laboratory reports.  
*Make sure all requested analyses were performed and all samples are accounted for in the reports.*
- Check laboratory reports to make sure hold times were met and that the reporting levels meet or are lower than the reporting levels agreed to in the contract.
- Check data for outlier values and follow up with the laboratory.  
*Occasionally typographical errors, unit reporting errors, or incomplete results are reported and should be easily detected. These errors need to be identified, clarified, and corrected quickly by the laboratory. The QSP should especially note data that is an order of magnitude or more different than similar locations or is inconsistent with previous data from the same location.*
- Check laboratory QA/QC results.  
*EPA establishes QA/QC checks and acceptable criteria for laboratory analyses. These data are typically reported along with the sample results. The QSP shall evaluate the reported QA/QC data to check for contamination (method, field, and equipment blanks), precision (laboratory matrix spike duplicates), and accuracy (matrix spikes and laboratory control samples). When QA/QC checks are outside acceptable ranges, the laboratory must flag the data, and usually provides an explanation of the potential impact to the sample results.*
- Check the data set for outlier values and, accordingly, confirm results and re-analyze samples where appropriate.  
*Sample re-analysis should only be undertaken when it appears that some part of the QA/QC resulted in a value out of the accepted range. Sample results may not be discounted unless the analytical laboratory identifies the required QA/QC criteria were not met and confirms this in writing.*

Field data including inspections and observations must be verified as soon as the field logs are received, typically at the end of the sampling event. Field data verification shall include:

- Check field logs to make sure all required measurements were completed and appropriately documented;
- Check reported values that appear out of the typical range or inconsistent; Follow-up immediately to identify potential reporting or equipment problems, if appropriate, recalibrate equipment after sampling;
- Verify equipment calibrations;
- Review observations noted on the field logs; and
- Review notations of any errors and actions taken to correct the equipment or recording errors.

## **7.12            *Records Retention***

All records of stormwater monitoring information and copies of reports (including Annual Reports) must be retained for a period of at least three years from date of submittal or longer if required by the Regional Water Board.

Results of visual monitoring, field measurements, and laboratory analyses must be kept in the SWPPP along with CoCs, and other documentation related to the monitoring.

Records are to be kept onsite while construction is ongoing. Records to be retained include:

- The date, place, and time of inspections, sampling, visual observations, and/or measurements, including precipitation;
- The individual(s) who performed the inspections, sampling, visual observation, and/or field measurements;
- The date and approximate time of field measurements and laboratory analyses;
- The individual(s) who performed the laboratory analyses;
- A summary of all analytical results, the method detection limits and reporting limits, and the analytical techniques or methods used;
- Rain gauge readings from site inspections;
- QA/QC records and results;
- Calibration records;
- Visual observation and sample collection exemption records;
- The records of any corrective actions and follow-up activities that resulted from analytical results, visual observations, or inspections

## CSMP ATTACHMENT 1: WEATHER REPORTS

---

*Place Printed NOAA weather forecasts in this attachment*

## CSMP ATTACHMENT 2: MONITORING RECORDS

---

*Place completed BMP Inspection Forms, Visual Monitoring, Effluent Sampling and Receiving Water Field Logs, Monitoring Exceptions, in this Attachment.*

## CSMP ATTACHMENT 3:    EXAMPLE FORMS

---

- *Rain Gauge Log Sheet*
- *Visual Inspection Field Log Sheet*
- *BMP Inspection Report*
- *NAL or NEL Exceedance Evaluations Summary Report*
- *Chain of Custody Forms*

[illegible]

<b>Risk Level 1</b> <b>Visual Inspection Field Log Sheet</b>						
Date and Time of Inspection:					Report Date:	
Inspection Type:	<input type="checkbox"/> Weekly	<input type="checkbox"/> Before predicted rain	<input type="checkbox"/> During rain event	<input type="checkbox"/> Following qualifying rain event	<input type="checkbox"/> Contained stormwater release	<input type="checkbox"/> Quarterly non-stormwater
Site Information						
Construction Site Name: Addams Elementary School						
Construction stage and completed activities:				Approximate area of exposed site:		
Weather and Observations						
Date Rain Predicted to Occur:				Predicted % chance of rain:		
Estimate storm beginning: _____ (date and time)		Estimate storm duration:_____ (hours)		Estimate time since last storm: _____ (days or hours)	Rain gauge reading:_____ (inches)	
Observations: If yes identify location						
Odors                      Yes <input type="checkbox"/> No <input type="checkbox"/>						
Floating material      Yes <input type="checkbox"/> No <input type="checkbox"/>						
Suspended Material   Yes <input type="checkbox"/> No <input type="checkbox"/>						
Sheen                    Yes <input type="checkbox"/> No <input type="checkbox"/>						
Discolorations        Yes <input type="checkbox"/> No <input type="checkbox"/>						
Turbidity                Yes <input type="checkbox"/> No <input type="checkbox"/>						
Site Inspections						
Outfalls or BMPs Evaluated			Deficiencies Noted			
(add additional sheets or attached detailed BMP Inspection Checklists)						
Photos Taken:		Yes <input type="checkbox"/>	No <input type="checkbox"/>	Photo Reference IDs:		
Corrective Actions Identified (note if SWPPP/REAP change is needed)						
Inspector Information						
Inspector Name:				Inspector Title:		
Signature:					Date:	

<b>Risk Level 2 – Not Applicable</b> <b>Effluent Sampling Field Log Sheets</b>			
Construction Site Name: Addams Elementary School		Date:	Time Start:
Sampler:			
Sampling Event Type:	<input type="checkbox"/> Stormwater	<input type="checkbox"/> Non-stormwater	<input type="checkbox"/> Non-visible pollutant
Field Meter Calibration			
pH Meter ID No./Desc.: Calibration Date/Time:		Turbidity Meter ID No./Desc.: Calibration Date/Time:	
Field pH and Turbidity Measurements			
Discharge Location Description	pH	Turbidity	Time
Grab Samples Collected			
Discharge Location Description	Sample Type	Time	
Additional Sampling Notes:			
Time End:			

<b>Risk Level 3 – Not Applicable</b> <b>Effluent Sampling Field Log Sheets</b>				
Construction Site Name: Addams Elementary School		Date:	Time Start:	
Sampler:				
Sampling Event Type:	<input type="checkbox"/> Stormwater	<input type="checkbox"/> Non-stormwater	<input type="checkbox"/> Non-visible pollutant	<input type="checkbox"/> Post NEL Exceedance
Field Meter Calibration				
pH Meter ID No./Desc.: Calibration Date/Time:		Turbidity Meter ID No./Desc.: Calibration Date/Time:		
Field pH and Turbidity Measurements				
Discharge Location Description	pH	Turbidity	Time	
Grab Samples Collected				
Discharge Location Description	SSC	Other (specify)	Time	
Additional Sampling Notes:				
Time End:				

<b>Risk Level 3 – Not Applicable</b> <b>Receiving Water Sampling Field Log Sheets</b>			
Construction Site Name: Addams Elementary School		Date:	Time Start:
Sampler:			
Receiving Water Description and Observations			
Receiving Water Name/ID:			
Observations:			
Odors	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Floating material	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Suspended Material	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Sheen	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Discolorations	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Turbidity	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Field Meter Calibration			
pH Meter ID No./Desc.:		Turbidity Meter ID No./Desc.:	
Calibration Date/Time:		Calibration Date/Time:	
Field pH and Turbidity Measurements and SSC Grab Sample			
Upstream Location			
Type	Result	Time	Notes
pH			
Turbidity			
SSC	Collected Yes <input type="checkbox"/> No <input type="checkbox"/>		
Downstream Location			
Type	Result	Time	Notes
pH			
Turbidity			
SSC	Collected Yes <input type="checkbox"/> No <input type="checkbox"/>		
Additional Sampling Notes:			
Time End:			

NAL or NEL Exceedance Evaluation Summary Report		Page ___ of ___
Project Name	Addams Elementary School	
Project WDID		
Project Location	2117 W McKinley Ave, Fresno, CA 93728	
Date of Exceedance		
Type of Exceedance	NAL Daily Average <input type="checkbox"/> pH <input type="checkbox"/> Turbidity NEL Daily Average <input type="checkbox"/> pH <input type="checkbox"/> Turbidity  <input type="checkbox"/> Other (specify) _____	
Measurement or Analytical Method	<input type="checkbox"/> Field meter (Sensitivity: _____) <input type="checkbox"/> Lab method (specify) _____ (Reporting Limit: _____) (MDL: _____)	
Calculated Daily Average	<input type="checkbox"/> pH _ pH units <input type="checkbox"/> Turbidity __ NTU	
Rain Gauge Measurement	_____ inches	
Compliance Storm Event	_____ inches (5-year, 24-hour event)	
Visual Observations on Day of Exceedance		

NAL or NEL Exceedance Evaluation Summary Report		Page ____ of ____
<b>Description of BMPs in Place at Time of Event</b>		
<b>Initial Assessment of Cause</b>		
<b>Corrective Actions Taken (deployed after exceedance)</b>		
<b>Additional Corrective Actions Proposed</b>		
<b>Report Completed By</b>	<hr/> <b>(Print Name, Title)</b>	
<b>Signature</b>	<hr/>	

**CHAIN-OF-CUSTODY****DATE:****Lab ID:**

<b>DESTINATION LAB:</b>  <b>ATTN:</b>  <b>ADDRESS:</b>  <b>Office Phone:</b> <b>Cell Phone:</b>							<b>REQUESTED ANALYSIS</b>				<b>Notes:</b>	
							<b>SAMPLED BY:</b>					
<b>Contact:</b>												
<b>Project Name</b>			Addams Elementary School									
<b>Client Sample ID</b>	<b>Sample Date</b>	<b>Sample Time</b>	<b>Sample Matrix</b>	<b>Container</b>								
				<b>#</b>	<b>Type</b>	<b>Pres.</b>						
<b>SENDER COMMENTS:</b>							<b>RELINQUISHED BY</b>					
							Signature:					
							Print:					
							Company:					
							Date:		TIME:			
<b>LABORATORY COMMENTS:</b>							<b>RECEIVED BY</b>					
							Signature:					
							Print:					
							Company:					
							Date:		TIME:			

## SECTION 8 REFERENCES

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Project Plans and Specifications prepared by Blair, Church & Flynn Consulting Engineers

State Water Resources Control Board (2010). Order 2010-0014-DWQ, NPDES General Permit No. CAS000002: National Pollutant Discharges Elimination System (NPDES) California General Permit for Storm Water Discharge Associated with Construction and Land Disturbing Activities. Available on-line at:

[http://www.waterboards.ca.gov/water\\_issues/programs/stormwater/construction.shtml](http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml).

CASQA 2009, *Stormwater BMP Handbook Portal: Construction*, November 2009,

[www.casqa.org](http://www.casqa.org)

## ***APPENDIX A: CALCULATIONS***

---

Project #: 217-0215

Project Name: Adams Elementary School Additions and Modernizations

## Runoff Coefficient Calculation

### Pre-Development

	C-Factor	% of Site	Effective "C"
Graded Dirt	0.20	1%	0.002
Fields w/ Weeds	0.15	0%	0
Landscaping/Turf	0.15	62%	0.093
Concrete/Asphalt/Roof Top	0.90	37%	0.333
		100%	<b>0.43</b>

&lt;&lt;Effective "Pre-Development" C-Factor

### Post-Development

	C-Factor	% of Site	Effective "C"
Graded Dirt	0.20	1%	0.002
Fields w/ Weeds	0.15	0%	0
Landscaping/Turf	0.15	46%	0.069
Concrete/Asphalt/Roof Top	0.90	53%	0.477
		100%	<b>0.55</b>

&lt;&lt;Effective "Post-Development" C-Factor

Total Site Acreage **5.76** acres

Total Annual Rainfall **11.50** inches

Project Status	Runoff Coefficient	Site Area (acres)	Average Annual Rainfall (inches)	Average Annual Runoff (acre-feet)
Pre-Construction	0.43	5.76	11.50	2.36
Post-Construction	0.55	5.76	11.50	3.02

**0.66** Difference Between the Two

Project #: 217-0215  
Project Name: Adams Elementary School Additions and Modernizations

Pre	Pre-constr. Sqrft	% pre-cover	Post-constr. Sqrft	% post-cover
pervious area	157126	0.62596509	157126	0.625965086
Impervious	93888	0.37403491	93888	0.374034914

total sqrft calc  
251014

# National Pollutant Discharge Elimination System (NPDES)

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## Rainfall Erosivity Factor Calculator for Small Construction Sites

EPA’s stormwater regulations allow NPDES permitting authorities to waive NPDES permitting requirements for stormwater discharges from small construction sites if:

- the construction site disturbs less than five acres, and
- the rainfall erosivity factor (“R” in the revised universal soil loss equation, or RUSLE) value is less than five during the period of construction activity.

If your small construction project is located in an area where EPA is the permitting authority and your R factor is less than five, you qualify for a low erosivity waiver (LEW) from NPDES stormwater permitting. If your small construction project does not qualify for a waiver, then NPDES stormwater permit coverage is required. Follow the steps below to calculate your R-Factor.

LEW certifications are submitted through the NPDES eReporting Tool or “CGP-NeT”. Several states that are authorized to implement the NPDES permitting program also accept LEWs. Check with your state NPDES permitting authority for more information.

- [Submit your LEW through EPA’s eReporting Tool](#)
- [List of states, Indian country, and territories where EPA is the permitting authority](#)
- [Construction Rainfall Erosivity Waiver Fact Sheet](#)
- [Appendix C of the 2017 CGP – Small Construction Waivers and Instructions](#)

The R-factor calculation can also be integrated directly into custom applications using the [R-Factor web service](#).

For questions or comments, email EPA’s CGP staff at [cgp@epa.gov](mailto:cgp@epa.gov).



Select the estimated start and end dates of construction by clicking the boxes and using the dropdown calendar.


The period of construction activity begins at initial earth disturbance and ends with final stabilization.

Start Date:

08/18/2021

End Date:

08/17/2022



Locate your small construction project using the search box below or by clicking on the map.


Location:

36.76437, -119.83731

Search





 Click the "Calculate R Factor" button below to calculate an R Factor for your small construction project.

**Calculate R Factor**

## Facility Information

<b>Start Date:</b> 08/18/2021	<b>Latitude:</b> 36.7644
<b>End Date:</b> 08/17/2022	<b>Longitude:</b> -119.8373

### Calculation Results

Rainfall erosivity factor (R Factor) = **24.56**

A rainfall erosivity factor of 5.0 or greater has been calculated for your site's period of construction.

**You do NOT qualify for a waiver from NPDES permitting requirements and must seek Construction General Permit (CGP) coverage.** If you are located in an [area where EPA is the permitting authority](#), you must submit a Notice of Intent (NOI) through the [NPDES eReporting Tool \(NeT\)](#). Otherwise, you must seek coverage under your state’s CGP.

# National Pollutant Discharge Elimination System (NPDES)

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EPA’s stormwater regulations allow NPDES permitting authorities to waive NPDES permitting requirements for stormwater discharges from small construction sites if:

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The R-factor calculation can also be integrated directly into custom applications using the [R-Factor web service](#).

For questions or comments, email EPA’s CGP staff at [cgp@epa.gov](mailto:cgp@epa.gov).



Select the estimated start and end dates of construction by clicking the boxes and using the dropdown calendar.


The period of construction activity begins at initial earth disturbance and ends with final stabilization.

Start Date:

08/18/2022

End Date:

08/17/2023



Locate your small construction project using the search box below or by clicking on the map.

Location:

36.76437, -119.83731

Search





Click the "Calculate R Factor" button below to calculate an R Factor for your small construction project.

Calculate R Factor

Facility Information

Start Date: 08/18/2022	Latitude: 36.7644
End Date: 08/17/2023	Longitude: -119.8373

Calculation Results

Rainfall erosivity factor (R Factor) = **24.56**

A rainfall erosivity factor of 5.0 or greater has been calculated for your site's period of construction.

**You do NOT qualify for a waiver from NPDES permitting requirements and must seek Construction General Permit (CGP) coverage.** If you are located in an [area where EPA is the permitting authority](#), you must submit a Notice of Intent (NOI) through the [NPDES eReporting Tool \(NeT\)](#). Otherwise, you must seek coverage under your state’s CGP.

# Water Boards Storm Water Multiple Application & Report Tracking System

[Help](#)[Logout](#)

You are logged-in as: **Cassie Scholz**  
If this account does not belong to you, please log out.

Navigate To:



## Risk

The application is organized into different tabs. Please complete all applicable tabs before submitting the form. If you want to complete the application at a later time, please click on "Save & Exit".

<b>WDID/App ID:</b> - 534360	<b>Owner:</b> Fresno Unified School District	<b>Certified Date:</b>
<b>Status:</b> Not Submitted	4600 N Brawley Fresno CA 93722	<b>Processed Date:</b>
<b>Order No:</b> 2009-0009-DWQ	<b>Site:</b> Addams Elementary School Building Additions and Modernization	<b>NOT Effective Date:</b>
<b>Permit Type:</b> Construction - NOI	2117 W McKinley Ave Fresno CA 93728	<b>Previous ID:</b> -

[Owner Info](#)
[Developer Info](#)
[Site Info](#)
[Risk](#)
[Addl. Site Info](#)
[Post Construction](#)
[Billing Info](#)
[Attachments](#)
[Certification](#)
[Reports](#)
[Inspections](#)
[Print](#)

[Status History](#)
[Linked Users](#)
[NOTs](#)
[COIs](#)

### SEDIMENT RISK FACTOR WORKSHEET

Instructions: Enter R,K and LS factor values. System will calculate watershed erosion estimates and site sediment risk factor

#### A. Sediment Risk

A) R Factor Value: ([What's this?](#))

49.12

\* [Erosivity Calculator](#)

B) K Factor Value (weighted average, by area, for all site soils) ([What's this?](#))

\*\*\*If not using the SWRCB map(Populate K Factor) upload your analysis on the Attachment Tab prior to submitting to the SWRCB.

0.32

\* [Populate K Factor](#)

C) LS Factor (weighted average, by area, for all slopes) ([What's this?](#)) \*\*\*If not using the SWRCB map(Populate LS Factor) upload your analysis on the Attachment Tab prior to submitting to the SWRCB.

0.19

\* [Populate LS Factor](#)

**Watershed Erosion Estimate (=R\*K\*LS) in tons/acre**

2.99

**Site Sediment Risk Factor**

Low

Low Sediment Risk: < 15 tons/acre  
Medium Sediment Risk: >= 15 and <75 tons/acre  
High Sediment Risk: >= 75 tons/acre

### RECEIVING WATER (RW) RISK FACTOR WORKSHEET

#### A. Watershed Characteristics

A.1.(a) Does the disturbed area discharge directly or indirectly to a 303(d) listed waterbody impaired by sediment?

OR

A.1.(b) Is the disturbed area located within a sub-watershed draining to a 303(d) listed waterbody impaired by sediment?

OR

A.2. Is the disturbed area located within a planning watershed draining to a waterbody with designated beneficial uses of COLD, SPAWN AND MIGRATORY?

Populate Receiving Water Risk

No

Yes = High, No = Low

[Statewide Map of High Receiving Water Risk Watersheds](#)

Low

#### C. Combined Risk Level Matrix

##### Sediment Risk

		Low	Medium	High
Receiving Water Risk	Low	Level1		Level2
	High		Level2	Level3

Project Sediment Risk: **Low**

Project Receiving Water Risk: **Low**

Project Combined Risk: **Level1**

Save &amp; Exit

Save &amp; Continue

Fields marked with \* are mandatory fields.

## ***APPENDIX B: SITE MAPS***

---



NOT TO SCALE

**VICINITY MAP**  
CITY OF  
FRESNO, CA




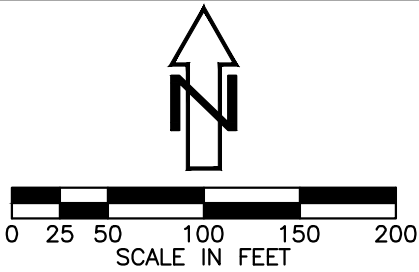
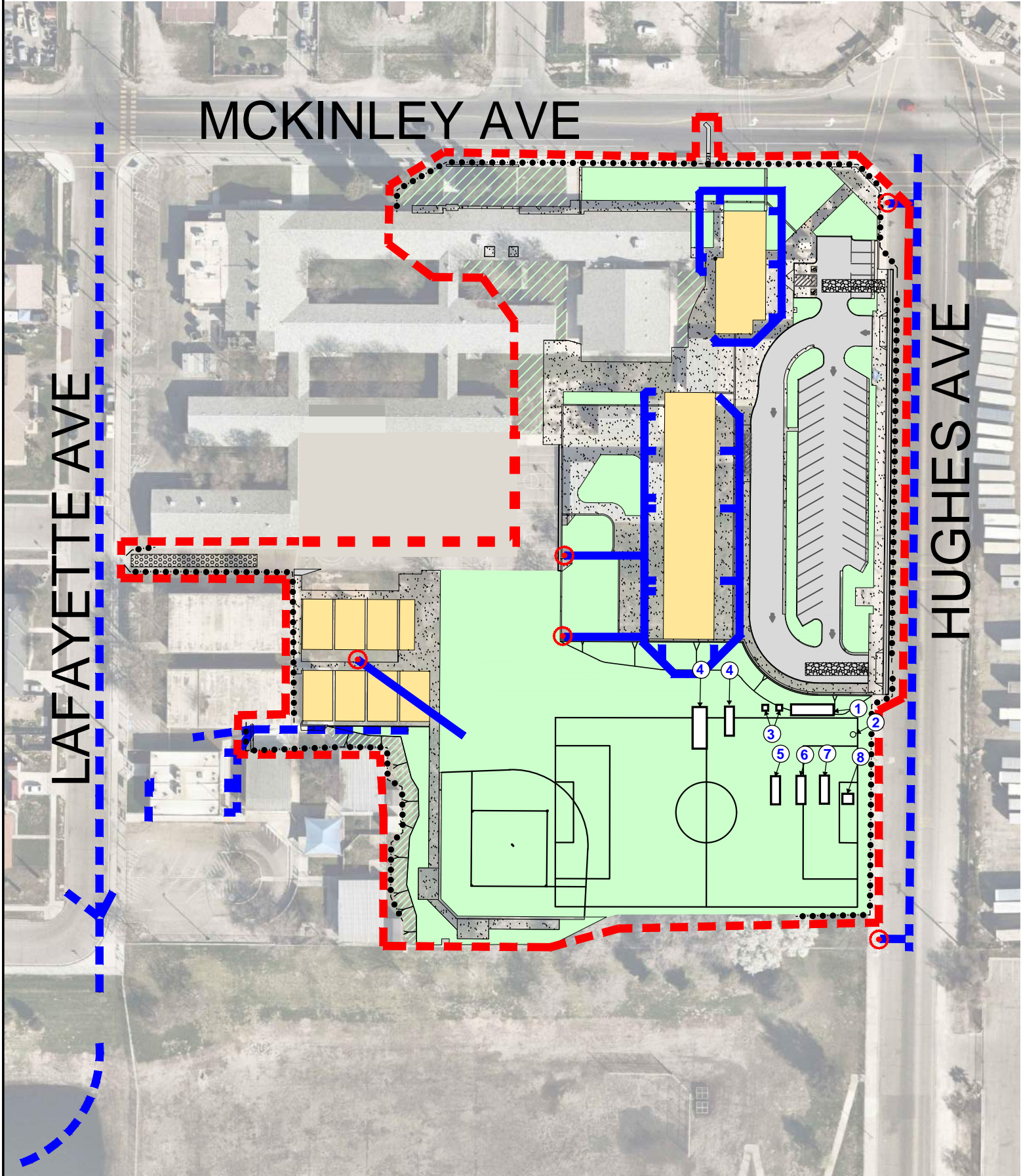
NOT TO SCALE

**PROJECT SITE**



**FIGURE 1**

	CONSULTANT Blair, Church & Flynn Consulting Engineers 4811 Clovis Avenue, Suite 300 Clovis, California 93612 Tel (509) 326-1400 Fax (509) 326-1200	FRESNO UNIFIED SCHOOL DISTRICT			
		STORM WATER POLLUTION PREVENTION PLAN		DR. BY MG	SHEET NO. 1
		JANE ADDAMS ELEMNETARY SCHOOL ADD & MOD		CH. BY JM	
		LOCATION MAPS		DATE 04/06/21	
			SCALE: AS NOTED	OF 2 SHEETS	




LEGEND:

- ① LOCATION OF JOB TRAILER CONTAINING SPILL KIT AND ONSITE SWPPP
- ② LOCATION OF RAIN GAUGE
- ③ RESTROOMS AND SANITARY FACILITIES PER CASQA WM-09
- ④ OVERNIGHT EQUIPMENT/VEHICLE STORAGE AND MAINTENANCE PER CASQA NS-8, NS-9 AND NS-10
- ⑤ MATERIAL STORAGE LOCATION PER CASQA WM-01
- ⑥ STOCKPILE STORAGE LOCATION PER CASQW WM-03
- ⑦ SOLID WASTE STORAGE LOCATION PER CASQA WM-05
- ⑧ CONCRETE WASHOUT LOCATION PER CASQA WM-08
- ⊙ PROTECT STORM WATER COLLECTION POINT/DRAIN INLET PER CASQA SE-10
- PROJECT BOUNDARY
- EXISTING STORM DRAIN PIPELINE
- ..... LOCATION OF MINIMUM SITE PERIMETER CONTROL BMP'S. REFER TO NOTE 1 AND THE SWPPP FOR BMP DETAILS AND FACT SHEETS. EXACT LOCATIONS OF THE PERIMETER SEDIMENT CONTROL BMP'S SHALL BE COORDINATED WITH THE QSP PRIOR TO INSTALLATION OR REMOVAL. (PERIMETER CONTROL EXAMPLES MAY INCLUDE FIBER ROLLS, SILT FENCE, SANDBAGS, ETC.)
- PROPOSED STORM DRAIN PIPELINE
- AREAS OF PROPOSED ASPHALT CONCRETE (IMPERVIOUS AREAS)
- AREAS OF PROPOSED CONCRETE (IMPERVIOUS AREAS)
- AREAS OF PROPOSED VEGETATION (PERVIOUS AREAS)
- AREAS TO BE STABILIZED AT CLOSEOUT IF DISTURBED DURING CONSTRUCTION (PERVIOUS AREA)
- PROPOSED BUILDING (IMPERVIOUS AREA)
- LOCATION OF STABILIZED CONSTRUCTION ROADWAY PER CASQA TC-2
- LOCATION OF STABILIZED CONSTRUCTION ENTRANCE/EXIT PER CASQA TC-1

NOTES TO CONTRACTOR:

- THE BMPS DEPICTED HEREON ARE NOT A COMPLETE LIST. REFER TO THE SWPPP APPENDIX FOR A FULL DESCRIPTION OF BMPS.
- IN ADDITION TO THE BMPS DEPICTED HEREON, THE QSP SHALL SELECT, IMPLEMENT AND MAINTAIN AN EFFECTIVE COMBINATION OF BOTH SEDIMENT AND EROSION CONTROL BMPS THROUGHOUT THE LIFE OF THE PROJECT. PERIMETER BMPS MAY INCLUDE SILT FENCE, SANDBAGS, FIBER ROLLS, BERMS, SWALES ETC.
- STREET SURFACES SHALL BE SWEEPED BY THE CONTRACTOR PER CASQA SE-7. VISIBLE SEDIMENT TRACKING SHALL BE SWEEPED OR VACUUMED ON A DAILY BASIS.
- DUST CONTROL PRACTICES SHALL CONFORM WITH THE LOCAL AIR DISTRICT AND CASQA WE-1.
- IF CONSTRUCTION IS PHASED, BMPS MAY BE INSTALLED ONLY WITHIN ACTIVE AREAS OF CONSTRUCTION. ONCE EACH PHASE OF CONSTRUCTION IS COMPLETE AND PROJECT AREA IS STABILIZED, BMPS MAY BE REMOVED WITHIN THE STABILIZED AREA.
- THE INDICATED BMP LOCATIONS ARE RECOMMENDATIONS FOR THE CONTRACTOR AND QSP. THE QSP SHALL CONTINUALLY UPDATE FIGURE 2 WITH THE ACTUAL LOCATIONS OF ALL BMPS, AND MAINTAIN A CURRENT COPY IN THE SITE SWPPP BINDER. IF THE IMPLEMENTED BMPS ARE SIGNIFICANTLY DIFFERENT FROM THOSE INDICATED IN THE SWPPP, A SWPPP AMENDMENT SHALL BE PREPARED AND SUBMITTED TO THE WATER BOARD.
- THE INDICATED STAGING AREAS ARE ASSUMED FOR SCHEMATIC PURPOSED ONLY, AND SHOULD BE COORDINATED WITH THE OWNER. DEPICTION OF STAGING AREAS SHALL NOT GUARANTEE USE OF THOSE AREAS WITHOUT PRIOR PERMISSION. THE QSP SHALL CONTINUALLY UPDATE FIGURE 2 WITH THE ACTUAL LOCATIONS OF ALL STAGING, AND MAINTAIN A CURRENT COPY IN THE SITE SWPPP BINDER. ALL STAGING AREAS SHALL BE FULLY STABILIZED BEFORE CLOSEOUT.
- FINAL STABILIZATION MUST BE IMPLEMENTED AT ANY AREA THAT HAS BEEN DISTURBED, AT ANY POINT DURING CONSTRUCTION, AND MUST REACH AT LEAST 70% ESTABLISHMENT BEFORE CLOSEOUT.
- INSTALL ANY VEGETATIVE STABILIZATION AS EARLY AS POSSIBLE TO ALLOW TIME TO REACH 70% ESTABLISHMENT.
- REFER TO THE CONSTRUCTION DRAWINGS FOR MORE DETAIL.

FIGURE 2

	CONSULTANT Blair, Church & Flynn Consulting Engineers 4811 Clovis Avenue, Suite 200 Clovis, California 93612 Tel (559) 326-1400 Fax (559) 326-1200	FRESNO UNIFIED SCHOOL DISTRICT			
		STORM WATER POLLUTION PREVENTION PLAN		DR. BY MG	SHEET NO. 2  OF 2 SHEETS
		JANE ADDAMS ELEMNETARY SCHOOL ADD & MOD		CH. BY JM	
		SITE MAP		DATE 04/06/21 SCALE: AS NOTED	

## ***APPENDIX C: PERMIT REGISTRATION DOCUMENTS***

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<b>Y/N</b>	<b>Permit Registration Document</b>
Y	Notice of Intent
Y	Risk Assessment, see Appendix A
Y	Certification
Y	Post Construction Water Balance
Y	Copy of Annual Fee Receipt
Y	Site Map, see Appendix B

## ***APPENDIX D:SWPPP AMENDMENT CERTIFICATIONS***

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**SWPPP Amendment No.**

Project Name: Addams Elementary School

Project Number: 217-0215

**Qualified SWPPP Developer's Certification of the  
Stormwater Pollution Prevention Plan Amendment**

“This Stormwater Pollution Prevention Plan and attachments were prepared under my direction to meet the requirements of the California Construction General Permit (SWRCB Order No. 2009-009-DWQ as amended by 2010-0014-DWQ). I certify that I am a Qualified SWPPP Developer in good standing as of the date signed below.”

\_\_\_\_\_  
QSD's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Cassie Scholz

\_\_\_\_\_  
24295

\_\_\_\_\_  
QSD Name

\_\_\_\_\_  
QSD Certificate Number

\_\_\_\_\_  
Project Engineer, QSD

\_\_\_\_\_  
(559) 326 – 1400

\_\_\_\_\_  
Title and Affiliation

\_\_\_\_\_  
Telephone

\_\_\_\_\_  
451 Clovis Ave. Suite 200

\_\_\_\_\_  
Clovis, CA 93612

\_\_\_\_\_  
[cscholz@bcf-engr.com](mailto:cscholz@bcf-engr.com)

\_\_\_\_\_  
Address

\_\_\_\_\_  
Email

## ***APPENDIX E: SUBMITTED CHANGES TO PRDS***

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## Log of Updated PRDs

The General Permit allows for the reduction or increase of the total acreage covered under the General Permit when a portion of the project is complete and/or conditions for termination of coverage have been met; when ownership of a portion of the project is purchased by a different entity; or when new acreage is added to the project.

Modified PRDs shall be filed electronically within 30 days of a reduction or increase in total disturbed area if a change in permit covered acreage is to be sought. The SWPPP shall be modified appropriately, with revisions and amendments recorded in Appendix C. Updated PRDs submitted electronically via SMARTS can be found in this Appendix.

---

This appendix includes all of the following updated PRDs (check all that apply):

- ☐ Revised Notice of Intent (NOI);
- ☐ Revised Site Map;
- ☐ Revised Risk Assessment;
- ☐ New landowner's information (name, address, phone number, email address); and
- ☐ New signed certification statement.

Derek Vendenoff

---

Legally Responsible Person

---

Signature of Legally Responsible Person or  
Approved Signatory

---

Name of Legally Responsible Person or Approved  
Signatory

---

Date

(559) 457-3055

---

Telephone Number

## ***APPENDIX F: CONSTRUCTION SCHEDULE***

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## **APPENDIX G: CONSTRUCTION ACTIVITIES, MATERIALS USED, AND ASSOCIATED POLLUTANTS**

**Table G.1 Construction Activities and Associated Pollutants**

<b>Phase</b>	<b>Activity</b>	<b>Associated Materials or Pollutants</b>
Demolition, Grading and Land Development	<ul style="list-style-type: none"> <li>Saw cut, crush, and remove existing concrete improvements</li> <li>Saw cut, break up, and remove existing asphalt pavement</li> <li>Remove trees, stump and roots</li> <li>Remove turf and vegetation</li> <li>Distribute material at designated areas</li> <li>Deliver and empty trash bins</li> <li>Deliver and service portable outhouses to site</li> <li>Deliver materials to site and store in containers</li> <li>Deliver equipment to site</li> <li>Park equipment during off hours, refuel, check fluid levels, grease, service and repair (oil, hydraulics, cooling fluid, brake fluid, power steering fluid, etc.)</li> <li>Import fill material</li> <li>Excavate and compact areas</li> </ul>	<ul style="list-style-type: none"> <li>Construction equipment fluids</li> <li>Concrete rubble and dust</li> <li>Saw cut wastewater</li> <li>Sediment from erosion</li> <li>Spills</li> <li>Septic spills, cleaning fluids, and washout</li> <li>Trash</li> <li>Fueling drips and spills (gasoline, diesel)</li> <li>Operating fluid drips and spills (oil, hydraulic, coolant, brake, power steering, etc.)</li> <li>Grease drips</li> </ul>
Landscaping and Site Stabilization Phase	<ul style="list-style-type: none"> <li>Deliver materials to site</li> <li>Deliver mulch material to site</li> <li>Excavate trenches</li> <li>Install water irrigation pipelines, valves, emitters and bubblers</li> <li>Install controller electrical service and valve control wires</li> <li>Install valve boxes</li> <li>Backfill and compact trenches</li> <li>Blow lines and test system</li> <li>Plant shrubs and trees</li> <li>Hydroseed, as required</li> </ul>	<ul style="list-style-type: none"> <li>Residue from materials</li> <li>Mulches</li> <li>Construction equipment fluids</li> <li>Sediments</li> <li>Shavings from conduit material</li> <li>Wastewater and chlorinated water</li> <li>PVC pipe dust, primer, and glue</li> <li>Fertilizers</li> <li>Herbicides</li> <li>Trash</li> </ul>
Streets and Utilities Phase	<ul style="list-style-type: none"> <li>Excavate trenches</li> <li>Install pipelines, laterals, and conduit</li> <li>Install manholes and utility structures</li> <li>Install inlets, cleanouts, valves, and conductors</li> <li>Backfill and compact trenches</li> <li>Install trench surface restoration</li> <li>Excavate and compact subgrade</li> <li>Install and compact base materials</li> <li>Apply paint binder</li> <li>Install forms and guide wires</li> <li>Install concrete and concrete improvements</li> <li>Install emulsion sealer</li> <li>Paint pavement striping and markings</li> </ul>	<ul style="list-style-type: none"> <li>Construction equipment fluids</li> <li>Concrete paste and curing compound</li> <li>Concrete and grout washout</li> <li>Joint and form lubricants</li> <li>Paints, thinners, and solvents</li> <li>Sediments</li> <li>Shavings from conduit material and sawdust</li> <li>Trash</li> <li>Wastewater and chlorinated water</li> </ul>

**Table G.1 Construction Activities and Associated Pollutants**

Phase	Activity	Associated Materials or Pollutants
Vertical Construction Phase	<ul style="list-style-type: none"> <li>• Excavate building foundations</li> <li>• Distribute excavated materials as onsite fill</li> <li>• Construct foundation, building walls, and roof</li> <li>• Install building plumbing</li> <li>• Construct building exterior covering and interior</li> <li>• Install insulation and finish system</li> <li>• Apply trim accessories, primer, sealer, and weather resistant barrier coating</li> <li>• Install windows, electrical wiring, cabinets, and flooring</li> <li>• Install building HVAC</li> <li>• Texture walls, paint interiors and building</li> <li>• Touch-up painting and clean exposed finished surfaces</li> </ul>	<ul style="list-style-type: none"> <li>• Construction equipment fluids</li> <li>• Sediments</li> <li>• Concrete, grout, and stucco washout</li> <li>• Adhesives, cleaners, and sealants</li> <li>• Solder, lead, and heavy metal shavings</li> <li>• Cutting oil and welding slag</li> <li>• Steel and aluminum grindings</li> <li>• Roofing and flooring material trash</li> <li>• Sheetrock dust and sawdust</li> <li>• Insulation fibers</li> <li>• Ceramic tile dust and wash off water</li> <li>• Paint, lacquers, varnishes, thinners, stripping agents, sanding dust, stripping residue, paint washout, spills</li> <li>• Freon spills</li> <li>• Trash</li> </ul>

Categories per CASQA BMP Handbook (i.e., Sediment, Nutrients, Bacteria and Viruses, Oil and Grease, Metals, Synthetic Organics, Pesticides, Gross Pollutants, and Vector Production)

***APPENDIX H: CASQA STORMWATER BMP HANDBOOK  
PORTAL: CONSTRUCTION FACT SHEETS***

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# Scheduling

## EC-1

JANUARY				
MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
		1	2 NTP MOBILIZATION	3
			9	10 Grading
6 Install erosion & sediment control measures	7	8 Land clearing		16
		14		23
12	13		15	22

### Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	<input checked="" type="checkbox"/>
WE	Wind Erosion Control	<input checked="" type="checkbox"/>
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ Primary Objective  
☒ Secondary Objective

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

None

### Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

### Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

### Limitations

- Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

### Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.
- Plan the project and develop a schedule showing each phase of construction. Clearly show how the rainy season relates

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# Scheduling

## EC-1

to soil disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.

- Include on the schedule, details on the rainy season implementation and deployment of:
  - Erosion control BMPs
  - Sediment control BMPs
  - Tracking control BMPs
  - Wind erosion control BMPs
  - Non-stormwater BMPs
  - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season.
  - Sequence trenching activities so that most open portions are closed before new trenching begins.
  - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
  - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

### Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques should be compared with the other less effective erosion and sedimentation controls to achieve a cost effective balance.

# Scheduling

## EC-1

### Inspection and Maintenance

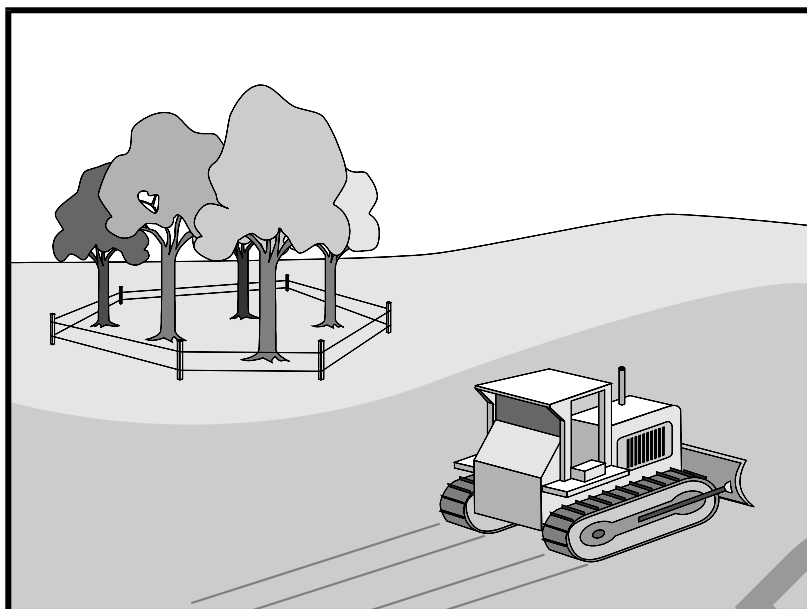
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

### References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.

# Preservation Of Existing Vegetation EC-2



## Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

## Legend:

- ☒ Primary Objective  
☒ Secondary Objective

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

## Potential Alternatives

None

## Description and Purpose

Carefully planned preservation of existing vegetation minimizes the potential of removing or injuring existing trees, vines, shrubs, and grasses that protect soil from erosion.

## Suitable Applications

Preservation of existing vegetation is suitable for use on most projects. Large project sites often provide the greatest opportunity for use of this BMP. Suitable applications include the following:

- Areas within the site where no construction activity occurs, or occurs at a later date. This BMP is especially suitable to multi year projects where grading can be phased.
- Areas where natural vegetation exists and is designated for preservation. Such areas often include steep slopes, watercourse, and building sites in wooded areas.
- Areas where local, state, and federal government require preservation, such as vernal pools, wetlands, marshes, certain oak trees, etc. These areas are usually designated on the plans, or in the specifications, permits, or environmental documents.
- Where vegetation designated for ultimate removal can be temporarily preserved and be utilized for erosion control and sediment control.

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# Preservation Of Existing Vegetation EC-2

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## Limitations

- Requires forward planning by the owner/developer, contractor, and design staff.
- Limited opportunities for use when project plans do not incorporate existing vegetation into the site design.
- For sites with diverse topography, it is often difficult and expensive to save existing trees while grading the site satisfactory for the planned development.

## Implementation

The best way to prevent erosion is to not disturb the land. In order to reduce the impacts of new development and redevelopment, projects may be designed to avoid disturbing land in sensitive areas of the site (e.g., natural watercourses, steep slopes), and to incorporate unique or desirable existing vegetation into the site's landscaping plan. Clearly marking and leaving a buffer area around these unique areas during construction will help to preserve these areas as well as take advantage of natural erosion prevention and sediment trapping.

Existing vegetation to be preserved on the site must be protected from mechanical and other injury while the land is being developed. The purpose of protecting existing vegetation is to ensure the survival of desirable vegetation for shade, beautification, and erosion control. Mature vegetation has extensive root systems that help to hold soil in place, thus reducing erosion. In addition, vegetation helps keep soil from drying rapidly and becoming susceptible to erosion. To effectively save existing vegetation, no disturbances of any kind should be allowed within a defined area around the vegetation. For trees, no construction activity should occur within the drip line of the tree.

## Timing

- Provide for preservation of existing vegetation prior to the commencement of clearing and grubbing operations or other soil disturbing activities in areas where no construction activity is planned or will occur at a later date.

## Design and Layout

- Mark areas to be preserved with temporary fencing. Include sufficient setback to protect roots.
  - Orange colored plastic mesh fencing works well.
  - Use appropriate fence posts and adequate post spacing and depth to completely support the fence in an upright position.
- Locate temporary roadways, stockpiles, and layout areas to avoid stands of trees, shrubs, and grass.
- Consider the impact of grade changes to existing vegetation and the root zone.
- Maintain existing irrigation systems where feasible. Temporary irrigation may be required.
- Instruct employees and subcontractors to honor protective devices. Prohibit heavy equipment, vehicular traffic, or storage of construction materials within the protected area.

# Preservation Of Existing Vegetation EC-2

---

## Costs

There is little cost associated with preserving existing vegetation if properly planned during the project design, and these costs may be offset by aesthetic benefits that enhance property values. During construction, the cost for preserving existing vegetation will likely be less than the cost of applying erosion and sediment controls to the disturbed area. Replacing vegetation inadvertently destroyed during construction can be extremely expensive, sometimes in excess of \$10,000 per tree.

## Inspection and Maintenance

During construction, the limits of disturbance should remain clearly marked at all times. Irrigation or maintenance of existing vegetation should be described in the landscaping plan. If damage to protected trees still occurs, maintenance guidelines described below should be followed:

- Verify that protective measures remain in place. Restore damaged protection measures immediately.
- Serious tree injuries shall be attended to by an arborist.
- Damage to the crown, trunk, or root system of a retained tree shall be repaired immediately.
- Trench as far from tree trunks as possible, usually outside of the tree drip line or canopy. Curve trenches around trees to avoid large roots or root concentrations. If roots are encountered, consider tunneling under them. When trenching or tunneling near or under trees to be retained, place tunnels at least 18 in. below the ground surface, and not below the tree center to minimize impact on the roots.
- Do not leave tree roots exposed to air. Cover exposed roots with soil as soon as possible. If soil covering is not practical, protect exposed roots with wet burlap or peat moss until the tunnel or trench is ready for backfill.
- Cleanly remove the ends of damaged roots with a smooth cut.
- Fill trenches and tunnels as soon as possible. Careful filling and tamping will eliminate air spaces in the soil, which can damage roots.
- If bark damage occurs, cut back all loosened bark into the undamaged area, with the cut tapered at the top and bottom and drainage provided at the base of the wood. Limit cutting the undamaged area as much as possible.
- Aerate soil that has been compacted over a trees root zone by punching holes 12 in. deep with an iron bar, and moving the bar back and forth until the soil is loosened. Place holes 18 in. apart throughout the area of compacted soil under the tree crown.
- Fertilization
  - Fertilize stressed or damaged broadleaf trees to aid recovery.
  - Fertilize trees in the late fall or early spring.

# **Preservation Of Existing Vegetation EC-2**

---

- Apply fertilizer to the soil over the feeder roots and in accordance with label instructions, but never closer than 3 ft to the trunk. Increase the fertilized area by one-fourth of the crown area for conifers that have extended root systems.
- Retain protective measures until all other construction activity is complete to avoid damage during site cleanup and stabilization.

## **References**

County of Sacramento Tree Preservation Ordinance, September 1981.

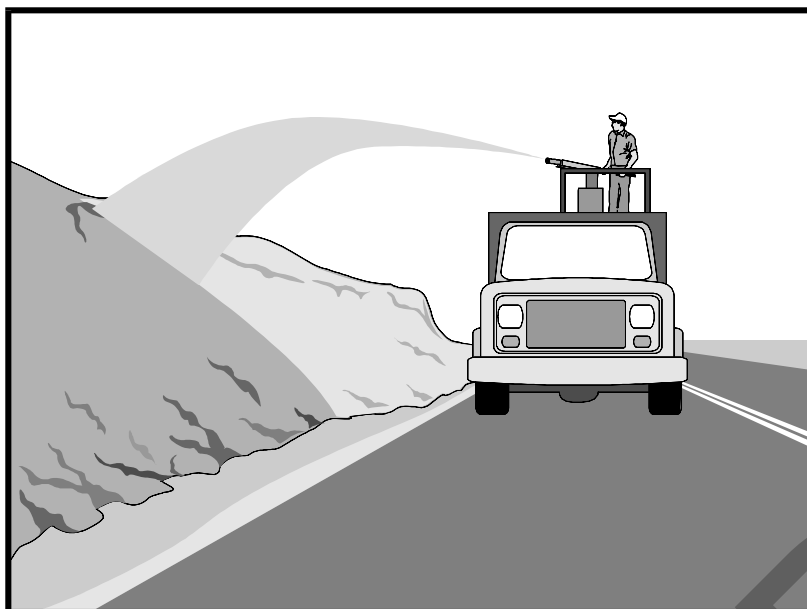
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for The Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

# Hydraulic Mulch

# EC-3



## Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	<input checked="" type="checkbox"/>
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

## Legend:

- ☒ Primary Category  
☒ Secondary Category

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

## Potential Alternatives

- EC-4 Hydroseeding
- EC-5 Soil Binders
- EC-6 Straw Mulch
- EC-7 Geotextiles and Mats
- EC-8 Wood Mulching
- EC-14 Compost Blanket
- EC-16 Non-Vegetative Stabilization

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## Description and Purpose

Hydraulic Mulch consists of various types of fibrous materials mixed with water and sprayed onto the soil surface in slurry form to provide a layer of temporary protection from wind and water erosion.

## Suitable Applications

Hydraulic mulch as a temporary, stand alone, erosion control BMP is suitable for disturbed areas that require temporary protection from wind and water erosion until permanent soil stabilization activities commence. Examples include:

- Rough-graded areas that will remain inactive for longer than permit-required thresholds (e.g., 14 days) or otherwise require stabilization to minimize erosion or prevent sediment discharges.
- Soil stockpiles.
- Slopes with exposed soil between existing vegetation such as trees or shrubs.
- Slopes planted with live, container-grown vegetation or plugs.
- Slopes burned by wildfire.

# Hydraulic Mulch

## EC-3

Hydraulic mulch can also be applied to augment other erosion control BMPs such as:

- In conjunction with straw mulch (see EC-6 Straw Mulch) where the rate of hydraulic mulch is reduced to 100-500 lbs per acre and the slurry is applied over the straw as a tackifying agent to hold the straw in place.
- Supplemental application of soil amendments, such as fertilizer, lime, gypsum, soil bio-stimulants or compost.

### Limitations

In general, hydraulic mulch is not limited by slope length, gradient or soil type. However, the following limitations typically apply:

- Most hydraulic mulch applications, particularly bonded fiber matrices (BFMs), require at least 24 hours to dry before rainfall occurs.
- Temporary applications (i.e., without a vegetative component) may require a second application in order to remain effective for an entire rainy season.
- Treatment areas must be accessible to hydraulic mulching equipment.
- Availability of water sources in remote areas for mixing and application.
- As a stand-alone temporary BMP, hydraulic mulches may need to be re-applied to maintain their erosion control effectiveness, typically after 6-12 months depending on the type of mulch used.
- Availability of hydraulic mulching equipment may be limited just prior to the rainy season and prior to storms due to high demand.
- Cellulose fiber mulches alone may not perform well on steep slopes or in coarse soils.
- This BMP consists of a mixture of several constituents (e.g., fibers/mulches, tackifiers, and other chemical constituents), some of which may be proprietary and may come pre-mixed by the manufacturer. The water quality impacts of these constituents are relatively unknown and some may have water quality impacts due to their chemical makeup. Refer to specific chemical properties identified in the product Material Safety Data Sheet; products should be evaluated for project-specific implementation by the SWPPP Preparer. Refer to factsheet EC-05 for further guidance on selecting soil binders.

### Implementation

- Where feasible, it is preferable to prepare soil surfaces prior to application by roughening embankments and fill areas with a crimping or punching type roller or by track walking.
- The majority of hydraulic mulch applications do not necessarily require surface/soil preparation (See EC-15 Soil Preparation) although in almost every case where re-vegetation is included as part of the practice, soil preparation can be beneficial. One of the advantages of hydraulic mulch over other erosion control methods is that it can be applied in areas where soil preparation is precluded by site conditions, such as steep slopes, rocky soils, or inaccessibility.

# Hydraulic Mulch

## EC-3

- Avoid mulch over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Hydraulic mulching is generally performed utilizing specialized machines that have a large water-holding/mixing tank and some form of mechanical agitation or other recirculation method to keep water, mulch and soil amendments in suspension. The mixed hydraulic slurry can be applied from a tower sprayer on top of the machine or by extending a hose to areas remote from the machine.
- Where possible apply hydraulic mulch from multiple directions to adequately cover the soil. Application from a single direction can result in shadowing, uneven coverage and failure of the BMP.
- Hydraulic mulch can also include a vegetative component, such as seed, rhizomes, or stolons (see EC-4 Hydraulic Seed).
- Typical hydraulic mulch application rates range from 2,000 pounds per acre for standard mulches (SMs) to 3,500 pounds per acre for BFMs. However, the required amount of hydraulic mulch to provide adequate coverage of exposed topsoil may appear to exceed the standard rates when the roughness of the soil surface is changed due to soil preparation methods (see EC-15 Soil Preparation) or by slope gradient.
- Other factors such as existing soil moisture and soil texture can have a profound effect on the amount of hydraulic mulch required (i.e. application rate) applied to achieve an erosion-resistant covering.
- Avoid use of mulch without a tackifier component, especially on slopes.
- Mulches used in the hydraulic mulch slurry can include:
  - Cellulose fiber
  - Thermally-processed wood fibers
  - Cotton
  - Synthetics
  - Compost (see EC-14, Compost Blanket)
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

### Categories of Hydraulic Mulches

#### Standard Hydraulic Mulch (SM)

Standard hydraulic mulches are generally applied at a rate of 2,000 pounds per acre and are manufactured containing around 5% tackifier (i.e. soil binder), usually a plant-derived guar or psyllium type. Most standard mulches are green in color derived from food-color based dyes.

# Hydraulic Mulch

## EC-3

### Hydraulic Matrices (HM) and Stabilized Fiber Matrices (SFM)

Hydraulic matrices and stabilized fiber matrices are slurries which contain increased levels of tackifiers/soil binders; usually 10% or more by weight. HMs and SFMs have improved performance compared to a standard hydraulic mulch (SM) because of the additional percentage of tackifier and because of their higher application rates, typically 2,500 – 4,000 pounds per acre. Hydraulic matrices can include a mixture of fibers, for example, a 50/50 blend of paper and wood fiber. In the case of an SFM, the tackifier/soil binder is specified as a polyacrylamide (PAM).

### Bonded Fiber Matrix (BFM)

Bonded fiber matrices (BFMs) are hydraulically-applied systems of fibers, adhesives (typically guar based) and chemical cross-links. Upon drying, the slurry forms an erosion-resistant blanket that prevents soil erosion and promotes vegetation establishment. The cross-linked adhesive in the BFM should be biodegradable and should not dissolve or disperse upon re-wetting. BFMs are typically applied at rates from 3,000 to 4,000 lbs/acre based on the manufacturer's recommendation. BFMs should not be applied immediately before, during or immediately after rainfall or if the soil is saturated. Depending on the product, BFMs typically require 12 to 24 hours to dry and become effective.

### Mechanically-Bonded Fiber Matrices (MBFM)

Mechanically-bonded fiber matrices (MBFMs) are hydraulically applied systems similar to BFM that use crimped synthetic fibers and PAM and are typically applied to a slope at a higher application rate than a standard BFM.

### Hydraulic Compost Matrix (HCM)

Hydraulic compost matrix (HCM) is a field-derived practice whereby finely graded or sifted compost is introduced into the hydraulic mulch slurry. A guar-type tackifier can be added for steeper slope applications as well as any specified seed mixtures. A HCM can help to accelerate seed germination and growth. HCMs are particularly useful as an in-fill for three-dimensional re-vegetation geocomposites, such as turf reinforcement mats (TRM) (see EC-7 Geotextiles and Mats).

### **Costs**

Average installed costs for hydraulic mulch categories are provided in Table 1, below.

**Table 1**  
**HYDRAULIC MULCH BMPs**  
**INSTALLED COSTS**

BMP	Installed Cost/Acre
Standard Hydraulic Mulching (SM)	\$1,700 - \$3,600 per acre
Hydraulic Matrices (HM) and Stabilized Fiber Matrices	
Guar-based	\$2,000 - \$4,000 per acre
PAM-based	\$2,500 - \$5,610 per acre
Bonded Fiber Matrix (BFM)	\$3,900 - \$6,900 per acre
Mechanically Bonded Fiber Matrix (MBFM)	\$4,500 - \$6,000 per acre
Hydraulic Compost Matrix (HCM)	\$3,000 - \$3,500 per acre

# Hydraulic Mulch

## EC-3

Source: Cost information received from individual product manufacturers solicited by Geosyntec Consultants (2004)

### Inspection and Maintenance

- Maintain an unbroken, temporary mulched ground cover throughout the period of construction when the soils are not being reworked.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Compare the number of bags or weight of applied mulch to the area treated to determine actual application rates and compliance with specifications.

### References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Controlling Erosion of Construction Sites, Agricultural Information #347, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service – SCS).

Guides for Erosion and Sediment Control in California, USDA Soils Conservation Service, January 1991.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Sedimentation and Erosion Control, An Inventory of Current Practices Draft, US EPA, April 1990.

Soil Erosion by Water, Agriculture Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

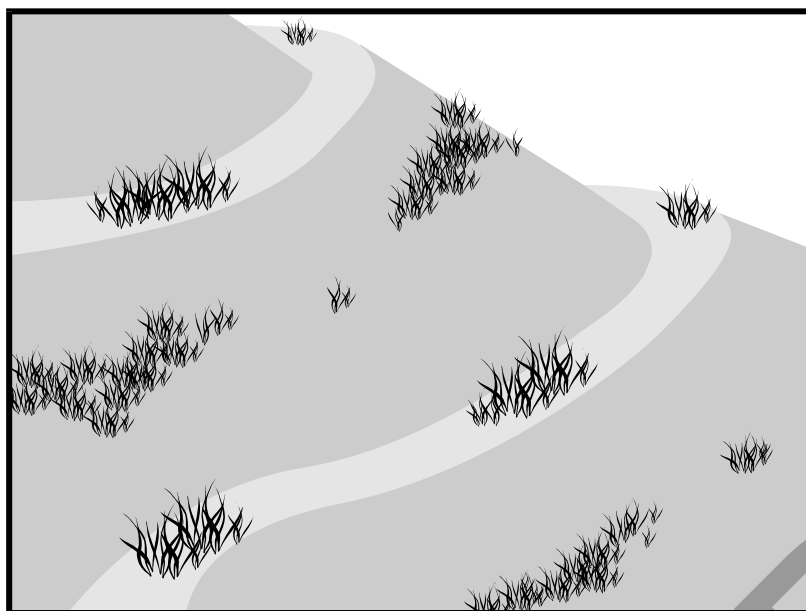
Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

# Hydroseeding

# EC-4



## Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	<input checked="" type="checkbox"/>
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

## Legend:

- ☒ **Primary Category**  
☒ **Secondary Category**

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

## Potential Alternatives

- EC-3 Hydraulic Mulch
- EC-5 Soil Binders
- EC-6 Straw Mulch
- EC-7 Geotextiles and Mats
- EC-8 Wood Mulching
- EC-14 Compost Blanket
- EC-16 Non-Vegetative Stabilization

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## Description and Purpose

Hydroseeding typically consists of applying a mixture of a hydraulic mulch, seed, fertilizer, and stabilizing emulsion with a hydraulic mulcher, to temporarily protect exposed soils from erosion by water and wind. Hydraulic seeding, or hydroseeding, is simply the method by which temporary or permanent seed is applied to the soil surface.

## Suitable Applications

Hydroseeding is suitable for disturbed areas requiring temporary protection until permanent stabilization is established, for disturbed areas that will be re-disturbed following an extended period of inactivity, or to apply permanent stabilization measures. Hydroseeding without mulch or other cover (e.g. EC-7, Erosion Control Blanket) is not a stand-alone erosion control BMP and should be combined with additional measures until vegetation establishment.

Typical applications for hydroseeding include:

- Disturbed soil/graded areas where permanent stabilization or continued earthwork is not anticipated prior to seed germination.
- Cleared and graded areas exposed to seasonal rains or temporary irrigation.
- Areas not subject to heavy wear by construction equipment or high traffic.



# Hydroseeding

## EC-4

### Limitations

- Availability of hydroseeding equipment may be limited just prior to the rainy season and prior to storms due to high demand.
- Hydraulic seed should be applied with hydraulic mulch or a stand-alone hydroseed application should be followed by one of the following:
  - Straw mulch (see Straw Mulch EC-6)
  - Rolled erosion control products (see Geotextiles and Mats EC-7)
  - Application of Compost Blanket (see Compost Blanket EC-14)

Hydraulic seed may be used alone only on small flat surfaces when there is sufficient time in the season to ensure adequate vegetation establishment and coverage to provide adequate erosion control.

- Hydraulic seed without mulch does not provide immediate erosion control.
- Temporary seeding may not be appropriate for steep slopes (i.e., slopes readily prone to rill erosion or without sufficient topsoil).
- Temporary seeding may not be appropriate in dry periods without supplemental irrigation.
- Temporary vegetation may have to be removed before permanent vegetation is applied.
- Temporary vegetation may not be appropriate for short term inactivity (i.e. less than 3-6 months).
- This BMP consists of a mixture of several constituents (e.g., fibers/mulches, tackifiers, and other chemical constituents), some of which may be proprietary and may come pre-mixed by the manufacturer. The water quality impacts of these constituents are relatively unknown and some may have water quality impacts due to their chemical makeup. Additionally these constituents may require non-visible pollutant monitoring. Refer to specific chemical properties identified in the product Material Safety Data Sheet; products should be evaluated for project-specific implementation by the SWPPP Preparer. Refer to factsheet EC-05 for further guidance on selecting soil binders.

### Implementation

In order to select appropriate hydraulic seed mixtures, an evaluation of site conditions should be performed with respect to:

- |   |                                  |
|---|----------------------------------|
| - Soil conditions                         | - Maintenance requirements       |
| - Site topography and exposure (sun/wind) | - Sensitive adjacent areas       |
| - Season and climate                      | - Water availability             |
| - Vegetation types                        | - Plans for permanent vegetation |

# Hydroseeding

## EC-4

The local office of the U.S.D.A. Natural Resources Conservation Service (NRCS), Resource Conservation Districts and Agricultural Extension Service can provide information on appropriate seed mixes.

The following steps should be followed for implementation:

- Where appropriate or feasible, soil should be prepared to receive the seed by disking or otherwise scarifying (See EC-15, Soil Preparation) the surface to eliminate crust, improve air and water infiltration and create a more favorable environment for germination and growth.
- Avoid use of hydraulic seed in areas where the BMP would be incompatible with future earthwork activities.
- Hydraulic seed can be applied using a multiple step or one step process.
  - In a multiple step process, hydraulic seed is applied first, followed by mulch or a Rolled Erosion Control Product (RECP).
  - In the one step process, hydraulic seed is applied with hydraulic mulch in a hydraulic matrix. When the one step process is used to apply the mixture of fiber, seed, etc., the seed rate should be increased to compensate for all seeds not having direct contact with the soil.
- All hydraulically seeded areas should have mulch, or alternate erosion control cover to keep seeds in place and to moderate soil moisture and temperature until the seeds germinate and grow.
- All seeds should be in conformance with the California State Seed Law of the Department of Agriculture. Each seed bag should be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. The container should be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained. All legume seed should be pellet inoculated. Inoculant sources should be species specific and should be applied at a rate of 2 lb of inoculant per 100 lb seed.
- Commercial fertilizer should conform to the requirements of the California Food and Agricultural Code, which can be found at [http://www.leginfo.ca.gov/.html/fac\\_table\\_of\\_contents.html](http://www.leginfo.ca.gov/.html/fac_table_of_contents.html). Fertilizer should be pelleted or granular form.
- Follow up applications should be made as needed to cover areas of poor coverage or germination/vegetation establishment and to maintain adequate soil protection.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

# Hydroseeding

## EC-4

### Costs

Average cost for installation and maintenance may vary from as low as \$1,900 per acre for flat slopes and stable soils, to \$4,000 per acre for moderate to steep slopes and/or erosive soils. Cost of seed mixtures vary based on types of required vegetation.

BMP	Installed Cost per Acre
Hydraulic Seed	\$1,900-\$4,000

Source: Cost information received from individual product manufacturers solicited by Geosyntec Consultants (2004).

### Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Where seeds fail to germinate, or they germinate and die, the area must be re-seeded, fertilized, and mulched within the planting season, using not less than half the original application rates.
- Irrigation systems, if applicable, should be inspected daily while in use to identify system malfunctions and line breaks. When line breaks are detected, the system must be shut down immediately and breaks repaired before the system is put back into operation.
- Irrigation systems should be inspected for complete coverage and adjusted as needed to maintain complete coverage.

### References

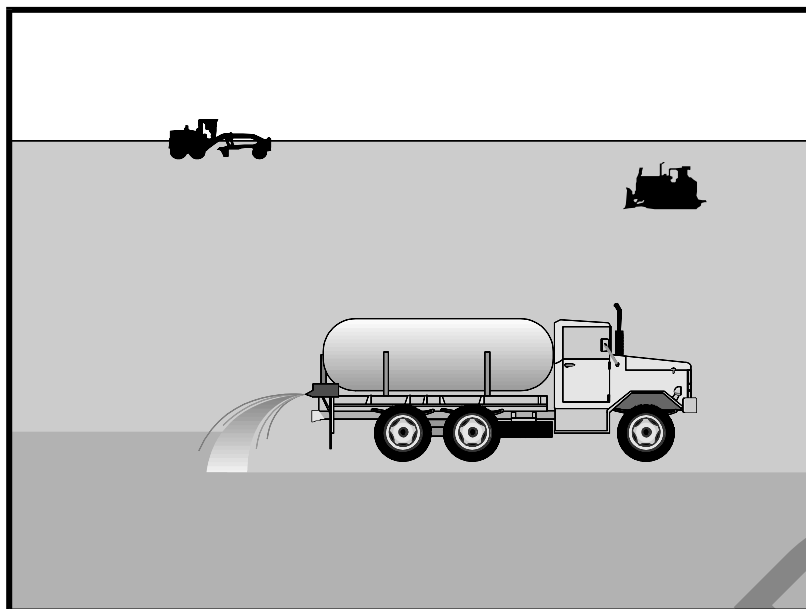
Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.

# Soil Binders

## EC-5



### Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	<input checked="" type="checkbox"/>
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ Primary Category
- ☒ Secondary Category

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

- EC-3 Hydraulic Mulch
- EC-4 Hydroseeding
- EC-6 Straw Mulch
- EC-7 Geotextiles and Mats
- EC-8 Wood Mulching

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### Description and Purpose

Soil binding consists of application and maintenance of a soil stabilizer to exposed soil surfaces. Soil binders are materials applied to the soil surface to temporarily prevent water and wind induced erosion of exposed soils on construction sites.

### Suitable Applications

Soil binders are typically applied to disturbed areas requiring temporary protection. Because soil binders, when used as a stand-alone practice, can often be incorporated into the soil, they are a good alternative to mulches in areas where grading activities will soon resume. Soil binders are commonly used in the following areas:

- Rough graded soils that will be inactive for a short period of time
- Soil stockpiles
- Temporary haul roads prior to placement of crushed rock
- Compacted soil road base
- Construction staging, materials storage, and layout areas

### Limitations

- Soil binders are temporary in nature and may need reapplication.
- Soil binders require a minimum curing time until fully effective, as prescribed by the manufacturer. Curing time



# Soil Binders

## EC-5

may be 24 hours or longer. Soil binders may need reapplication after a storm event.

- Soil binders will generally experience spot failures during heavy rainfall events. If runoff penetrates the soil at the top of a slope treated with a soil binder, it is likely that the runoff will undercut the stabilized soil layer and discharge at a point further down slope.
- Plant-material-based soil binders do not generally hold up to pedestrian or vehicular traffic across treated areas as well as polymeric emulsion blends or cementitious-based binders.
- Soil binders may not sufficiently penetrate compacted soils.
- Some soil binders are soil texture specific in terms of their effectiveness. For example, polyacrylamides (PAMs) work very well on silt and clayey soils but their performance decreases dramatically in sandy soils.
- Some soil binders may not perform well with low relative humidity. Under rainy conditions, some agents may become slippery or leach out of the soil.
- Soil binders may not cure if low temperatures occur within 24 hours of application.
- The water quality impacts of some chemical soil binders are relatively unknown and some may have water quality impacts due to their chemical makeup. Additionally, these chemical may require non-visible pollutant monitoring. Products should be evaluated for project-specific implementation by the SWPPP Preparer. Refer to the product Material Safety Data Sheet for chemical properties.

### Implementation

#### **General Considerations**

- Soil binders should conform to local municipality specifications and requirements.
- Site soil types will dictate appropriate soil binders to be used.
- A soil binder must be environmentally benign (non-toxic to plant and animal life), easy to apply, easy to maintain, economical, and should not stain paved or painted surfaces. Soil binders should not pollute stormwater when cured. Obtain a Material Safety Data Sheet (MSDS) from the manufacturer to ensure non-toxicity.
- Stormwater runoff from PAM treated soils should pass through one of the following sediment control BMP prior to discharging to surface waters.
  - When the total drainage area is greater than or equal to 5 acres, PAM treated areas should drain to a sediment basin.
  - Areas less than 5 acres should drain to sediment control BMPs, such as a sediment trap, or a series of check dams. The total number of check dams used should be maximized to achieve the greatest amount of settlement of sediment prior to discharging from the site. Each check dam should be spaced evenly in the drainage channel through which stormwater flows are discharged off site.

# Soil Binders

## EC-5

- Performance of soil binders depends on temperature, humidity, and traffic across treated areas.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

### ***Selecting a Soil Binder***

Properties of common soil binders used for erosion control are provided on Table 1 at the end of this Fact Sheet. Use Table 1 to select an appropriate soil binder. Refer to WE-1, Wind Erosion Control, for dust control soil binders.

Factors to consider when selecting a soil binder include the following:

- Suitability to situation - Consider where the soil binder will be applied, if it needs a high resistance to leaching or abrasion, and whether it needs to be compatible with any existing vegetation. Determine the length of time soil stabilization will be needed, and if the soil binder will be placed in an area where it will degrade rapidly. In general, slope steepness is not a discriminating factor for the listed soil binders.
- Soil types and surface materials - Fines and moisture content are key properties of surface materials. Consider a soil binder's ability to penetrate, likelihood of leaching, and ability to form a surface crust on the surface materials.
- Frequency of application - The frequency of application is related to the functional longevity of the binder, which can be affected by subgrade conditions, surface type, climate, and maintenance schedule.
- Frequent applications could lead to high costs. Application frequency may be minimized if the soil binder has good penetration, low evaporation, and good longevity. Consider also that frequent application will require frequent equipment clean up.

### ***Plant-Material-Based (Short Lived, <6 months) Binders***

**Guar:** Guar is a non-toxic, biodegradable, natural galactomannan-based hydrocolloid treated with dispersant agents for easy field mixing. It should be mixed with water at the rate of 11 to 15 lb per 1,000 gallons. Recommended minimum application rates are as follows:

**Application Rates for Guar Soil Stabilizer**

Slope (H:V):	Flat	4:1	3:1	2:1	1:1
lb/acre:	40	45	50	60	70

**Psyllium:** Psyllium is composed of the finely ground muciloid coating of plantago seeds that is applied as a dry powder or in a wet slurry to the surface of the soil. It dries to form a firm but rewettable membrane that binds soil particles together, but permits germination and growth of seed. Psyllium requires 12 to 18 hours drying time. Application rates should be from 80 to 200 lb/acre, with enough water in solution to allow for a uniform slurry flow.

# Soil Binders

## EC-5

**Starch:** Starch is non-ionic, cold water soluble (pre-gelatinized) granular cornstarch. The material is mixed with water and applied at the rate of 150 lb/acre. Approximate drying time is 9 to 12 hours.

### ***Plant-Material-Based (Long Lived, 6-12 months) Binders***

**Pitch and Rosin Emulsion:** Generally, a non-ionic pitch and rosin emulsion has a minimum solids content of 48%. The rosin should be a minimum of 26% of the total solids content. The soil stabilizer should be non-corrosive, water dilutable emulsion that upon application cures to a water insoluble binding and cementing agent. For soil erosion control applications, the emulsion is diluted and should be applied as follows:

- For clayey soil: 5 parts water to 1 part emulsion
- For sandy soil: 10 parts water to 1 part emulsion

Application can be by water truck or hydraulic seeder with the emulsion and product mixture applied at the rate specified by the manufacturer.

### ***Polymeric Emulsion Blend Binders***

**Acrylic Copolymers and Polymers:** Polymeric soil stabilizers should consist of a liquid or solid polymer or copolymer with an acrylic base that contains a minimum of 55% solids. The polymeric compound should be handled and mixed in a manner that will not cause foaming or should contain an anti-foaming agent. The polymeric emulsion should not exceed its shelf life or expiration date; manufacturers should provide the expiration date. Polymeric soil stabilizer should be readily miscible in water, non-injurious to seed or animal life, non-flammable, should provide surface soil stabilization for various soil types without totally inhibiting water infiltration, and should not re-emulsify when cured. The applied compound typically requires 12 to 24 hours drying time. Liquid copolymer should be diluted at a rate of 10 parts water to 1 part polymer and the mixture applied to soil at a rate of 1,175 gallons/acre.

**Liquid Polymers of Methacrylates and Acrylates:** This material consists of a tackifier/sealer that is a liquid polymer of methacrylates and acrylates. It is an aqueous 100% acrylic emulsion blend of 40% solids by volume that is free from styrene, acetate, vinyl, ethoxylated surfactants or silicates. For soil stabilization applications, it is diluted with water in accordance with the manufacturer's recommendations, and applied with a hydraulic seeder at the rate of 20 gallons/acre. Drying time is 12 to 18 hours after application.

**Copolymers of Sodium Acrylates and Acrylamides:** These materials are non-toxic, dry powders that are copolymers of sodium acrylate and acrylamide. They are mixed with water and applied to the soil surface for erosion control at rates that are determined by slope gradient:

Slope Gradient (H:V)	lb/acre
Flat to 5:1	3.0 – 5.0
5:1 to 3:1	5.0 – 10.0
2:1 to 1:1	10.0 – 20.0

# Soil Binders

## EC-5

**Poly-Acrylamide (PAM) and Copolymer of Acrylamide:** Linear copolymer polyacrylamide for use as a soil binder is packaged as a dry flowable solid, as a liquid. Refer to the manufacturer's recommendation for dilution and application rates as they vary based on liquid or dry form, site conditions and climate.

- Limitations specific to PAM are as follows:
  - Do not use PAM on a slope that flows into a water body without passing through a sediment trap or sediment basin.
  - The specific PAM copolymer formulation must be anionic. Cationic PAM should not be used in any application because of known aquatic toxicity problems. Only the highest drinking water grade PAM, certified for compliance with ANSI/NSF Standard 60 for drinking water treatment, should be used for soil applications.
  - PAM designated for erosion and sediment control should be "water soluble" or "linear" or "non-cross linked".
  - PAM should not be used as a stand-alone BMP to protect against water-based erosion. When combined with mulch, its effectiveness increases dramatically.

**Hydro-Colloid Polymers:** Hydro-Colloid Polymers are various combinations of dry flowable poly-acrylamides, copolymers and hydro-colloid polymers that are mixed with water and applied to the soil surface at rates of 55 to 60 lb/acre. Drying times are 0 to 4 hours.

### ***Cementitious-Based Binders***

**Gypsum:** This is a formulated gypsum based product that readily mixes with water and mulch to form a thin protective crust on the soil surface. It is composed of high purity gypsum that is ground, calcined and processed into calcium sulfate hemihydrate with a minimum purity of 86%. It is mixed in a hydraulic seeder and applied at rates 4,000 to 12,000 lb/acre. Drying time is 4 to 8 hours.

### ***Applying Soil Binders***

After selecting an appropriate soil binder, the untreated soil surface must be prepared before applying the soil binder. The untreated soil surface must contain sufficient moisture to assist the agent in achieving uniform distribution. In general, the following steps should be followed:

- Follow manufacturer's written recommendations for application rates, pre-wetting of application area, and cleaning of equipment after use.
- Prior to application, roughen embankment and fill areas.
- Consider the drying time for the selected soil binder and apply with sufficient time before anticipated rainfall. Soil binders should not be applied during or immediately before rainfall.
- Avoid over spray onto roads, sidewalks, drainage channels, sound walls, existing vegetation, etc.

# Soil Binders

## EC-5

- Soil binders should not be applied to frozen soil, areas with standing water, under freezing or rainy conditions, or when the temperature is below 40°F during the curing period.
- More than one treatment is often necessary, although the second treatment may be diluted or have a lower application rate.
- Generally, soil binders require a minimum curing time of 24 hours before they are fully effective. Refer to manufacturer's instructions for specific cure time.
- For liquid agents:
  - Crown or slope ground to avoid ponding.
  - Uniformly pre-wet ground at 0.03 to 0.3 gal/yd<sup>2</sup> or according to manufacturer's recommendations.
  - Apply solution under pressure. Overlap solution 6 to 12 in.
  - Allow treated area to cure for the time recommended by the manufacturer; typically at least 24 hours.
  - Apply second treatment before first treatment becomes ineffective, using 50% application rate.
  - In low humidities, reactivate chemicals by re-wetting with water at 0.1 to 0.2 gal/yd<sup>2</sup>.

### Costs

Costs vary according to the soil stabilizer selected for implementation. The following are approximate installed costs:

Soil Binder	Cost per Acre (2004) <sup>1</sup>	Estimated Cost per Acre (2009) <sup>2</sup>
Plant-Material-Based (Short Lived) Binders	\$700-\$900	\$770-\$990
Plant-Material-Based (Long Lived) Binders	\$1,200-\$1,500	\$1,320-\$1,650
Polymeric Emulsion Blend Binders	\$700-\$1,500	\$770-\$1,650
Cementitious-Based Binders	\$800-\$1,200	\$880-\$1,350

1. Source: Cost information received from individual product manufacturers solicited by Geosyntec Consultants (2004).

2. 2009 costs reflect a 10% escalation over year 2004 costs. Escalation based on informal survey of industry trends. Note: Expected cost increase is offset by competitive economic conditions.

### Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

# Soil Binders

## EC-5

- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Reapply the selected soil binder as needed to maintain effectiveness.

<b>Table 1 Properties of Soil Binders for Erosion Control</b>				
<b>Evaluation Criteria</b>	<b>Binder Type</b>			
	<b>Plant Material Based (Short Lived)</b>	<b>Plant Material Based (Long Lived)</b>	<b>Polymeric Emulsion Blends</b>	<b>Cementitious-Based Binders</b>
Relative Cost	Low	Moderate to High	Low to High	Low to Moderate
Resistance to Leaching	High	High	Low to Moderate	Moderate
Resistance to Abrasion	Moderate	Low	Moderate to High	Moderate to High
Longevity	Short to Medium	Medium	Medium to Long	Medium
Minimum Curing Time before Rain	9 to 18 hours	19 to 24 hours	0 to 24 hours	4 to 8 hours
Compatibility with Existing Vegetation	Good	Poor	Poor	Poor
Mode of Degradation	Biodegradable	Biodegradable	Photodegradable/ Chemically Degradable	Photodegradable/ Chemically Degradable
Labor Intensive	No	No	No	No
Specialized Application Equipment	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher
Liquid/Powder	Powder	Liquid	Liquid/Powder	Powder
Surface Crusting	Yes, but dissolves on rewetting	Yes	Yes, but dissolves on rewetting	Yes
Clean Up	Water	Water	Water	Water
Erosion Control Application Rate	Varies <sup>(1)</sup>	Varies <sup>(1)</sup>	Varies <sup>(1)</sup>	4,000 to 12,000 lbs/acre

(1) See Implementation for specific rates.

## References

Erosion Control Pilot Study Report, State of California Department of Transportation (Caltrans), June 2000.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Sedimentation and Erosion Control, An Inventory of Current Practices Draft, US EPA, April 1990.

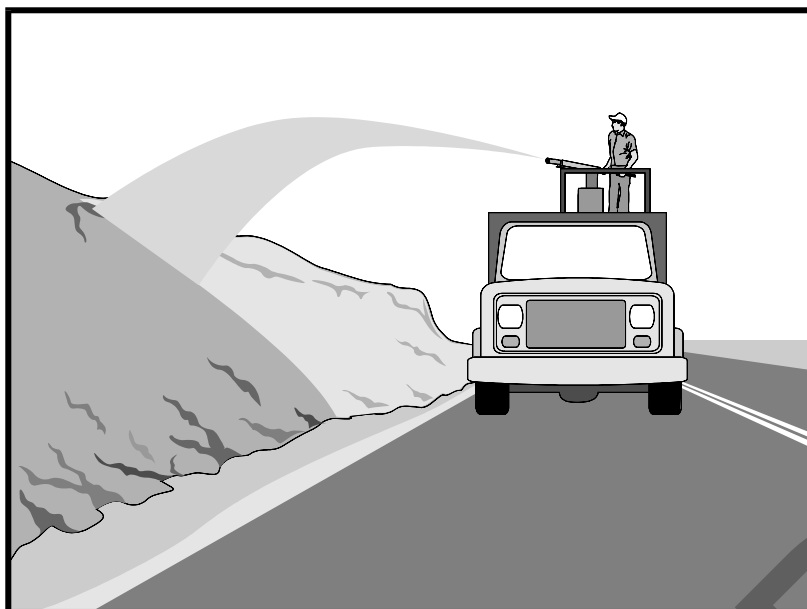
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

# Straw Mulch

# EC-6



## Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	<input checked="" type="checkbox"/>
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

## Legend:

- ☒ Primary Category
- ☒ Secondary Category

## Description and Purpose

Straw mulch consists of placing a uniform layer of straw and incorporating it into the soil with a studded roller or crimper, or anchoring it with a tackifier or stabilizing emulsion. Straw mulch protects the soil surface from the impact of rain drops, preventing soil particles from becoming dislodged.

## Suitable Applications

Straw mulch is suitable for disturbed areas requiring temporary protection until permanent stabilization is established. Straw mulch can be specified for the following applications:

- As a stand-alone BMP on disturbed areas until soils can be prepared for permanent vegetation. The longevity of straw mulch is typically less than six months.
- Applied in combination with temporary seeding strategies
- Applied in combination with permanent seeding strategies to enhance plant establishment and final soil stabilization
- Applied around containerized plantings to control erosion until the plants become established to provide permanent stabilization

## Limitations

Availability of straw and straw blowing equipment may be limited just prior to the rainy season and prior to storms due to high demand.

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

## Potential Alternatives

- EC-3 Hydraulic Mulch
- EC-4 Hydroseeding
- EC-5 Soil Binders
- EC-7 Geotextiles and Mats
- EC-8 Wood Mulching
- EC-14 Compost Blanket

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# Straw Mulch

## EC-6

- There is a potential for introduction of weed seed and unwanted plant material if weed-free agricultural straw is not specified.
- Straw mulch applied by hand is more time intensive and potentially costly.
- Wind may limit application of straw and blow straw into undesired locations.
- May have to be removed prior to permanent seeding or prior to further earthwork.
- “Punching” of straw does not work in sandy soils, necessitating the use of tackifiers.
- Potential fugitive dust control issues associated with straw applications can occur. Application of a stabilizing emulsion or a water stream at the same time straw is being blown can reduce this problem.
- Use of plastic netting should be avoided in areas where wildlife may be entrapped and may be prohibited for projects in certain areas with sensitive wildlife species, especially reptiles and amphibians.

### Implementation

- Straw should be derived from weed-free wheat, rice, or barley. Where required by the plans, specifications, permits, or environmental documents, native grass straw should be used.
- Use tackifier to anchor straw mulch to the soil on slopes.
- Crimping, punch roller-type rollers, or track walking may also be used to incorporate straw mulch into the soil on slopes. Track walking can be used where other methods are impractical.
- Avoid placing straw onto roads, sidewalks, drainage channels, sound walls, existing vegetation, etc.
- Straw mulch with tackifier should not be applied during or immediately before rainfall.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

### Application Procedures

- When using a tackifier to anchor the straw mulch, roughen embankment or fill areas by rolling with a crimping or punching-type roller or by track walking before placing the straw mulch. Track walking should only be used where rolling is impractical.
- Apply straw at a rate of between 3,000 and 4,000 lb/acre, either by machine or by hand distribution and provide 100% ground cover. A lighter application is used for flat surfaces and a heavier application is used for slopes.
- Evenly distribute straw mulch on the soil surface.
- Anchoring straw mulch to the soil surface by “punching” it into the soil mechanically (incorporating) can be used in lieu of a tackifier.

# Straw Mulch

## EC-6

- Methods for holding the straw mulch in place depend upon the slope steepness, accessibility, soil conditions, and longevity.
  - A tackifier acts to glue the straw fibers together and to the soil surface. The tackifier should be selected based on longevity and ability to hold the fibers in place. A tackifier is typically applied at a rate of 125 lb/acre. In windy conditions, the rates are typically 180 lb/acre.
  - On very small areas, a spade or shovel can be used to punch in straw mulch.
  - On slopes with soils that are stable enough and of sufficient gradient to safely support construction equipment without contributing to compaction and instability problems, straw can be "punched" into the ground using a knife blade roller or a straight bladed coultter, known commercially as a "crimper."

### Costs

Average annual cost for installation and maintenance is included in the table below. Application by hand is more time intensive and potentially more costly.

BMP	Unit Cost per Acre
Straw mulch, crimped or punched	\$2,458-\$5,375
Straw mulch with tackifier	\$1,823-\$4,802

Source: Cost information received from individual product suppliers solicited by Geosyntec Consultants (2004).

### Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- The key consideration in inspection and maintenance is that the straw needs to last long enough to achieve erosion control objectives. Straw mulch as a stand-alone BMP is temporary and is not suited for long-term erosion control.
- Maintain an unbroken, temporary mulched ground cover while disturbed soil areas are inactive. Repair any damaged ground cover and re-mulch exposed areas.
- Reapplication of straw mulch and tackifier may be required to maintain effective soil stabilization over disturbed areas and slopes.

## References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Controlling Erosion of Construction Sites, Agricultural Information Bulletin #347, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service – SCS).

Guides for Erosion and Sediment Control in California, USDA Soils Conservation Service, January 1991.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Soil Erosion by Water, Agricultural Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

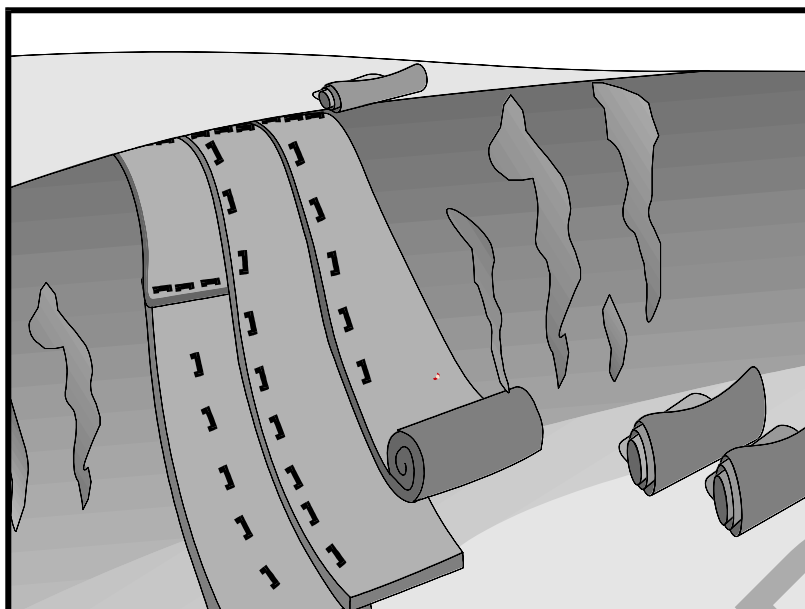
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

# Geotextiles and Mats

## EC-7



### Description and Purpose

Matings, or Rolled Erosion Control Products (RECPs), can be made of natural or synthetic materials or a combination of the two. RECPs are used to cover the soil surface to reduce erosion from rainfall impact, hold soil in place, and absorb and hold moisture near the soil surface. Additionally, RECPs may be used to stabilize soils until vegetation is established or to reinforce non-woody surface vegetation.

### Suitable Applications

RECPs are typically applied on slopes where erosion hazard is high and vegetation will be slow to establish. Matings are also used on stream banks, swales and other drainage channels where moving water at velocities between 3 ft/s and 6 ft/s are likely to cause scour and wash out new vegetation, and in areas where the soil surface is disturbed and where existing vegetation has been removed. RECPs may also be used when seeding cannot occur (e.g., late season construction and/or the arrival of an early rain season). RECPs should be considered when the soils are fine grained and potentially erosive. RECPs should be considered in the following situations.

- Steep slopes, generally steeper than 3:1 (H:V)
- Slopes where the erosion potential is high
- Slopes and disturbed soils where mulch must be anchored
- Disturbed areas where plants are slow to develop

### Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	<input checked="" type="checkbox"/>
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ **Primary Category**  
☒ **Secondary Category**

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

- EC-3 Hydraulic Mulch  
 EC-4 Hydroseeding

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# Geotextiles and Mats

## EC-7

- Channels with flows exceeding 3.3 ft/s
- Channels to be vegetated
- Stockpiles
- Slopes adjacent to water bodies

### Limitations

- RECP installed costs are generally higher than other erosion control BMPs, limiting their use to areas where other BMPs are ineffective (e.g. channels, steep slopes).
- RECPs may delay seed germination, due to reduction in soil temperature.
- RECPs are generally not suitable for excessively rocky sites or areas where the final vegetation will be mowed (since staples and netting can catch in mowers). If a staple or pin cannot be driven into the soil because the underlying soil is too hard or rocky, then an alternative BMP should be selected.
- If used for temporary erosion control, RECPs should be removed and disposed of prior to application of permanent soil stabilization measures.
- The use of plastic should be limited to covering stockpiles or very small graded areas for short periods of time (such as through one imminent storm event) until more environmentally friendly measures, such as seeding and mulching, may be installed.
  - Plastic sheeting is easily vandalized, easily torn, photodegradable, and must be disposed of at a landfill.
  - Plastic sheeting results in 100% runoff, which may cause serious erosion problems in the areas receiving the increased flow.
- RECPs may have limitations based on soil type, slope gradient, or channel flow rate; consult the manufacturer for proper selection.
- Not suitable for areas that have foot traffic (tripping hazard) – e.g., pad areas around buildings under construction.
- RECPs that incorporate a plastic netting (e.g. straw blanket typically uses a plastic netting to hold the straw in place) may not be suitable near known wildlife habitat. Wildlife can become trapped in the plastic netting.
- RECPs may have limitations in extremely windy climates. However, when RECPs are properly trenched at the top and bottom and stapled in accordance with the manufacturer's recommendations, problems with wind can be minimized.

# Geotextiles and Mats

## EC-7

### **Implementation**

#### **Material Selection**

- Natural RECPs have been found to be effective where re-vegetation will be provided by re-seeding. The choice of material should be based on the size of area, side slopes, surface conditions such as hardness, moisture, weed growth, and availability of materials.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.
- The following natural and synthetic RECPs are commonly used:

#### **Geotextiles**

- Material can be a woven or a non-woven polypropylene fabric with minimum thickness of 0.06 in., minimum width of 12 ft and should have minimum tensile strength of 150 lbs (warp), 80 lbs (fill) in conformance with the requirements in ASTM Designation: D 4632. The permittivity of the fabric should be approximately  $0.07 \text{ sec}^{-1}$  in conformance with the requirements in ASTM Designation: D4491. The fabric should have an ultraviolet (UV) stability of 70 percent in conformance with the requirements in ASTM designation: D4355. Geotextile blankets must be secured in place with wire staples or sandbags and by keying into tops of slopes to prevent infiltration of surface waters under geotextile. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- Geotextiles may be reused if they are suitable for the use intended.

#### **Plastic Covers**

- Generally plastic sheeting should only be used as stockpile covering or for very small graded areas for short periods of time (such as through one imminent storm event). If plastic sheeting must be used, choose a plastic that will withstand photo degradation.
- Plastic sheeting should have a minimum thickness of 6 mils, and must be keyed in at the top of slope (when used as a temporary slope protection) and firmly held in place with sandbags or other weights placed no more than 10 ft apart. Seams are typically taped or weighted down their entire length, and there should be at least a 12 in. to 24 in. overlap of all seams. Edges should be embedded a minimum of 6 in. in soil (when used as a temporary slope protection).
- All sheeting must be inspected periodically after installation and after significant rainstorms to check for erosion, undermining, and anchorage failure. Any failures must be repaired immediately. If washout or breakages occur, the material should be re-installed after repairing the damage to the slope.

#### **Erosion Control Blankets/Mats**

- Biodegradable RECPs are typically composed of jute fibers, curled wood fibers, straw, coconut fiber, or a combination of these materials. In order for an RECP to be considered 100% biodegradable, the netting, sewing or adhesive system that holds the biodegradable mulch fibers together must also be biodegradable. See typical installation details at the end of this fact sheet.

# Geotextiles and Mats

## EC-7

- **Jute** is a natural fiber that is made into a yarn that is loosely woven into a biodegradable mesh. The performance of jute as a stand-alone RECP is low. Most other RECPs outperform jute as a temporary erosion control product and therefore jute is not commonly used. It is designed to be used in conjunction with vegetation. The material is supplied in rolled strips, which should be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.
- **Excelsior** (curled wood fiber) blanket material should consist of machine produced mats of curled wood excelsior with 80 percent of the fiber 6 in. or longer. The excelsior blanket should be of consistent thickness. The wood fiber must be evenly distributed over the entire area of the blanket. The top surface of the blanket should be covered with a photodegradable extruded plastic mesh. The blanket should be smolder resistant without the use of chemical additives and should be non-toxic and non-injurious to plant and animal life. Excelsior blankets should be furnished in rolled strips, a minimum of 48 in. wide, and should have an average weight of 0.8 lb/yd<sup>2</sup>,  $\pm 10$  percent, at the time of manufacture. Excelsior blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- **Straw blanket** should be machine produced mats of straw with a lightweight biodegradable netting top layer. The straw should be attached to the netting with biodegradable thread or glue strips. The straw blanket should be of consistent thickness. The straw should be evenly distributed over the entire area of the blanket. Straw blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd<sup>2</sup>. Straw blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- **Wood fiber blanket** is composed of biodegradable fiber mulch with extruded plastic netting held together with adhesives. The material is designed to enhance re-vegetation. The material is furnished in rolled strips, which must be secured to the ground with U-shaped staples or stakes in accordance with manufacturers' recommendations.
- **Coconut fiber blanket** should be a machine produced mat of 100 percent coconut fiber with biodegradable netting on the top and bottom. The coconut fiber should be attached to the netting with biodegradable thread or glue strips. The coconut fiber blanket should be of consistent thickness. The coconut fiber should be evenly distributed over the entire area of the blanket. Coconut fiber blanket should be furnished in rolled strips with a minimum of 6.5 ft wide, a minimum of 80 ft. long and a minimum of 0.5 lb/yd<sup>2</sup>. Coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- **Coconut fiber mesh** is a thin permeable membrane made from coconut or corn fiber that is spun into a yarn and woven into a biodegradable mat. It is designed to be used in conjunction with vegetation and typically has longevity of several years. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

# Geotextiles and Mats

## EC-7

- **Straw coconut fiber blanket** should be machine produced mats of 70 percent straw and 30 percent coconut fiber with a biodegradable netting top layer and a biodegradable bottom net. The straw and coconut fiber should be attached to the netting with biodegradable thread or glue strips. The straw coconut fiber blanket should be of consistent thickness. The straw and coconut fiber should be evenly distributed over the entire area of the blanket. Straw coconut fiber blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd<sup>2</sup>. Straw coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- Non-biodegradable RECPs are typically composed of polypropylene, polyethylene, nylon or other synthetic fibers. In some cases, a combination of biodegradable and synthetic fibers is used to construct the RECP. Netting used to hold these fibers together is typically non-biodegradable as well.
  - **Plastic netting** is a lightweight biaxially oriented netting designed for securing loose mulches like straw or paper to soil surfaces to establish vegetation. The netting is photodegradable. The netting is supplied in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.
  - **Plastic mesh** is an open weave geotextile that is composed of an extruded synthetic fiber woven into a mesh with an opening size of less than 1/4 in. It is used with re-vegetation or may be used to secure loose fiber such as straw to the ground. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.
  - **Synthetic fiber with netting** is a mat that is composed of durable synthetic fibers treated to resist chemicals and ultraviolet light. The mat is a dense, three dimensional mesh of synthetic (typically polyolefin) fibers stitched between two polypropylene nets. The mats are designed to be re-vegetated and provide a permanent composite system of soil, roots, and geomatrix. The material is furnished in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.
  - **Bonded synthetic fibers** consist of a three dimensional geomatrix nylon (or other synthetic) matting. Typically it has more than 90 percent open area, which facilitates root growth. It's tough root reinforcing system anchors vegetation and protects against hydraulic lift and shear forces created by high volume discharges. It can be installed over prepared soil, followed by seeding into the mat. Once vegetated, it becomes an invisible composite system of soil, roots, and geomatrix. The material is furnished in rolled strips that must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.
  - **Combination synthetic and biodegradable RECPs** consist of biodegradable fibers, such as wood fiber or coconut fiber, with a heavy polypropylene net stitched to the top and a high strength continuous filament geomatrix or net stitched to the bottom. The material is designed to enhance re-vegetation. The material is furnished in rolled strips,

# Geotextiles and Mats

## EC-7

which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

### ***Site Preparation***

- Proper soil preparation is essential to ensure complete contact of the RECP with the soil. Soil Roughening is not recommended in areas where RECPs will be installed.
- Grade and shape the area of installation.
- Remove all rocks, clods, vegetation or other obstructions so that the installed blankets or mats will have complete, direct contact with the soil.
- Prepare seedbed by loosening 2 to 3 in. of topsoil.

### ***Seeding/Planting***

Seed the area before blanket installation for erosion control and re-vegetation. Seeding after mat installation is often specified for turf reinforcement application. When seeding prior to blanket installation, all areas disturbed during blanket installation must be re-seeded. Where soil filling is specified for turf reinforcement mats (TRMs), seed the matting and the entire disturbed area after installation and prior to filling the mat with soil.

Fertilize and seed in accordance with seeding specifications or other types of landscaping plans. The protective matting can be laid over areas where grass has been planted and the seedlings have emerged. Where vines or other ground covers are to be planted, lay the protective matting first and then plant through matting according to design of planting.

### ***Check Slots***

Check slots shall be installed as required by the manufacturer.

### ***Laying and Securing Matting***

- Before laying the matting, all check slots should be installed and the seedbed should be friable, made free from clods, rocks, and roots. The surface should be compacted and finished according to the requirements of the manufacturer's recommendations.
- Mechanical or manual lay down equipment should be capable of handling full rolls of fabric and laying the fabric smoothly without wrinkles or folds. The equipment should meet the fabric manufacturer's recommendations or equivalent standards.

### ***Anchoring***

- U-shaped wire staples, metal geotextile stake pins, or triangular wooden stakes can be used to anchor mats and blankets to the ground surface.
- Wire staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- Metal stake pins should be 0.188 in. diameter steel with a 1.5 in. steel washer at the head of the pin, and 8 in. in length.
- Wire staples and metal stakes should be driven flush to the soil surface.

# Geotextiles and Mats

## EC-7

### *Installation on Slopes*

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Begin at the top of the slope and anchor the blanket in a 6 in. deep by 6 in. wide trench. Backfill trench and tamp earth firmly.
- Unroll blanket down slope in the direction of water flow.
- Overlap the edges of adjacent parallel rolls 2 to 3 in. and staple every 3 ft (or greater, per manufacturer's specifications).
- When blankets must be spliced, place blankets end over end (shingle style) with 6 in. overlap. Staple through overlapped area, approximately 12 in. apart.
- Lay blankets loosely and maintain direct contact with the soil. Do not stretch.
- Staple blankets sufficiently to anchor blanket and maintain contact with the soil. Staples should be placed down the center and staggered with the staples placed along the edges. Steep slopes, 1:1 (H:V) to 2:1 (H:V), require a minimum of 2 staples/yd<sup>2</sup>. Moderate slopes, 2:1 (H:V) to 3:1 (H:V), require a minimum of 1 1/2 staples/yd<sup>2</sup>. Check manufacturer's specifications to determine if a higher density staple pattern is required.

### *Installation in Channels*

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Dig initial anchor trench 12 in. deep and 6 in. wide across the channel at the lower end of the project area.
- Excavate intermittent check slots, 6 in. deep and 6 in. wide across the channel at 25 to 30 ft intervals along the channels.
- Cut longitudinal channel anchor trenches 4 in. deep and 4 in. wide along each side of the installation to bury edges of matting, whenever possible extend matting 2 to 3 in. above the crest of the channel side slopes.
- Beginning at the downstream end and in the center of the channel, place the initial end of the first roll in the anchor trench and secure with fastening devices at 12 in. intervals. Note: matting will initially be upside down in anchor trench.
- In the same manner, position adjacent rolls in anchor trench, overlapping the preceding roll a minimum of 3 in.
- Secure these initial ends of mats with anchors at 12 in. intervals, backfill and compact soil.
- Unroll center strip of matting upstream. Stop at next check slot or terminal anchor trench. Unroll adjacent mats upstream in similar fashion, maintaining a 3 in. overlap.

# Geotextiles and Mats

## EC-7

- Fold and secure all rolls of matting snugly into all transverse check slots. Lay mat in the bottom of the slot then fold back against itself. Anchor through both layers of mat at 12 in. intervals, then backfill and compact soil. Continue rolling all mat widths upstream to the next check slot or terminal anchor trench.
- Alternate method for non-critical installations: Place two rows of anchors on 6 in. centers at 25 to 30 ft. intervals in lieu of excavated check slots.
- Staple shingled lap spliced ends a minimum of 12 in. apart on 12 in. intervals.
- Place edges of outside mats in previously excavated longitudinal slots; anchor using prescribed staple pattern, backfill, and compact soil.
- Anchor, fill, and compact upstream end of mat in a 12 in. by 6 in. terminal trench.
- Secure mat to ground surface using U-shaped wire staples, geotextile pins, or wooden stakes.
- Seed and fill turf reinforcement matting with soil, if specified.

### ***Soil Filling (if specified for turf reinforcement mat (TRM))***

Installation should be in accordance with the manufacturer's recommendations. Typical installation guidelines are as follows:

- After seeding, spread and lightly rake 1/2-3/4 inches of fine topsoil into the TRM apertures to completely fill TRM thickness. Use backside of rake or other flat implement.
- Alternatively, if allowed by product specifications, spread topsoil using lightweight loader, backhoe, or other power equipment. Avoid sharp turns with equipment.
- Always consult the manufacturer's recommendations for installation.
- Do not drive tracked or heavy equipment over mat.
- Avoid any traffic over matting if loose or wet soil conditions exist.
- Use shovels, rakes, or brooms for fine grading and touch up.
- Smooth out soil filling just exposing top netting of mat.

### ***Temporary Soil Stabilization Removal***

- Temporary soil stabilization removed from the site of the work must be disposed of if necessary.

### **Costs**

Installed costs can be relatively high compared to other BMPs. Approximate costs for installed materials are shown below:

# Geotextiles and Mats

## EC-7

Rolled Erosion Control Products		Installed Cost per Acre (2004) <sup>1</sup>	Estimated Cost per Acre (2009) <sup>2</sup>
Biodegradable	Jute Mesh	\$6,000-\$7,000	\$6,600-\$7,700
	Curled Wood Fiber	\$8,000-\$10,500	\$8,800-\$11,050
	Straw	\$8,000-\$10,500	\$8,800-\$11,050
	Wood Fiber	\$8,000-\$10,500	\$8,800-\$11,050
	Coconut Fiber	\$13,000-\$14,000	\$14,300-\$15,400
	Coconut Fiber Mesh	\$30,000-\$33,000	\$33,000-\$36,300
	Straw Coconut Fiber	\$10,000-\$12,000	\$11,000-\$13,200
Non-Biodegradable	Plastic Netting	\$2,000-\$2,200	\$2,200-\$2,220
	Plastic Mesh	\$3,000-\$3,500	\$3,300-\$3,850
	Synthetic Fiber with Netting	\$34,000-\$40,000	\$37,400-\$44,000
	Bonded Synthetic Fibers	\$45,000-\$55,000	\$49,500-\$60,500
	Combination with Biodegradable	\$30,000-\$36,000	\$33,000-\$39,600

1. Source: Cost information received from individual product manufacturers solicited by Geosyntec Consultants (2004).

2. 2009 costs reflect a 10% escalation over year 2004 costs. Escalation based on informal survey of industry trends. Note: Expected cost increase is offset by competitive economic conditions.

### Inspection and Maintenance

- RECPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident shall be repaired and BMPs reapplied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.
- If washout or breakage occurs, re-install the material after repairing the damage to the slope or channel.
- Make sure matting is uniformly in contact with the soil.
- Check that all the lap joints are secure.
- Check that staples are flush with the ground.

### References

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005

Erosion Control Pilot Study Report, State of California Department of Transportation (Caltrans), June 2000.

Guides for Erosion and Sediment Controls in California, USDA Soils Conservation Service, January 1991.

# Geotextiles and Mats

## EC-7

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

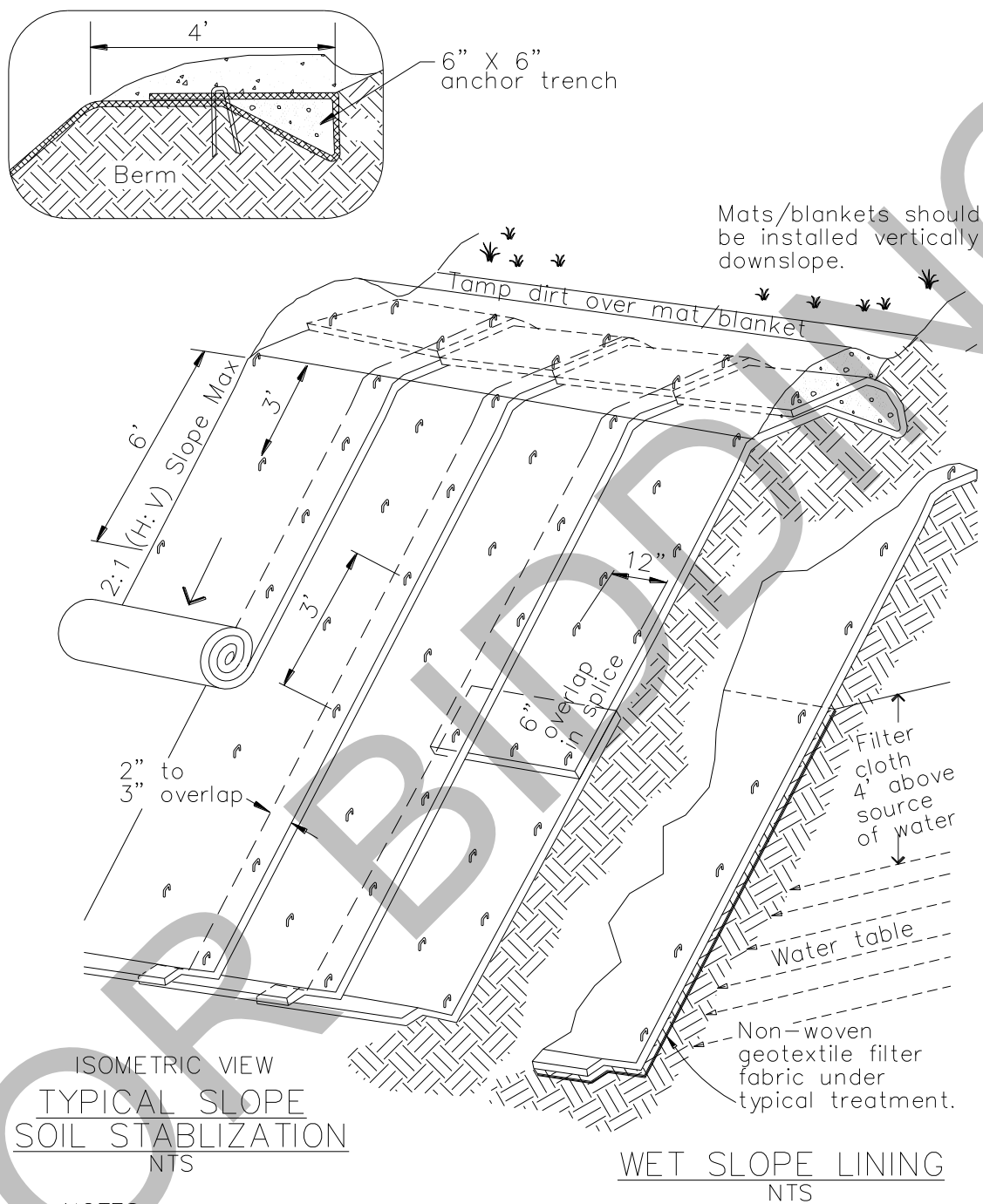
Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for The Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

# Geotextiles and Mats

## EC-7



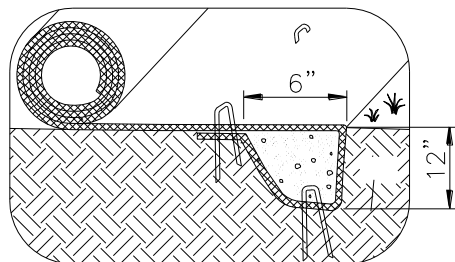
### NOTES:

1. Slope surface shall be free of rocks, clods, sticks and grass. Mats/blankets shall have good soil contact.
2. Lay blankets loosely and stake or staple to maintain direct contact with the soil. Do not stretch.
3. Install per manufacturer's recommendations

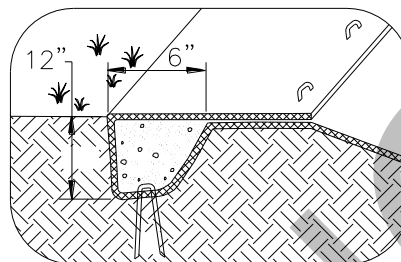
### TYPICAL INSTALLATION DETAIL

# Geotextiles and Mats

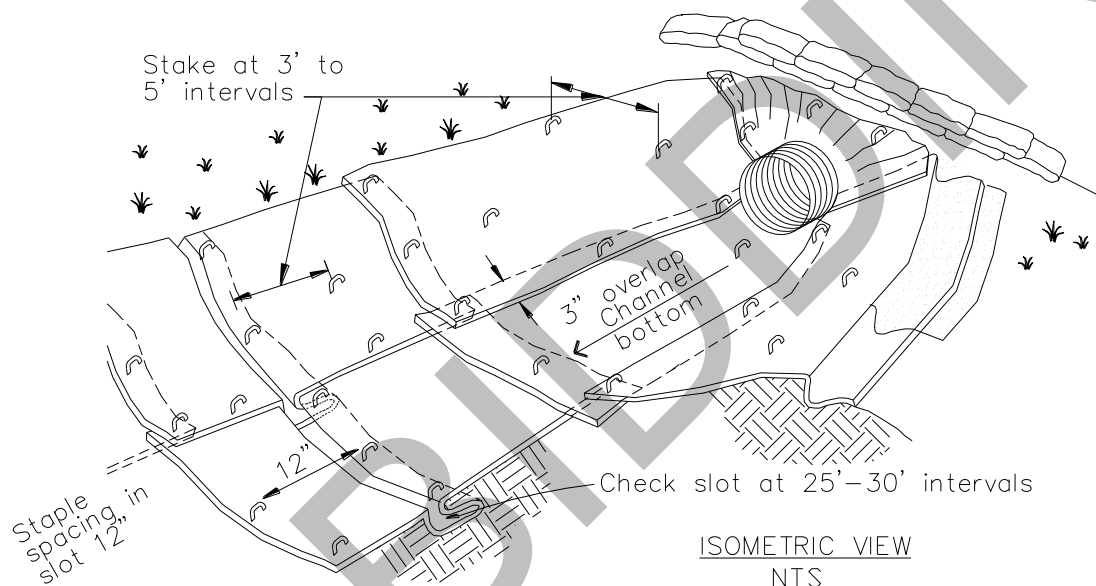
## EC-7



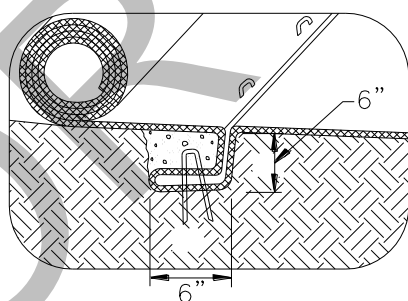
INITIAL CHANNEL ANCHOR TRENCH  
NTS



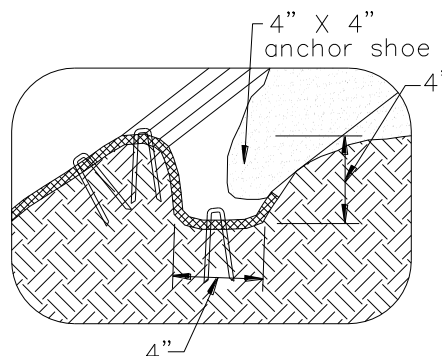
TERMINAL SLOPE AND CHANNEL  
ANCHOR TRENCH  
NTS



ISOMETRIC VIEW  
NTS



INTERMITTENT CHECK SLOT  
NTS



LONGITUDINAL ANCHOR TRENCH  
NTS

### NOTES:

1. Check slots to be constructed per manufacturers specifications.
2. Staking or stapling layout per manufacturers specifications.
3. Install per manufacturer's recommendations

### TYPICAL INSTALLATION DETAIL

# Wood Mulching

# EC-8



## Description and Purpose

Wood mulching consists of applying a mixture of shredded wood mulch, bark or compost to disturbed soils. The primary function of wood mulching is to reduce erosion by protecting bare soil from rainfall impact, increasing infiltration, and reducing runoff.

## Suitable Applications

Wood mulching is suitable for disturbed soil areas requiring temporary protection until permanent stabilization is established.

## Limitations

- Not suitable for use on slopes steeper than 3:1 (H:V). Best suited to flat areas or gentle slopes or 5:1 (H:V) or flatter.
- Wood mulch and compost may introduce unwanted species.
- Not suitable for areas exposed to concentrated flows.
- May need to be removed prior to further earthwork.

## Implementation

### Mulch Selection

There are many types of mulches. Selection of the appropriate type of mulch should be based on the type of application, site conditions, and compatibility with planned or future uses.

## Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	<input checked="" type="checkbox"/>
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

## Potential Alternatives

- EC-3 Hydraulic Mulch
- EC-4 Hydroseeding
- EC-5 Soil Binders
- EC-6 Straw Mulch
- EC-7 Geotextiles and Mats

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# Wood Mulching

## EC-8

### ***Application Procedures***

Prior to application, after existing vegetation has been removed, roughen embankment and fill areas by rolling with a device such as a punching type roller or by track walking. The construction application procedures for mulches vary significantly depending upon the type of mulching method specified. Two methods are highlighted here:

- **Green Material:** This type of mulch is produced by the recycling of vegetation trimmings such as grass, shredded shrubs, and trees. Methods of application are generally by hand although pneumatic methods are available.
  - Green material can be used as a temporary ground cover with or without seeding.
  - The green material should be evenly distributed on site to a depth of not more than 2 in.
- **Shredded Wood:** Suitable for ground cover in ornamental or revegetated plantings.
  - Shredded wood/bark is conditionally suitable. See note under limitations.
  - Distribute by hand or use pneumatic methods.
  - Evenly distribute the mulch across the soil surface to a depth of 2 to 3 in.
- Avoid mulch placement onto roads, sidewalks, drainage channels, existing vegetation, etc.

### **Costs**

Average annual cost for installation and maintenance (3-4 months useful life) is around \$4,000 per acre, but cost can increase if the source is not close to the project site.

### **Inspection and Maintenance**

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident shall be repaired and BMPs reapplied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.
- Regardless of the mulching technique selected, the key consideration in inspection and maintenance is that the mulch needs to last long enough to achieve erosion control objectives. If the mulch is applied as a stand alone erosion control method over disturbed areas (without seed), it should last the length of time the site will remain barren or until final re-grading and revegetation.
- Where vegetation is not the ultimate cover, such as ornamental and landscape applications of bark or wood chips, inspection and maintenance should focus on longevity and integrity of the mulch.
- Reapply mulch when bare earth becomes visible.

# Wood Mulching

## EC-8

### References

Controlling Erosion of Construction Sites Agriculture Information Bulletin #347, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service – SCS).

Guides for Erosion and Sediment Control in California, USDA Soils Conservation Service, January 1991.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control, An Inventory of Current Practices Draft, U.S. EPA, April 1990.

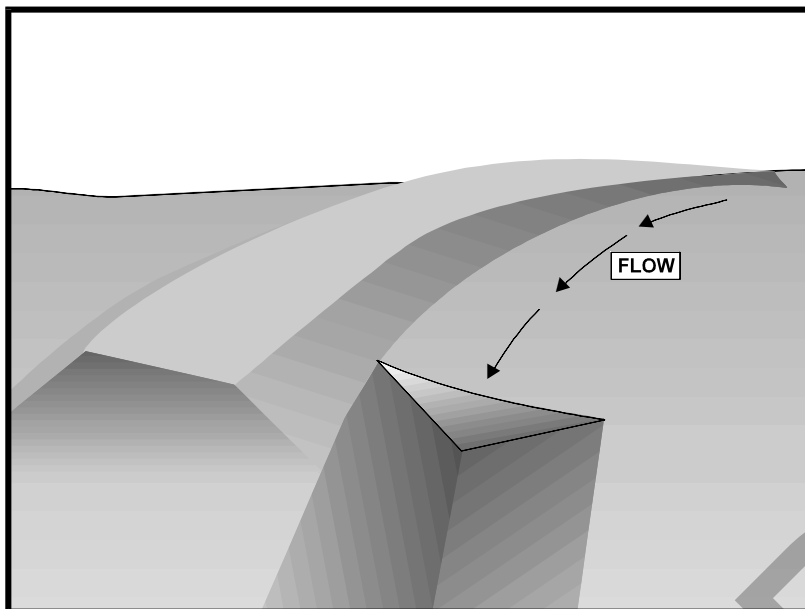
Soil Erosion by Water Agricultural Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

# Earth Dikes and Drainage Swales

## EC-9



### Description and Purpose

An earth dike is a temporary berm or ridge of compacted soil used to divert runoff or channel water to a desired location. A drainage swale is a shaped and sloped depression in the soil surface used to convey runoff to a desired location. Earth dikes and drainage swales are used to divert off site runoff around the construction site, divert runoff from stabilized areas and disturbed areas, and direct runoff into sediment basins or traps.

### Suitable Applications

Earth dikes and drainage swales are suitable for use, individually or together, where runoff needs to be diverted from one area and conveyed to another.

- Earth dikes and drainage swales may be used:
  - To convey surface runoff down sloping land
  - To intercept and divert runoff to avoid sheet flow over sloped surfaces
  - To divert and direct runoff towards a stabilized watercourse, drainage pipe or channel
  - To intercept runoff from paved surfaces
  - Below steep grades where runoff begins to concentrate
  - Along roadways and facility improvements subject to flood drainage

### Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ **Primary Objective**
- ☒ **Secondary Objective**

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

None

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# Earth Dikes and Drainage Swales

## EC-9

- At the top of slopes to divert runoff from adjacent or undisturbed slopes
- At bottom and mid slope locations to intercept sheet flow and convey concentrated flows
- Divert sediment laden runoff into sediment basins or traps

### Limitations

Dikes should not be used for drainage areas greater than 10 acres or along slopes greater than 10 percent. For larger areas more permanent drainage structures should be built. All drainage structures should be built in compliance with local municipal requirements.

- Earth dikes may create more disturbed area on site and become barriers to construction equipment.
- Earth dikes must be stabilized immediately, which adds cost and maintenance concerns.
- Diverted stormwater may cause downstream flood damage.
- Dikes should not be constructed of soils that may be easily eroded.
- Regrading the site to remove the dike may add additional cost.
- Temporary drains and swales or any other diversion of runoff should not adversely impact upstream or downstream properties.
- Temporary drains and swales must conform to local floodplain management requirements.
- Earth dikes/drainage swales are not suitable as sediment trapping devices.
- It may be necessary to use other soil stabilization and sediment controls such as check dams, plastics, and blankets, to prevent scour and erosion in newly graded dikes, swales, and ditches.
- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in drainage swales.

### Implementation

The temporary earth dike is a berm or ridge of compacted soil, located in such a manner as to divert stormwater to a sediment trapping device or a stabilized outlet, thereby reducing the potential for erosion and offsite sedimentation. Earth dikes can also be used to divert runoff from off site and from undisturbed areas away from disturbed areas and to divert sheet flows away from unprotected slopes.

An earth dike does not itself control erosion or remove sediment from runoff. A dike prevents erosion by directing runoff to an erosion control device such as a sediment trap or directing runoff away from an erodible area. Temporary diversion dikes should not adversely impact adjacent properties and must conform to local floodplain management regulations, and should not be used in areas with slopes steeper than 10%.

Slopes that are formed during cut and fill operations should be protected from erosion by runoff. A combination of a temporary drainage swale and an earth dike at the top of a slope can divert

# Earth Dikes and Drainage Swales EC-9

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runoff to a location where it can be brought to the bottom of the slope (see EC-11, Slope Drains). A combination dike and swale is easily constructed by a single pass of a bulldozer or grader and compacted by a second pass of the tracks or wheels over the ridge. Diversion structures should be installed when the site is initially graded and remain in place until post construction BMPs are installed and the slopes are stabilized.

Diversion practices concentrate surface runoff, increasing its velocity and erosive force. Thus, the flow out of the drain or swale must be directed onto a stabilized area or into a grade stabilization structure. If significant erosion will occur, a swale should be stabilized using vegetation, chemical treatment, rock rip-rap, matting, or other physical means of stabilization. Any drain or swale that conveys sediment laden runoff must be diverted into a sediment basin or trap before it is discharged from the site.

## **General**

- Care must be applied to correctly size and locate earth dikes, drainage swales. Excessively steep, unlined dikes, and swales are subject to erosion and gully formation.
- Conveyances should be stabilized.
- Use a lined ditch for high flow velocities.
- Select flow velocity based on careful evaluation of the risks due to erosion of the measure, soil types, overtopping, flow backups, washout, and drainage flow patterns for each project site.
- Compact any fills to prevent unequal settlement.
- Do not divert runoff onto other property without securing written authorization from the property owner.
- When possible, install and utilize permanent dikes, swales, and ditches early in the construction process.
- Provide stabilized outlets.

## **Earth Dikes**

Temporary earth dikes are a practical, inexpensive BMP used to divert stormwater runoff. Temporary diversion dikes should be installed in the following manner:

- All dikes should be compacted by earth moving equipment.
- All dikes should have positive drainage to an outlet.
- All dikes should have 2:1 or flatter side slopes, 18 in. minimum height, and a minimum top width of 24 in. Wide top widths and flat slopes are usually needed at crossings for construction traffic.
- The outlet from the earth dike must function with a minimum of erosion. Runoff should be conveyed to a sediment trapping device such as a Sediment Trap (SE-3) or Sediment Basin

# Earth Dikes and Drainage Swales

## EC-9

(SE-2) when either the dike channel or the drainage area above the dike are not adequately stabilized.

- Temporary stabilization may be achieved using seed and mulching for slopes less than 5% and either rip-rap or sod for slopes in excess of 5%. In either case, stabilization of the earth dike should be completed immediately after construction or prior to the first rain.
- If riprap is used to stabilize the channel formed along the toe of the dike, the following typical specifications apply:

Channel Grade	Riprap Stabilization
0.5-1.0%	4 in. Rock
1.1-2.0%	6 in. Rock
2.1-4.0%	8 in. Rock
4.1-5.0%	8 in. -12 in. Riprap

- The stone riprap, recycled concrete, etc. used for stabilization should be pressed into the soil with construction equipment.
- Filter cloth may be used to cover dikes in use for long periods.
- Construction activity on the earth dike should be kept to a minimum.

### ***Drainage Swales***

Drainage swales are only effective if they are properly installed. Swales are more effective than dikes because they tend to be more stable. The combination of a swale with a dike on the downhill side is the most cost effective diversion.

Standard engineering design criteria for small open channel and closed conveyance systems should be used (see the local drainage design manual). Unless local drainage design criteria state otherwise, drainage swales should be designed as follows:

- No more than 5 acres may drain to a temporary drainage swale.
- Place drainage swales above or below, not on, a cut or fill slope.
- Swale bottom width should be at least 2 ft
- Depth of the swale should be at least 18 in.
- Side slopes should be 2:1 or flatter.
- Drainage or swales should be laid at a grade of at least 1 percent, but not more than 15 percent.
- The swale must not be overtopped by the peak discharge from a 10-year storm, irrespective of the design criteria stated above.

# Earth Dikes and Drainage Swales EC-9

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- Remove all trees, stumps, obstructions, and other objectionable material from the swale when it is built.
- Compact any fill material along the path of the swale.
- Stabilize all swales immediately. Seed and mulch swales at a slope of less than 5 percent, and use rip-rap or sod for swales with a slope between 5 and 15 percent. For temporary swales, geotextiles and mats (EC-7) may provide immediate stabilization.
- Irrigation may be required to establish sufficient vegetation to prevent erosion.
- Do not operate construction vehicles across a swale unless a stabilized crossing is provided.
- Permanent drainage facilities must be designed by a professional engineer (see the local drainage design criteria for proper design).
- At a minimum, the drainage swale should conform to predevelopment drainage patterns and capacities.
- Construct the drainage swale with a positive grade to a stabilized outlet.
- Provide erosion protection or energy dissipation measures if the flow out of the drainage swale can reach an erosive velocity.

## Costs

- Cost ranges from \$15 to \$55 per ft for both earthwork and stabilization and depends on availability of material, site location, and access.
- Small dikes: \$2.50 - \$6.50/linear ft; Large dikes: \$2.50/yd<sup>3</sup>.
- The cost of a drainage swale increases with drainage area and slope. Typical swales for controlling internal erosion are inexpensive, as they are quickly formed during routine earthwork.

## Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect ditches and berms for washouts. Replace lost riprap, damaged linings or soil stabilizers as needed.
- Inspect channel linings, embankments, and beds of ditches and berms for erosion and accumulation of debris and sediment. Remove debris and sediment and repair linings and embankments as needed.
- Temporary conveyances should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction

# Earth Dikes and Drainage Swales

## EC-9

### References

Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A. Bursetynsky, P.E., McGraw Hill Book Company, 1986.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Metzger, M.E. 2004. Managing mosquitoes in stormwater treatment devices. University of California Division of Agriculture and Natural Resources, Publication 8125. On-line: <http://anrcatalog.ucdavis.edu/pdf/8125.pdf>

National Association of Home Builders (NAHB). Stormwater Runoff & Nonpoint Source Pollution Control Guide for Builders and Developers. National Association of Home Builders, Washington, D.C., 1995

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Report No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991

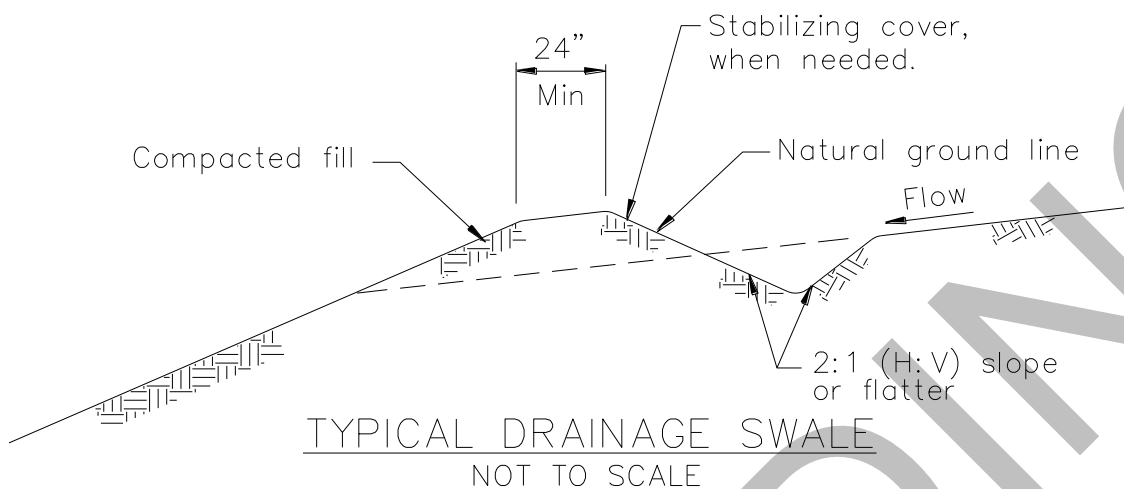
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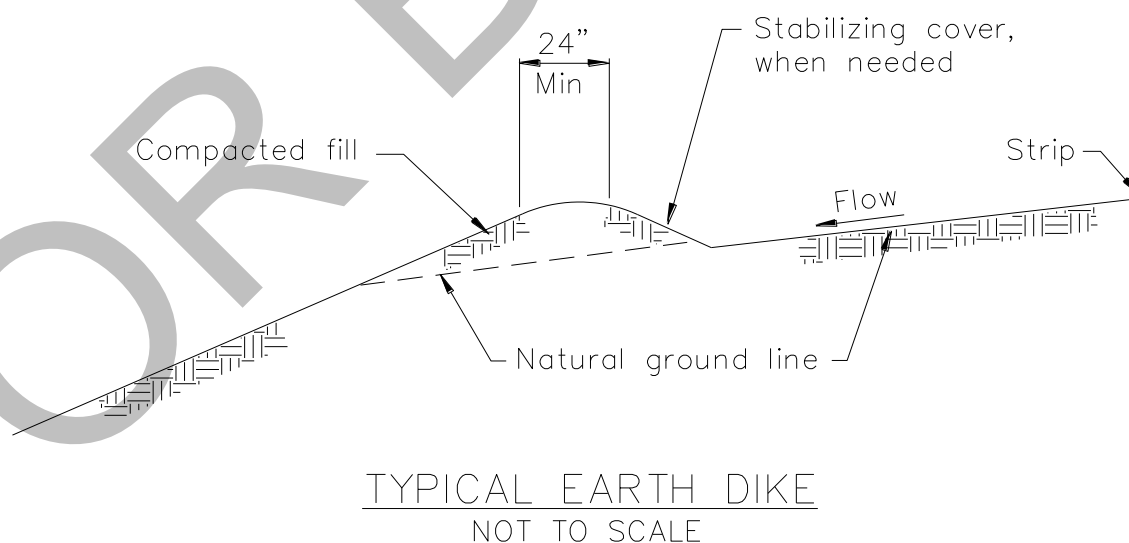
# Earth Dikes and Drainage Swales

## EC-9



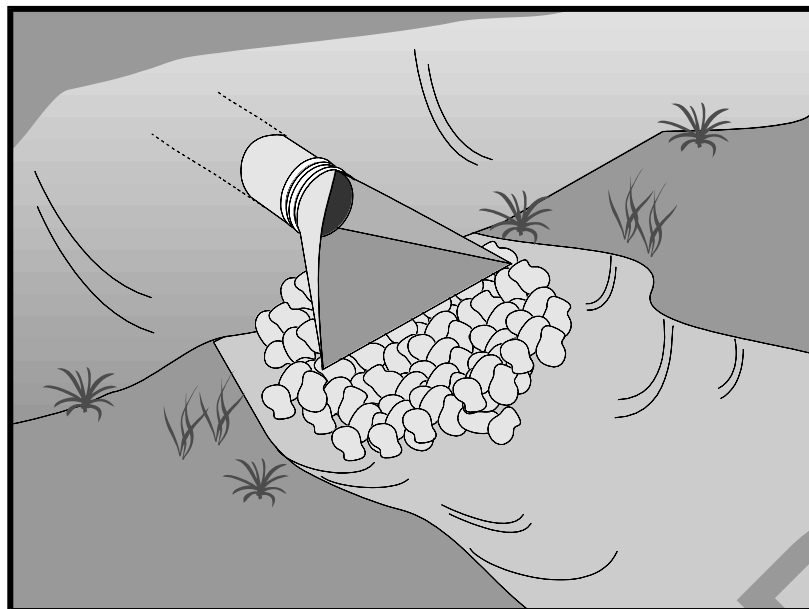
### NOTES:

1. Stabilize inlet, outlets and slopes.
2. Properly compact the subgrade.



# Velocity Dissipation Devices

## EC-10



### Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ **Primary Objective**  
☒ **Secondary Objective**

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

None

### Description and Purpose

Outlet protection is a physical device composed of rock, grouted riprap, or concrete rubble, which is placed at the outlet of a pipe or channel to prevent scour of the soil caused by concentrated, high velocity flows.

### Suitable Applications

Whenever discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This includes temporary diversion structures to divert runoff during construction.

- These devices may be used at the following locations:
  - Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits, or channels.
  - Outlets located at the bottom of mild to steep slopes.
  - Discharge outlets that carry continuous flows of water.
  - Outlets subject to short, intense flows of water, such as flash floods.
  - Points where lined conveyances discharge to unlined conveyances

### Limitations

- Large storms or high flows can wash away the rock outlet protection and leave the area susceptible to erosion.

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# Velocity Dissipation Devices

## EC-10

- Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- Outlet protection may negatively impact the channel habitat.
- Grouted riprap may break up in areas of freeze and thaw.
- If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.
- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in velocity dissipation devices.

### Implementation

#### *General*

Outlet protection is needed where discharge velocities and energies at the outlets of culverts, conduits or channels are sufficient to erode the immediate downstream reach. This practice protects the outlet from developing small eroded pools (plunge pools), and protects against gully erosion resulting from scouring at a culvert mouth.

#### *Design and Layout*

As with most channel design projects, depth of flow, roughness, gradient, side slopes, discharge rate, and velocity should be considered in the outlet design. Compliance to local and state regulations should also be considered while working in environmentally sensitive streambeds. General recommendations for rock size and length of outlet protection mat are shown in the rock outlet protection figure in this BMP and should be considered minimums. The apron length and rock size gradation are determined using a combination of the discharge pipe diameter and estimate discharge rate: Select the longest apron length and largest rock size suggested by the pipe size and discharge rate. Where flows are conveyed in open channels such as ditches and swales, use the estimated discharge rate for selecting the apron length and rock size. Flows should be same as the culvert or channel design flow but never the less than the peak 5 year flow for temporary structures planned for one rainy season, or the 10 year peak flow for temporary structures planned for two or three rainy seasons.

- There are many types of energy dissipaters, with rock being the one that is represented in the attached figure.
- Best results are obtained when sound, durable, and angular rock is used.
- Install riprap, grouted riprap, or concrete apron at selected outlet. Riprap aprons are best suited for temporary use during construction. Grouted or wired tied rock riprap can minimize maintenance requirements.
- Rock outlet protection is usually less expensive and easier to install than concrete aprons or energy dissipaters. It also serves to trap sediment and reduce flow velocities.
- Carefully place riprap to avoid damaging the filter fabric.

# Velocity Dissipation Devices

## EC-10

- Stone 4 in. to 6 in. may be carefully dumped onto filter fabric from a height not to exceed 12 in.
- Stone 8 in. to 12 in. must be hand placed onto filter fabric, or the filter fabric may be covered with 4 in. of gravel and the 8 in. to 12 in. rock may be dumped from a height not to exceed 16 in.
- Stone greater than 12 in. shall only be dumped onto filter fabric protected with a layer of gravel with a thickness equal to one half the  $D_{50}$  rock size, and the dump height limited to twice the depth of the gravel protection layer thickness.
- For proper operation of apron: Align apron with receiving stream and keep straight throughout its length. If a curve is needed to fit site conditions, place it in upper section of apron.
- Outlets on slopes steeper than 10 percent should have additional protection.

### Costs

Costs are low if material is readily available. If material is imported, costs will be higher. Average installed cost is \$150 per device.

### Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur. Minimize areas of standing water by removing sediment blockages and filling scour depressions.
- Inspect apron for displacement of the riprap and damage to the underlying fabric. Repair fabric and replace riprap that has washed away. If riprap continues to wash away, consider using larger material.
- Inspect for scour beneath the riprap and around the outlet. Repair damage to slopes or underlying filter fabric immediately.
- Temporary devices should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction.

### References

County of Sacramento Improvement Standards, Sacramento County, May 1989.

Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A. Bursztynsky, P.E., McGraw Hill Book Company, 1986.

Handbook of Steel Drainage & Highway Construction, American Iron and Steel Institute, 1983.

# Velocity Dissipation Devices

## EC-10

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Metzger, M.E. 2004. Managing mosquitoes in stormwater treatment devices. University of California Division of Agriculture and Natural Resources, Publication 8125. On-line: <http://anrcatalog.ucdavis.edu/pdf/8125.pdf>

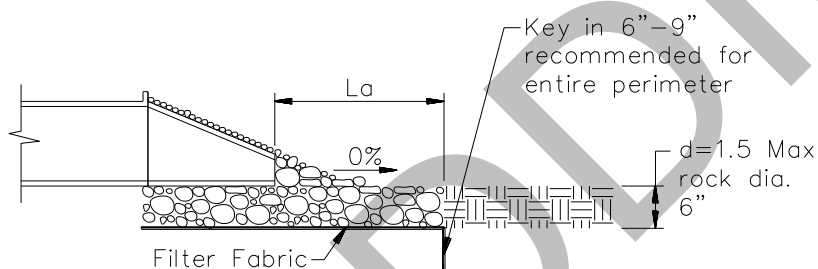
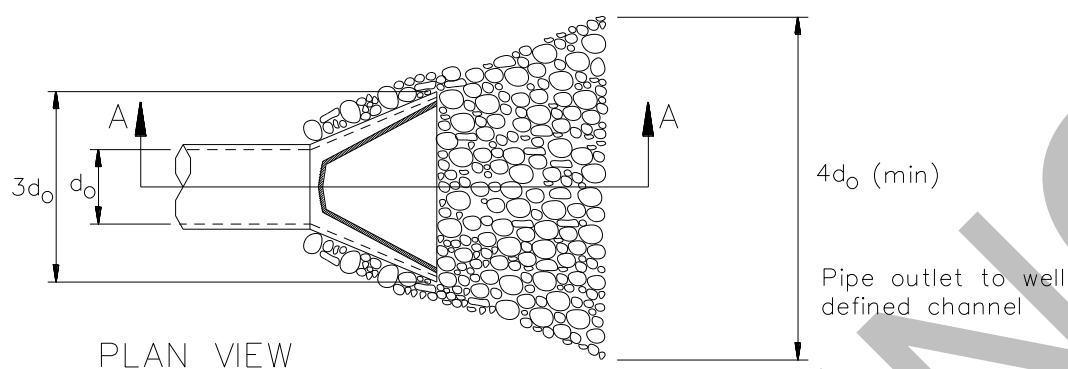
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, state of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

# Velocity Dissipation Devices

## EC-10

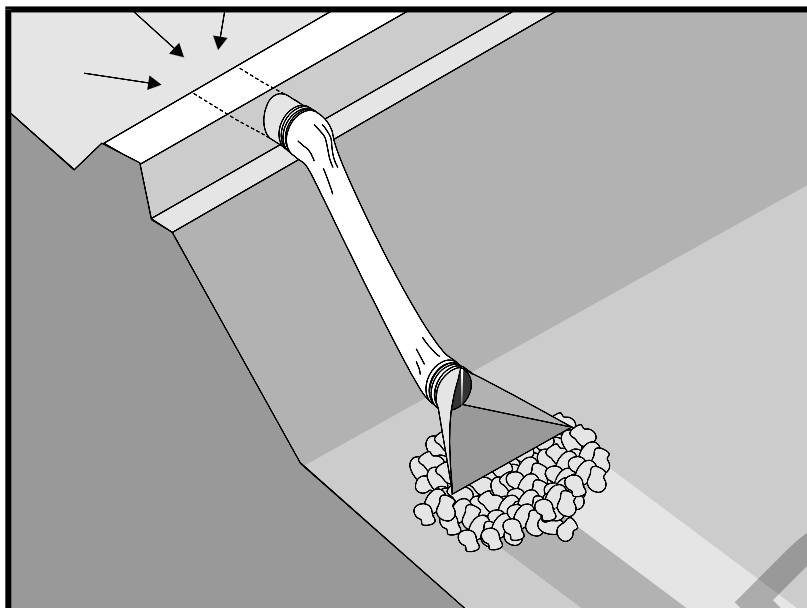


Pipe Diameter inches	Discharge ft <sup>3</sup> /s	Apron Length, La ft	Rip Rap D <sub>50</sub> Diameter Min inches
12	5	10	4
	10	13	6
18	10	10	6
	20	16	8
	30	23	12
	40	26	16
24	30	16	8
	40	26	8
	50	26	12
	60	30	16

For larger or higher flows consult a Registered Civil Engineer  
Source: USDA - SCS

# Slope Drains

## EC-11



### Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

EC-9 Earth Dike, Drainage Swales

### Description and Purpose

A slope drain is a pipe used to intercept and direct surface runoff or groundwater into a stabilized watercourse, trapping device, or stabilized area. Slope drains are used with earth dikes and drainage ditches to intercept and direct surface flow away from slope areas to protect cut or fill slopes.

### Suitable Applications

- Where concentrated flow of surface runoff must be conveyed down a slope in order to prevent erosion.
- Drainage for top of slope diversion dikes or swales.
- Drainage for top of cut and fill slopes where water can accumulate.
- Emergency spillway for a sediment basin.

### Limitations

Installation is critical for effective use of the pipe slope drain to minimize potential gully erosion.

- Maximum drainage area per slope drain is 10 acres. (For large areas use a paved chute, rock lined channel, or additional pipes.)
- Severe erosion may result when slope drains fail by overtopping, piping, or pipe separation.

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# Slope Drains

## EC-11

- During large storms, pipe slope drains may become clogged or over charged, forcing water around the pipe and causing extreme slope erosion.
- If the sectional down drain is not sized correctly, the runoff can spill over the drain sides causing gully erosion and potential failure of the structure.
- Dissipation of high flow velocities at the pipe outlet is required to avoid downstream erosion.
- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in energy dissipaters associated with slope drain outlets.

### Implementation

#### **General**

The slope drain is applicable for any construction site where concentrated surface runoff can accumulate and must be conveyed down the slope in order to prevent erosion. The slope drain is effective because it prevents the stormwater from flowing directly down the slope by confining all the runoff into an enclosed pipe or channel. Due to the time lag between grading slopes and installation of permanent stormwater collection systems and slope stabilization measures, temporary provisions to intercept runoff are sometimes necessary. Particularly in steep terrain, slope drains can protect unstabilized areas from erosion.

#### **Installation**

The slope drain may be a rigid pipe, such as corrugated metal, a flexible conduit, or a lined terrace drain with the inlet placed on the top of a slope and the outlet at the bottom of the slope. This BMP typically is used in combination with a diversion control, such as an earth dike or drainage swale at the top of the slope.

The following criteria must be considered when siting slope drains.

- Permanent structures included in the project plans can often serve as construction BMPs if implemented early. However, the permanent structure must meet or exceed the criteria for the temporary structure.
- Inlet structures must be securely entrenched and compacted to avoid severe gully erosion.
- Slope drains must be securely anchored to the slope and must be adequately sized to carry the capacity of the design storm and associated forces.
- Outlets must be stabilized with riprap, concrete or other type of energy dissipator, or directed into a stable sediment trap or basin. See EC-10, Velocity Dissipation Devices.
- Debris racks are recommended at the inlet. Debris racks located several feet upstream of the inlet can usually be larger than racks at the inlet, and thus provide enhanced debris protection and less plugging.
- Safety racks are also recommended at the inlet and outlet of pipes where children or animals could become entrapped.
- Secure inlet and surround with dikes to prevent gully erosion and anchor pipe to slope.

# Slope Drains

## EC-11

- When using slope drains, limit drainage area to 10 acres per pipe. For larger areas, use a rock lined channel or a series of pipes.
- Size to convey at least the peak flow of a 10-year storm. The design storm is conservative due to the potential impact of system failures.
- Maximum slope generally limited to 2:1 (H:V) as energy dissipation below steeper slopes is difficult.
- Direct surface runoff to slope drains with interceptor dikes. See BMP EC-9, Earth Dikes and Drainage Swales. Top of interceptor dikes should be 12 in. higher than the top of the slope drain.
- Slope drains can be placed on or buried underneath the slope surface.
- Recommended materials include both metal and plastic pipe, either corrugated or smooth wall. Concrete pipe can also be used.
- When installing slope drains:
  - Install slope drains perpendicular to slope contours.
  - Compact soil around and under entrance, outlet, and along length of pipe.
  - Securely anchor and stabilize pipe and appurtenances into soil.
  - Check to ensure that pipe connections are watertight.
  - Protect area around inlet with filter cloth. Protect outlet with riprap or other energy dissipation device. For high energy discharges, reinforce riprap with concrete or use reinforced concrete device.
  - Protect outlet of slope drains using a flared end section when outlet discharges to a flexible energy dissipation device.
  - A flared end section installed at the inlet will improve flow into the slope drain and prevent erosion at the pipe entrance. Use a flared end section with a 6 in. minimum toe plate to help prevent undercutting. The flared section should slope towards the pipe inlet.

### ***Design and Layout***

The capacity for temporary drains should be sufficient to convey at least the peak runoff from a 10-year rainfall event. The pipe size may be computed using the Rational Method or a method established by the local municipality. Higher flows must be safely stored or routed to prevent any offsite concentration of flow and any erosion of the slope. The design storm is purposely conservative due to the potential impacts associated with system failures.

As a guide, temporary pipe slope drains should not be sized smaller than shown in the following table:

# Slope Drains

## EC-11

Minimum Pipe Diameter (Inches)	Maximum Drainage Area (Acres)
12	1.0
18	3.0
21	5.0
24	7.0
30	10.0

Larger drainage areas can be treated if the area can be subdivided into areas of 10 acres or less and each area is treated as a separate drainage. Drainage areas exceeding 10 acres must be designed by a Registered Civil Engineer and approved by the agency that issued the grading permit.

### **Materials:**

Soil type, rainfall patterns, construction schedule, local requirements, and available supply are some of the factors to be considered when selecting materials. The following types of slope drains are commonly used:

- **Rigid Pipe:** This type of slope drain is also known as a pipe drop. The pipe usually consists of corrugated metal pipe or rigid plastic pipe. The pipe is placed on undisturbed or compacted soil and secured onto the slope surface or buried in a trench. Concrete thrust blocks must be used when warranted by the calculated thrust forces. Collars should be properly installed and secured with metal strappings or watertight collars.
- **Flexible Pipe:** The flexible pipe slope drain consists of a flexible tube of heavy duty plastic, rubber, or composite material. The tube material is securely anchored onto the slope surface. The tube should be securely fastened to the metal inlet and outlet conduit sections with metal strappings or watertight collars.
- **Section Downdrains:** The section downdrain consists of pre-fabricated, section conduit of half round or third round material. The sectional downdrain performs similar to a flume or chute. The pipe must be placed on undisturbed or compacted soil and secured into the slope.
- **Concrete-lined Terrace Drain:** This is a concrete channel for draining water from a terrace on a slope to the next level. These drains are typically specified as permanent structures and if installed early, can serve as slope drains during construction, which should be designed according to local drainage design criteria.

### **Costs**

- Cost varies based on pipe selection and selected outlet protection.

# Slope Drains

## EC-11

<b>Corrugated Steel Pipes, Per Foot</b>	
Size	Supplied and Installed Cost (No Trenching Included)
12"	\$19.60 per LF
15"	\$22.00
18"	\$26.00
24"	\$32.00
30"	\$50.00
<b>PVC Pipes, Per Foot</b>	
Size	Supplied and Installed Cost (No Trenching Included)
12"	\$24.50
14"	\$49.00
16"	\$51.00
18"	\$54.00
20"	\$66.00
24"	\$93.00
30"	\$130.00

### Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur. Minimize areas of standing water by removing sediment blockages and filling scour depressions.
- Inspect outlet for erosion and downstream scour. If eroded, repair damage and install additional energy dissipation measures. If downstream scour is occurring, it may be necessary to reduce flows being discharged into the channel unless other preventative measures are implemented.
- Insert inlet for clogging or undercutting. Remove debris from inlet to maintain flows. Repair undercutting at inlet and if needed, install flared section or rip rap around the inlet to prevent further undercutting.
- Inspect pipes for leakage. Repair leaks and restore damaged slopes.
- Inspect slope drainage for accumulations of debris and sediment.

# Slope Drains

## EC-11

- Remove built up sediment from entrances and outlets as required. Flush drains if necessary; capture and settle out sediment from discharge.
- Make sure water is not ponding onto inappropriate areas (e.g., active traffic lanes, material storage areas, etc.).
- Pipe anchors must be checked to ensure that the pipe remains anchored to the slope. Install additional anchors if pipe movement is detected.

### References

Draft – Sedimentation and Erosion Control, An Inventory of Current Practices, U.S.E.P.A., April 1990.

Metzger, M.E. 2004. Managing mosquitoes in stormwater treatment devices. University of California Division of Agriculture and Natural Resources, Publication 8125. On-line: <http://anrcatalog.ucdavis.edu/pdf/8125.pdf>

National Association of Home Builders (NAHB). Stormwater Runoff & Nonpoint Source Pollution Control Guide for Builders and Developers. National Association of Home Builders, Washington, D.C., 1995

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

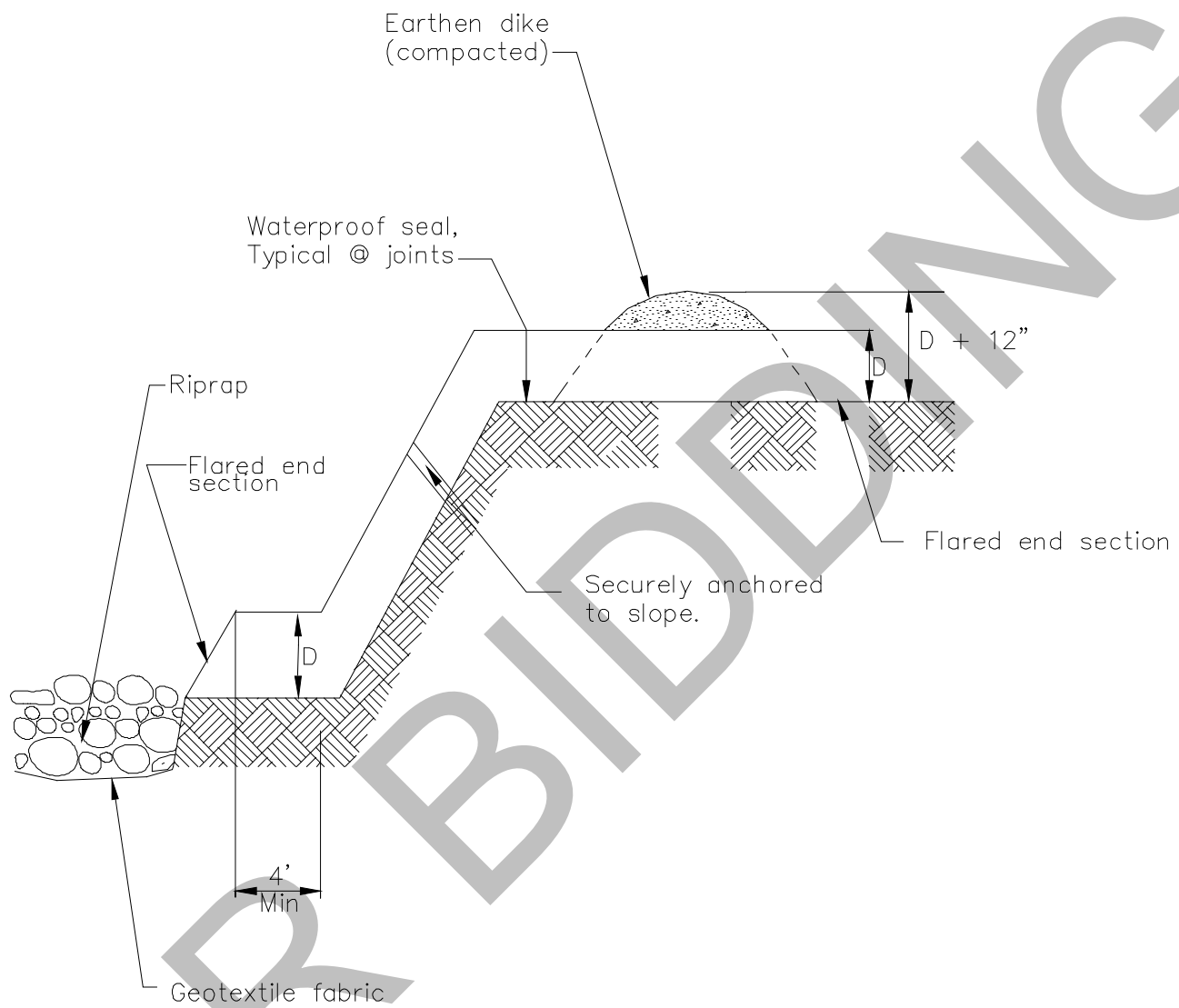
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

# Slope Drains

## EC-11



TYPICAL SLOPE DRAIN  
NOT TO SCALE

# Streambank Stabilization

## EC-12



### Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ **Primary Objective**  
☒ **Secondary Objective**

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

Combination of erosion and sediment controls.

### Description and Purpose

Stream channels, streambanks, and associated riparian areas are dynamic and sensitive ecosystems that respond to changes in land use activity. Streambank and channel disturbance resulting from construction activities can increase the stream's sediment load, which can cause channel erosion or sedimentation and have adverse affects on the biotic system. BMPs can reduce the discharge of sediment and other pollutants to minimize the impact of construction activities on watercourses. Streams on the 303(d) list and listed for sediment may require numerous measures to prevent any increases in sediment load to the stream.

### Suitable Applications

These procedures typically apply to all construction projects that disturb or occur within stream channels and their associated riparian areas.

### Limitations

Specific permit requirements or mitigation measures such as Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game supercede the guidance in this BMP.

- If numerical based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required. Streams listed as 303(d) impaired for sediment, silt, or turbidity, are required to

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# Streambank Stabilization

# EC-12

conduct sampling to verify that there is no net increase in sediment load due to construction activities.

## Implementation

### Planning

- Proper planning, design, and construction techniques can minimize impacts normally associated with in stream construction activities. Poor planning can adversely affect soil, fish, wildlife resources, land uses, or land users. Planning should take into account: scheduling; avoidance of in-stream construction; minimizing disturbance area and construction time period; using pre-disturbed areas; selecting crossing location; and selecting equipment.

### Scheduling

- Construction activities should be scheduled according to the relative sensitivity of the environmental concerns and in accordance with EC-1, Scheduling. Scheduling considerations will be different when working near perennial streams vs. ephemeral streams and are as follows.
- When in-stream construction is conducted in a perennial stream, work should optimally be performed during the rainy season. This is because in the summer, any sediment-containing water that is discharged into the watercourse will cause a large change in both water clarity and water chemistry. During the rainy season, there is typically more and faster flowing water in the stream so discharges are diluted faster. However, should in-stream work be scheduled for summer, establishing an isolation area, or diverting the stream, will significantly decrease the amount of sediment stirred up by construction work. Construction work near perennial streams should optimally be performed during the dry season (see below).
- When working in or near ephemeral streams, work should be performed during the dry season. By their very nature, ephemeral streams are usually dry in the summer, and therefore, in-stream construction activities will not cause significant water quality problems. However, when tying up the site at the end of the project, wash any fines (see Washing Fines) that accumulated in the channel back into the bed material, to decrease pollution from the first rainstorm of the season.
- When working near ephemeral or perennial streams, erosion and sediment controls (see silt fences, straw bale barriers, etc.) should be implemented to keep sediment out of stream channel.

### Minimize Disturbance

- Minimize disturbance through: selection of the narrowest crossing location; limiting the number of equipment trips across a stream during construction; and, minimizing the number and size of work areas (equipment staging areas and spoil storage areas). Place work areas at least 50 ft from stream channel. Field reconnaissance should be conducted during the planning stage to identify work areas.

### Use of Pre-Disturbed Areas

- Locate project sites and work areas in areas disturbed by prior construction or other activity when possible.

# Streambank Stabilization

# EC-12

## *Selection of Project Site*

- Avoid steep and unstable banks, highly erodible or saturated soils, or highly fractured rock.
- Select project site that minimizes disturbance to aquatic species or habitat.

## *Equipment Selection*

- Select equipment that reduces the amount of pressure exerted on the ground surface, and therefore, reduces erosion potential and/or use overhead or aerial access for transporting equipment across drainage channels. Use equipment that exerts ground pressures of less than 5 or 6 lb/in<sup>2</sup>, where possible. Low ground pressure equipment includes: wide or high flotation tires (34 to 72 in. wide); dual tires; bogie axle systems; tracked machines; lightweight equipment; and, central tire inflation systems.

## **Streambank Stabilization**

### ***Preservation of Existing Vegetation***

- Preserve existing vegetation in accordance with EC-2, Preservation of Existing Vegetation. In a streambank environment, preservation of existing vegetation provides the following benefits.

### *Water Quality Protection*

- Vegetated buffers on slopes trap sediment and promote groundwater recharge. The buffer width needed to maintain water quality ranges from 15 to 100 ft. On gradual slopes, most of the filtering occurs within the first 30 ft. Steeper slopes require a greater width of vegetative buffer to provide water quality benefits.

### *Streambank Stabilization*

- The root system of riparian vegetation stabilizes streambanks by increasing tensile strength in the soil. The presence of vegetation modifies the moisture condition of slopes (infiltration, evapo transpiration, interception) and increases bank stability.

### *Riparian Habitat*

- Buffers of diverse riparian vegetation provide food and shelter for riparian and aquatic organisms. Minimizing impacts to fisheries habitat is a major concern when working near streams and rivers. Riparian vegetation provides shade, shelter, organic matter (leaf detritus and large woody debris), and other nutrients that are necessary for fish and other aquatic organisms. Buffer widths for habitat concerns are typically wider than those recommended for water quality concerns (100 to 1500 ft).
- When working near watercourses, it is important to understand the work site's placement in the watershed. Riparian vegetation in headwater streams has a greater impact on overall water quality than vegetation in downstream reaches. Preserving existing vegetation upstream is necessary to maintain water quality, minimize bank failure, and maximize riparian habitat, downstream of the work site.

### *Limitations*

- Local county and municipal ordinances regarding width, extent and type of vegetative buffer required may exceed the specifications provided here; these ordinances should be investigated prior to construction.

# Streambank Stabilization

# EC-12

## *Streambank Stabilization Specific Installation*

- As a general rule, the width of a buffer strip between a road and the stream is recommended to be 50 ft plus four times the percent slope of the land, measured between the road and the top of stream bank.

## **Hydraulic Mulch**

- Apply hydraulic mulch on disturbed streambanks above mean high water level in accordance with EC-3, Hydraulic Mulch to provide temporary soil stabilization.

## *Limitations*

- Do not place hydraulic mulch or tackifiers below the mean high water level, as these materials could wash into the channel and impact water quality or possibly cause eutrophication (eutrophication is an algal bloom caused by excessively high nutrient levels in the water).

## **Hydroseeding**

- Hydroseed disturbed streambanks in accordance with EC-4, Hydroseeding.

## *Limitations*

- Do not place tackifiers or fertilizers below the mean high water level, as these materials could wash into the channel and impact water quality or possibly cause eutrophication.

## **Soil Binders**

- Apply soil binders to disturbed streambanks in accordance with EC-5, Soil Binders.

## *Limitations*

- Do not place soil binders below the mean high water level. Soil binder must be environmentally benign and non-toxic to aquatic organisms.

## **Straw Mulch**

- Apply straw mulch to disturbed streambanks in accordance with EC-6, Straw Mulch.

## *Limitations*

- Do not place straw mulch below the mean high water level, as this material could wash into the channel and impact water quality or possibly cause eutrophication.

## **Geotextiles and Mats**

- Install geotextiles and mats as described in EC-7, Geotextiles and Mats, to stabilize disturbed channels and streambanks. Not all applications should be in the channel, for example, certain geotextile netting may snag fish gills and are not appropriate in fish bearing streams. Geotextile fabrics that are not biodegradable are not appropriate for in stream use. Additionally, geotextile fabric or blankets placed in channels must be adequate to sustain anticipated hydraulic forces.

## **Earth Dikes, Drainage Swales, and Lined Ditches**

- Convey, intercept, or divert runoff from disturbed streambanks using EC-9, Earth Dikes and Drainage Swales.

# Streambank Stabilization

## EC-12

### *Limitations*

- Do not place earth dikes in watercourses, as these structures are only suited for intercepting sheet flow, and should not be used to intercept concentrated flow.
- Appropriately sized velocity dissipation devices (EC-10) must be placed at outlets to minimize erosion and scour.

### **Velocity Dissipation Devices**

- Place velocity dissipation devices at outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits or channels in accordance with EC-10, Velocity Dissipation Devices.

### **Slope Drains**

- Use slope drains to intercept and direct surface runoff or groundwater into a stabilized watercourse, trapping device or stabilized area in accordance with EC-11, Slope Drains.

### *Limitations*

- Appropriately sized outlet protection and velocity dissipation devices (EC-10) must be placed at outlets to minimize erosion and scour.

## **Streambank Sediment Control**

### **Silt Fences**

- Install silt fences in accordance with SE-1, Silt Fence, to control sediment. Silt fences should only be installed where sediment laden water can pond, thus allowing the sediment to settle out.

### **Fiber Rolls**

- Install fiber rolls in accordance with SE-5, Fiber Rolls, along contour of slopes above the high water level to intercept runoff, reduce flow velocity, release the runoff as sheet flow and provide removal of sediment from the runoff. In a stream environment, fiber rolls should be used in conjunction with other sediment control methods such as SE-1, Silt Fence or SE-9 Straw Bale Barrier. Install silt fence, straw bale barrier, or other erosion control method along toe of slope above the high water level.

### **Gravel Bag Berm**

- A gravel bag berm or barrier can be utilized to intercept and slow the flow of sediment laden sheet flow runoff in accordance with SE-6, Gravel Bag Berm. In a stream environment gravel bag barriers can allow sediment to settle from runoff before water leaves the construction site and can be used to isolate the work area from the live stream.

### *Limitations*

- Gravel bag barriers are not recommended as a perimeter sediment control practice around streams.

### **Straw Bale Barrier**

- Install straw bale barriers in accordance with SE-9, Straw Bale Barrier, to control sediment. Straw bale barriers should only be installed where sediment laden water can pond, thus allowing the sediment to settle out. Install a silt fence in accordance with SE-1, Silt Fence,

# Streambank Stabilization

## EC-12

on down slope side of straw bale barrier closest to stream channel to provide added sediment control.

### **Rock Filter**

#### *Description and Purpose*

Rock filters are temporary erosion control barriers composed of rock that is anchored in place. Rock filters detain the sediment laden runoff, retain the sediment, and release the water as sheet flow at a reduced velocity. Typical rock filter installations are illustrated at the end of this BMP.

#### *Applications*

- Near the toe of slopes that may be subject to flow and rill erosion.

#### *Limitations*

- Inappropriate for contributing drainage areas greater than 5 acres.
- Requires sufficient space for ponded water.
- Ineffective for diverting runoff because filters allow water to slowly seep through.
- Rock filter berms are difficult to remove when construction is complete.
- Unsuitable in developed areas or locations where aesthetics is a concern.

#### *Specifications*

- Rock: open graded rock, 0.75 to 5 in. for concentrated flow applications.
- Woven wire sheathing: 1 in. diameter, hexagonal mesh, galvanized 20gauge (used with rock filters in areas of concentrated flow).
- In construction traffic areas, maximum rock berm heights should be 12 in. Berms should be constructed every 300 ft on slopes less than 5%, every 200 ft on slopes between 5% and 10%, and every 100 ft on slopes greater than 10%.

#### *Maintenance*

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Reshape berms as needed and replace lost or dislodged rock, and filter fabric.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.

# Streambank Stabilization

# EC-12

## ***K-rail***

### *Description and Purpose*

This is temporary sediment control that uses K-rails to form the sediment deposition area, or to isolate the near bank construction area. Install K-rails at toe of slope in accordance with procedures described in NS-5, Clear Water Diversion.

Barriers are placed end to end in a pre-designed configuration and gravel filled bags are used at the toe of the barrier and at their abutting ends to seal and prevent movement of sediment beneath or through the barrier walls.

### *Appropriate Applications*

- This technique is useful at the toe of embankments, cuts or fills slopes.

### *Limitations*

- The K-rail method should not be used to dewater a project site, as the barrier is not watertight.

### *Implementation*

- Refer to NS-5, Clear Water Diversion, for implementation requirements.

## **Instream Construction Sediment Control**

There are three different options currently available for reducing turbidity while working in a stream or river. The stream can be isolated from the area in which work is occurring by means of a water barrier, the stream can be diverted around the work site through a pipe or temporary channel, or one can employ construction practices that minimize sediment suspension.

Whatever technique is implemented, an important thing to remember is that dilution can sometimes be the solution. A probable “worst time” to release high TSS into a stream system might be when the stream is very low; summer low flow, for example. During these times, the flow may be low while the biological activity in the stream is very high. Conversely, the addition of high TSS or sediment during a big storm discharge might have a relatively low impact, because the stream is already turbid, and the stream energy is capable of transporting both suspended solids, and large quantities of bedload through the system. The optimum time to “pull” in-stream structures may be during the rising limb of a storm hydrograph.

### ***Techniques to minimize Total Suspended Solids (TSS)***

- **Padding** - Padding laid in the stream below the work site may trap some solids that are deposited in the stream during construction. After work is done, the padding is removed from the stream, and placed on the bank to assist in re-vegetation.
- **Clean, washed gravel** - Using clean, washed gravel decreases solid suspension, as there are fewer small particles deposited in the stream.
- **Excavation using a large bucket** - Each time a bucket of soil is placed in the stream, a portion is suspended. Approximately the same amount is suspended whether a small amount of soil is placed in the stream, or a large amount. Therefore, using a large excavator bucket instead of a small one, will reduce the total amount of soil that washes downstream.

# Streambank Stabilization

# EC-12

- **Use of dozer for backfilling** - Using a dozer for backfilling instead of a backhoe follows the same principles – the fewer times soil is deposited in the stream, the less soil will be suspended.
- **Partial dewatering with a pump** - Partially dewatering a stream with a pump reduces the amount of water, and thus the amount of water that can suspend sediment.

## ***Washing Fines***

### *Definition and Purpose*

- Washing fines is an “in-channel” sediment control method, which uses water, either from a water truck or hydrant, to wash stream fines that were brought to the surface of the channel bed during restoration, back into the interstitial spaces of the gravel and cobbles.
- The purpose of this technique is to reduce or eliminate the discharge of sediment from the channel bottom during the first seasonal flow. Sediment should not be allowed into stream channels; however, occasionally in-channel restoration work will involve moving or otherwise disturbing fines (sand and silt sized particles) that are already in the stream, usually below bankfull discharge elevation. Subsequent re-watering of the channel can result in a plume of turbidity and sedimentation.
- This technique washes the fines back into the channel bed. Bedload materials, including gravel cobbles, boulders and those fines, are naturally mobilized during higher storm flows. This technique is intended to delay the discharge until the fines would naturally be mobilized.

### *Appropriate Applications*

- This technique should be used when construction work is required in channels. It is especially useful in intermittent or ephemeral streams in which work is performed “in the dry”, and which subsequently become re-watered.

### *Limitations*

- The stream must have sufficient gravel and cobble substrate composition.
- The use of this technique requires consideration of time of year and timing of expected stream flows.
- The optimum time for the use of this technique is in the fall, prior to winter flows.
- Consultation with, and approval from the Department of Fish and Game and the Regional Water Quality Control Board may be required.

### *Implementation*

- Apply sufficient water to wash fines, but not cause further erosion or runoff.
- Apply water slowly and evenly to prevent runoff and erosion.
- Consult with Department of Fish and Game and the Regional Water Quality Control Board for specific water quality requirements of applied water (e.g. chlorine).

# Streambank Stabilization

# EC-12

## *Inspection and Maintenance*

- None necessary

## **Costs**

Cost may vary according to the combination of practices implemented.

## **Inspection and Maintenance**

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events until final stabilization is achieved.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect and repair equipment (for damaged hoses, fittings, and gaskets).

## **References**

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control Practices, An Inventory of Current Practices (Draft), USEPA, 1990.

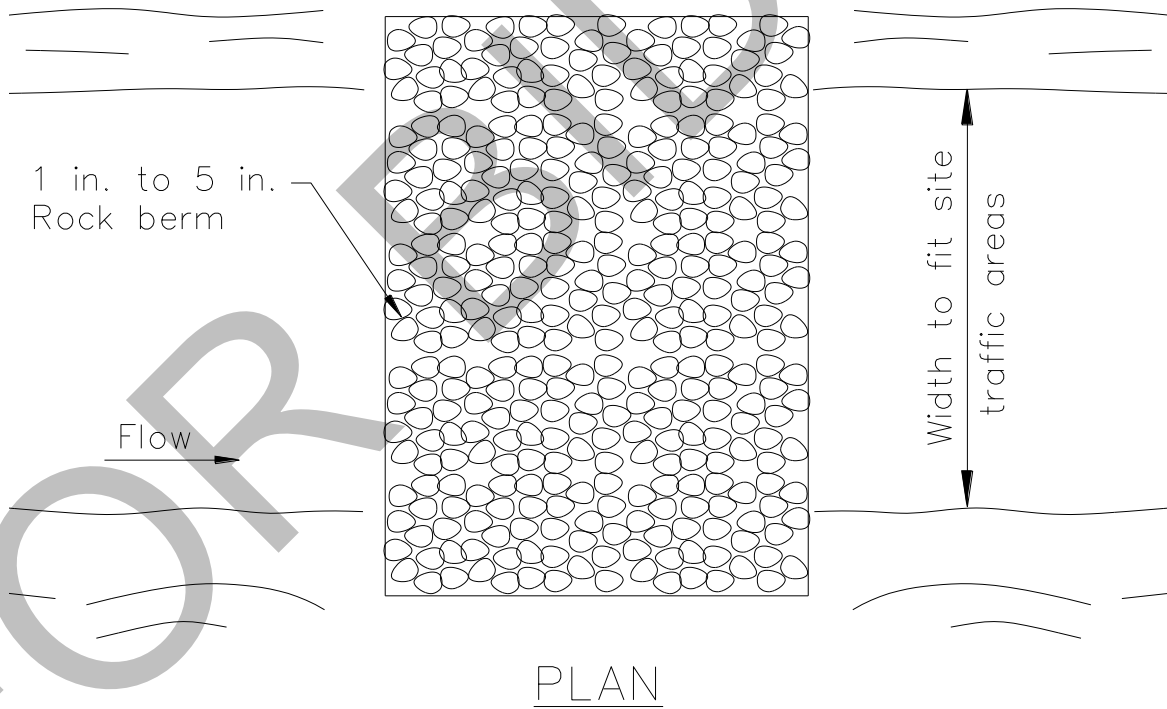
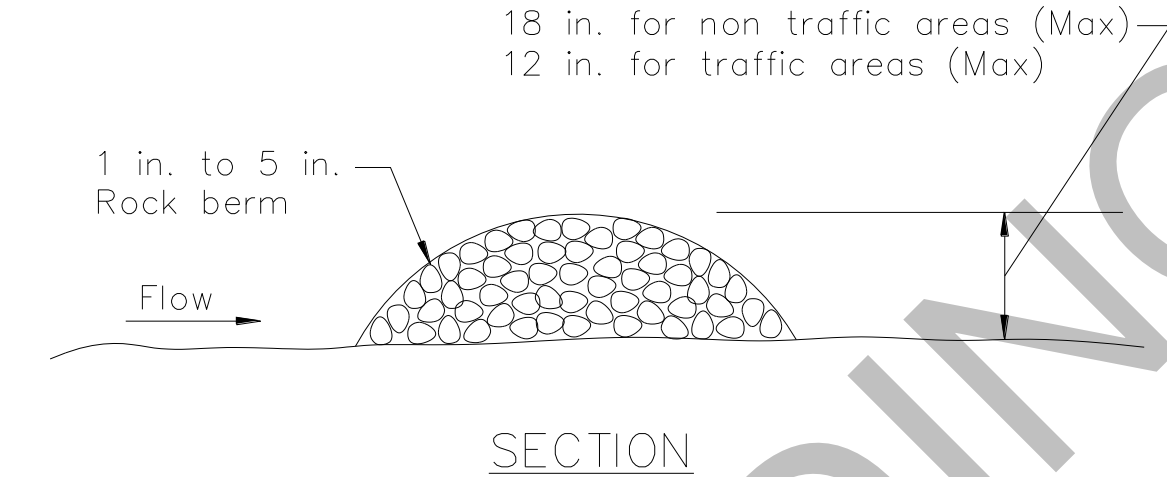
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

# Streambank Stabilization

# EC-12



TYPICAL ROCK FILTER  
NOT TO SCALE

# Compost Blanket

# EC-14



## Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

## Legend:

- ☒ Primary Category
- ☒ Secondary Category

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

## Potential Alternatives

- EC-3 Hydraulic Mulch
- EC-4 Hydroseeding
- EC-5 Soil Binders
- EC-7 Geotextiles and Mats
- EC-8 Wood Mulching

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## Description and Purpose

A compost blanket is applied to slopes and earth disturbed areas to prevent erosion, and in some cases, increase infiltration and/or establish vegetation. The compost blanket can be applied by hand, conveyor system, compost spreader, or pneumatic delivery (blower) system. The blanket thickness is determined from the slope steepness and anticipated precipitation. A compost blanket protects the soil surface from raindrop erosion, particularly rills and gullies that may form under other methods of erosion control.

A compost blanket, if properly installed, can be very successful at vegetation establishment, weed suppression and erosion control. The compost blanket comes into direct contact with the underlying soil, reducing rill formation. Furthermore, compost provides organic matter and nutrients important for vegetation growth. The compost blanket provides soil structure that allows water to infiltrate the soil surface and retain moisture, which also promotes seed germination and vegetation growth, in addition to reducing runoff.

Compost is typically derived from combinations of feedstocks, biosolids, leaf and yard trimmings, manure, wood, or mixed solid waste. Many types of compost are products of municipal recycle or "Greenwaste" programs. Compost is organic and biodegradable and can be left onsite. There are many types of compost with a variety of properties with specific functions, and accordingly, compost selection is an important design consideration in the application of this type of erosion control.



# Compost Blanket

## EC-14

### Suitable Applications

A compost blanket is appropriate for slopes and earth disturbed areas requiring protection until permanent stabilization is established. A compost blanket can also be used in combination with temporary and/or permanent seeding strategies to enhance plant establishment. Examples include:

- Rough-graded areas that will remain inactive for longer than 14 days
- Soil stockpiles
- Slopes with exposed soil between existing vegetation such as trees or shrubs
- Slopes planted with live, container-grown vegetation
- Disturbed areas where plants are slow to develop

A compost blanket is typically used on slopes of 2:1 (H:V) or gentler. However, a compost blanket can be effective when applied to slopes as steep as 1:1 (H:V) with appropriate design considerations including slope length, blanket thickness, adding components such as a tackifier, or using compost blankets in conjunction with other techniques, such as compost socks and berms or fiber rolls.

Compost can be pre-seeded prior to application to the soil (recommended by the EPA for construction site stormwater runoff control) or seeded after the blanket has been installed. The compost medium can also remove pollutants in stormwater including heavy metals; oil and grease; and hydrocarbons (USEPA, 1998).

### Limitations

- Compost can potentially leach nutrients (dissolved phosphorus and nitrogen) into runoff and potentially impact water quality. Compost should not be used directly upstream from nutrient impaired waterbodies (Adams et. al, 2008).
- Compost may also contain other undesirable constituents that are detrimental to water quality. Carefully consider the qualifications and experience of any compost producer/supplier.
- A compost blanket applied by hand is more time intensive and potentially costly. Using a pneumatic blower truck is the recommended cost effective method of application.
- When blowers are used, the treatment areas should be within 300 ft of a road or surface capable of supporting trucks.
- Wind may limit application of compost and result in application to undesired locations.
- Compost blankets should not be applied in areas of concentrated flows.
- Steeper slopes may require additional blanket thickness and other stability measures such as using tackifiers or slope interruption devices (compost socks and berms, or fiber rolls). The same applies for sites with high precipitation totals or during the rainy season.

# Compost Blanket

## EC-14

### Implementation

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

### ***Compost Materials***

- California Compost Regulations (Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3) define and require a quality of compost for application. Compost should comply with all physical and chemical requirements. Specific requirements are provided in Table 1 below, taken from Caltrans Standard Special Provision 10-1 (SSP 10-1), Erosion Control (Compost Blanket).
- The compost producer should be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies and any other State and Local Agencies that regulate Solid Waste Facilities. If exempt from State permitting requirements, the composting facility should certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.
- The compost producer should be a participant in United States Composting Council's Seal of Testing Assurance program.
- Compost moisture should be considered for composition quality and application purposes. A range of 30-50% is typical. Compost that is too dry is hard to apply and compost that is too wet is more difficult (and more expensive) to transport. For arid or semi-arid areas, or for application during the dry season, use compost with greater moisture content than areas with wetter climates. For wetter or more humid climates or for application during the wet season, drier composts can be used as the compost will absorb moisture from the ambient air.
- Organic content of the compost is also important and should range from 30 to 65% depending on site conditions.
- Compost should be high-quality mature compost. Immature compost can potentially leach nutrients.
- Compost should not be derived from mixed municipal solid waste and should be free of visible contaminants.
- Compost should not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Metal concentrations in compost should not exceed the maximum metal concentrations listed under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.
- Compost should not possess objectionable odors.
- Compost should be weed free.

# Compost Blanket

## EC-14

Table 1. Physical/Chemical Requirements of Compost  
Reference - Caltrans SSP-10 Erosion Control Blanket (Compost)

Property	Test Method	Requirement
pH	*TMECC 04.11-A Elastometric pH 1:5 Slurry Method pH Units	6.0–8.0
Soluble Salts	TMECC 04.10-A Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm)	0-10.0
Moisture Content	TMECC 03.09-A Total Solids & Moisture at 70+/- 5 deg C % Wet Weight Basis	30-60
Organic Matter Content	TMECC 05.07-A Loss-On-Ignition Organic Matter Method (LOI) % Dry Weight Basis	30–65
Maturity	TMECC 05.05-A Germination and Vigor Seed Emergence Seedling Vigor % Relative to Positive Control	80 or Above 80 or Above
Stability	TMECC 05.08-B Carbon Dioxide Evolution Rate mg CO <sub>2</sub> -C/g OM per day	8 or below
Particle Size	TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis	100% Passing, 3 inch 90-100% Passing, 1 inch 65-100% Passing, 3/4 inch 0 - 75% Passing, 1/4 inch Maximum length 6 inches
Pathogen	TMECC 07.01-B Fecal Coliform Bacteria < 1000 MPN/gram dry wt.	Pass
Pathogen	TMECC 07.01-B Salmonella < 3 MPN/4 grams dry wt.	Pass
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Plastic, Glass and Metal % > 4mm fraction	Combined Total: < 1.0
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Sharps (Sewing needles, straight pins and hypodermic needles) % > 4mm fraction	None Detected

\*TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

### Installation

- Prior to compost application, prepare the slope by removing loose rocks, roots, stumps, and other debris greater than 2" in diameter. Prepare the slope area surface by scarifying or track walking/roughening if necessary.
- Select method to apply the compost blanket. A pneumatic blower is most cost effective and most adaptive in applying compost to steep, rough terrain, and hard to reach locations.
- A compost blanket thickness of 1" to 4" should be applied to slopes of 2:1 (H:V) or gentler, based on site-specific conditions. Increase blanket thickness with increased slope steepness and/or during installation during the rainy season (for example, 2" to 3" should be used for a

# Compost Blanket

## EC-14

3:1 slope, while 1" to 2" can be used for a 4:1 slope). Erosion control using a compost blanket is not recommended for slopes greater than 1:1 (H:V).

- For steeper slopes, tackifiers should be utilized and/or other stabilization techniques employed. For example, compost socks or berms can be installed at intervals over the compost blanket (in a similar manner as Fiber Rolls, SE-5).
- Compost socks or berms (or equivalent linear sediment control BMP) should be placed at the top and/or bottom of the slope for additional erosion control performance.
- For optimum vegetation establishment, a blanket thickness of 1" to 2" is recommended. If vegetation establishment is not the primary function of the compost blanket, a thicker blanket may be recommended based on slope or rainfall conditions.
- Evenly distribute compost on the soil surface to the desired blanket thickness (1/2" to 4" as calculated prior based on site conditions and objectives). Even distribution is an important factor in preventing future rill and gully erosion.
- The compost blanket should extend 3 to 6 feet over the top of the shoulder of the slope. A compost sock or compost berm can be used at the top of the slope as an auxiliary technique to prevent runoff from flowing underneath the compost blanket.
- Use additional anchoring and erosion control BMPs in conjunction of the compost blanket as needed.

### Costs

The cost associated with a compost blanket is similar to that of a straw mat and generally less expensive than a geotextile blanket (USEPA, 2009). Caltrans has provided a recent estimate for \$5,000 to \$8,000 per acre for application of an unseeded 1 inch compost blanket (Caltrans Compost Specifications, 2009). Recently obtained vendor costs indicate that proprietary blends of compost that are seeded and contain a nutrient rich "tackifier" can cost approximately \$0.35 per square foot, or approximately \$15,000 per acre for a 2 inch blanket. Application by hand is more time intensive and likely more costly.

### Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident, another layer of compost should be reapplied as soon as possible. It may be necessary to install an additional type of stormwater BMP at the top of slope or as a slope interrupter to control flow, such as a fiber roll (SE-5) or compost sock (SE-11).
- Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.
- Limit or prohibit foot traffic to minimize damage to BMP or impede vegetation establishment.

# Compost Blanket

# EC-14

## References

An Analysis of Composting as an Environmental Remediation Technology, U.S. Environmental Protection Agency (USEPA), Solid Waste and Emergency Response (5305W), EPA530-R-8-008, 1998.

Characteristics of Compost: Moisture Holding and Water Quality Improvement, Center for Research in Water Resources, Kirchoff, C., Malina, J., and Barrett, M., 2003.

Compost Utilization for Erosion Control, The University of Georgia College of Agricultural and Environmental Sciences, [pubs.caes.uga.edu/caespubs/pubcd/B1200.htm](http://pubs.caes.uga.edu/caespubs/pubcd/B1200.htm), Faucette, B. and Risse, M., 2009.

Demonstration Project Using Yard Debris Compost for Erosion Control, Final Report, presented to Metropolitan Service District, W&H Pacific, 1993.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, 2005.

Standard Special Provision 10-1, Erosion Control (Compost Blanket), California Department of Transportation (Caltrans). 2007 Update.

Evaluation of Environmental Benefits and Impacts of Compost and Industry Standard Erosion and Sediment Controls Measures Used in Construction Activities, Dissertation, Institute of Ecology, University of Georgia, Faucette, B., 2004.

Filter Sock Presentation provided at Erosion, Sediment Control and Stormwater Management with Compost BMPs Workshop, U.S. Composting Council 13<sup>th</sup> Annual Conference and Trade Show, McCoy, S., 2005.

National Pollutant Discharge Elimination System (NPDES), Compost Blankets, U.S. Environmental Protection Agency (USEPA).  
[http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet\\_results&view=specific&bmp=118](http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=118), 2009.

Standard Specifications for Transportation Materials and Methods of Sampling and Testing Designation M10-03, Compost for Erosion/Sediment Control (Compost Blankets), Provisional, American Association of State Highway Transportation Officials (AASHTO), 2003.

Stormwater Best Management Practices (BMPs) Field Trials of Erosion Control Compost in Reclamation of Rock Quarry Operations, Nonpoint Source Protection Program CWA §319(h), Texas Commission on Environmental Quality, Adams, T., McFarland, A., Hauck, L., Barrett, M., and Eck, B., 2008.

# Soil Preparation/Roughening

## EC-15



### Description and Purpose

Soil Preparation/Roughening involves assessment and preparation of surface soils for BMP installation. This can include soil testing (for seed base, soil characteristics, or nutrients), as well as roughening surface soils by mechanical methods (including sheepsfoot rolling, track walking, scarifying, stair stepping, and imprinting) to prepare soil for additional BMPs, or to break up sheet flow. Soil Preparation can also involve tilling topsoil to prepare a seed bed and/or incorporation of soil amendments, to enhance vegetative establishment.

### Suitable Applications

**Soil preparation:** Soil preparation is essential to proper vegetative establishment. In particular, soil preparation (i.e. tilling, raking, and amendment) is suitable for use in combination with any soil stabilization method, including RECPs or sod. Soil preparation should not be confused with roughening.

**Roughening:** Soil roughening is generally referred to as track walking (sometimes called imprinting) a slope, where treads from heavy equipment run parallel to the contours of the slope and act as mini terraces. Soil preparation is most effective when used in combination with erosion controls. Soil Roughening is suitable for use as a complementary process for controlling erosion on a site. Roughening is not intended to be used as a stand-alone BMP, and should be used with perimeter controls, additional erosion control measures, grade breaks, and vegetative establishment for maximum effectiveness. Roughening is intended to only affect surface soils and should not compromise slope stability or overall compaction. Suitable applications for soil roughening include:

### Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ Primary Category  
☒ Secondary Category

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

- EC-3 Hydraulic Mulch
- EC-5 Soil Binders
- EC-7 Geotextiles and Mats

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# Soil Preparation/Roughening

## EC-15

- Along any disturbed slopes, including temporary stockpiles, sediment basins, or compacted soil diversion berms and swales.
- Roughening should be used in combination with hydraulically applied stabilization methods, compost blanket, or straw mulch; but should not be used in combination with RECPs or sod because roughening is intended to leave terraces on the slope.

### Limitations

- Preparation and roughening must take place prior to installing other erosion controls (such as hydraulically applied stabilizers) or sediment controls (such as fiber rolls) on the faces of slopes.
- In such cases where slope preparation is minimal, erosion control/revegetation BMPs that do not require extensive soil preparation - such as hydraulic mulching and seeding applications - should be employed.
- Consideration should be given to the type of erosion control BMP that follows surface preparation, as some BMPs are not designed to be installed over various types of tillage/roughening, i.e., RECPs (erosion control blankets) should not be used with soil roughening due to a “bridging” effect, which suspends the blanket above the seed bed.
- Surface roughness has an effect on the amount of mulch material that needs to be applied, which shows up as a general increase in mulch material due to an increase in surface area (Topographic Index -see EC-3 Hydraulic Mulching).

### Implementation

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

### General

A roughened surface can significantly reduce erosion. Based on tests done at the San Diego State Erosion Research Laboratory, various roughening techniques on slopes can result in a 12 - 76% reduction in the erosion rate versus smooth slopes.

### Materials

Minimal materials are required unless amendments and/or seed are added to the soil. The majority of soil roughening/preparation can be done with equipment that is on hand at a normal construction site, such as bull dozers and compaction equipment.

### Installation Guidelines

#### Soil Preparation

- Where appropriate or feasible, soil should be prepared to receive the seed by disking or otherwise scarifying the surface to eliminate crust, improve air and water infiltration and create a more favorable environment for germination and growth.
- Based upon soil testing conducted, apply additional soil amendments (e.g. fertilizers, additional seed) to the soil to help with germination. Follow EC-4, Hydroseeding, when selecting and applying seed and fertilizers.

# Soil Preparation/Roughening

# EC-15

## **Cut Slope Roughening:**

- Stair-step grade or groove the cut slopes that are steeper than 3:1.
- Use stair-step grading on any erodible material soft enough to be ripped with a bulldozer. Slopes consisting of soft rock with some subsoil are particularly suited to stair-step grading.
- Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the "step" in toward the vertical wall.
- Do not make individual vertical cuts more than 2 feet (0.6 m) high in soft materials or more than 3 feet (0.9 m) high in rocky materials.
- Groove the slope using machinery to create a series of ridges and depressions that run across the slope, on the contour.

## **Fill Slope Roughening:**

- Place on fill slopes with a gradient steeper than 3:1 in lifts not to exceed 8 inches (0.2 m), and make sure each lift is properly compacted.
- Ensure that the face of the slope consists of loose, uncompacted fill 4-6 inches (0.1-0.2 m) deep.
- Use grooving or tracking to roughen the face of the slopes, if necessary.
- Do not blade or scrape the final slope face.

## **Roughening for Slopes to be Mowed:**

- Slopes which require mowing activities should not be steeper than 3:1.
- Roughen these areas to shallow grooves by track walking, scarifying, sheepsfoot rolling, or imprinting.
- Make grooves close together (less than 10 inches), and not less than 1 inch deep, and perpendicular to the direction of runoff (i.e., parallel to the slope contours).
- Excessive roughness is undesirable where mowing is planned.

## **Roughening With Tracked Machinery:**

- Limit roughening with tracked machinery to soils with a sandy textural component to avoid undue compaction of the soil surface.
- Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not back-blade during the final grading operation.
- Seed and mulch roughened areas as soon as possible to obtain optimum seed germination and growth.

# Soil Preparation/Roughening

## EC-15

### Costs

Costs are based on the additional labor of tracking or preparation of the slope plus the cost of any required soil amendment materials.

### Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check the seeded slopes for signs of erosion such as rills and gullies. Fill these areas slightly above the original grade, then reseed and mulch as soon as possible.
- Inspect BMPs weekly during normal operations, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

### References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

# Non-Vegetative Stabilization

## EC-16



### Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TR	Tracking Control	
WE	Wind Erosion Control	<input checked="" type="checkbox"/>
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ Primary Category  
☒ Secondary Category

### Description and Purpose

Non-vegetative stabilization methods are used for temporary or permanent stabilization of areas prone to erosion and should be used only where vegetative options are not feasible; examples include:

- Areas of vehicular or pedestrian traffic such as roads or paths;
- Arid environments where vegetation would not provide timely ground coverage, or would require excessive irrigation;
- Rocky substrate, infertile or droughty soils where vegetation would be difficult to establish; and
- Areas where vegetation will not grow adequately within the construction time frame.

There are several non-vegetative stabilization methods and selection should be based on site-specific conditions.

**Decomposed Granite (DG)** is a permanent erosion protection method that consists of a layer of stabilized decomposed granite placed over an erodible surface.

**Degradable Mulches** of various types (see EC-3, EC-6, EC-8) can be used for temporary non-vegetative stabilization; examples include straw mulch, compost, wood chips or hydraulic mulch.

**Geotextiles and Mats** can be used for temporary non-vegetative stabilization (see EC-7). These BMPs are typically manufactured from degradable or synthetic materials and are

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

None

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# Non-Vegetative Stabilization

## EC-16

designed and specified based on their functional longevity, i.e., how long they will persist and provide erosion protection. All geotextiles and mats should be replaced when they exceed their functional longevity or when permanent stabilization methods are instituted.

**Gravel Mulch** is a non-degradable erosion control product that is composed of washed and screened coarse to very coarse gravel, 16 mm to 64 mm (0.6" - 2.5"), similar to an AASHTO No. 3 coarse aggregate.

**Rock Slope Protection** consists of utilizing large rock or rip-rap (4" - 24") to stabilize slopes with a high erosion potential and those subject to scour along waterways.

**Soil Binders** can be used for temporary non-vegetative stabilization (see EC-5). The key to their use is functional longevity. In most cases, the soil binder will need to be routinely monitored and re-applied to maintain an erosion-resistant coverage.

### Suitable Applications

Non-vegetated stabilization methods are suitable for use on disturbed soil areas and on material stockpiles that need to be temporarily or permanently protected from erosion by water and wind. Non-vegetated stabilization should only be utilized when vegetation cannot be established in the required timeframe, due to soil or climactic conditions, or where vegetation may be a potential fire hazard.

**Decomposed Granite (DG) and Gravel Mulch** are suitable for use in areas where vegetation establishment is difficult, on flat surfaces, trails and pathways, and when used in conjunction with a stabilizer or tackifier, on shallow slopes (i.e., 10:1 [H:V]). DG and gravel can also be used on shallow rocky slopes where vegetation cannot be established for permanent erosion control.

**Degradable Mulches** can be used to cover and protect soil surfaces from erosion both in temporary and permanent applications. In many cases, the use of mulches by themselves requires routine inspection and re-application. See EC-3 Hydraulic Mulch, EC-6 Straw Mulch, EC-8 Wood Mulch, or EC-14 Compost Blankets for more information.

**Geotextiles and Mats** can be used as a temporary stand-alone soil stabilization method. Depending on material selection, geotextiles and mats can be a short-term (3 mos – 1 year) or long-term (1-2 years) temporary stabilization method. For more information on geotextiles and mats see EC-7 Geotextiles and Mats.

**Rock Slope Protection** can be used when the slopes are subject to scour or have a high erosion potential, such as slopes adjacent to flowing waterways or slopes subject to overflow from detention facilities (spillways).

**Soil Binders** can be used for temporary stabilization of stockpiles and disturbed areas not subject to heavy traffic. See EC-5 Soil Binders for more information.

### Limitations

#### General

- Refer to EC-3, EC-6, EC-8, and EC-14 for limitations on use of mulches. Refer to EC-7 for limitations on use of geotextiles and mats. Refer to EC-5 for limitations on use of Soil Binders.

# Non-Vegetative Stabilization

## EC-16

### ***Decomposed Granite***

- Not available in some geographic regions.
- If not tackified, material may be susceptible to erosion even on slight slopes (e.g., 30:1 [H:V]).
- Installed costs may be more expensive than vegetative stabilization methods.

### ***Gravel Mulch***

- Availability is limited in some geographic regions.
- If not properly screened and washed, can contain fine material that can erode and/or create dust problems.
- If inadequately sized, material may be susceptible to erosion on sloped areas.
- Pore spaces fill with dirt and debris over time; may provide a growing medium for weeds.

### ***Rock Slope Protection***

- Installation is labor intensive.
- Installed costs can be significantly higher than vegetative stabilization methods.
- Rounded stones may not be used on slopes greater than 2:1 [H:V].

## **Implementation**

### ***General***

Non-vegetated stabilization should be used in accordance with the following general guidance:

- Should be used in conjunction with other BMPs, including drainage, erosion controls and sediment controls.
- Refer to EC-3, EC-6, EC-8, and EC-14 for implementation details for mulches. Refer to EC-7 for implementation details for geotextiles and mats. Refer to EC-5 for implementation details for soil binders.
- Non-vegetated stabilization measures should be implemented as soon as the disturbance in the areas they are intended to protect has ceased.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

### ***Decomposed Granite Stabilization***

- If used for a road or path should be installed on a prepared base.
- Should be mixed with a stabilizer if used for roads or pathways, or on slope applications.
- Though porous it is recommended to prevent standing water on or next to a decomposed granite road or pathway.

# Non-Vegetative Stabilization

## EC-16

### **Gravel Mulch**

- Should be sized based on slope, rainfall, and upgradient run-on conditions. Stone size should be increased as potential for erosion increases (steeper slopes, high intensity rainfall).
- If permanent, a weed control fabric should be placed prior to installation.
- Should be installed at a minimum 2" depth.
- Should completely cover all exposed surfaces.

### **Rock Slope Protection**

- Rock slope protection installation should follow Caltrans Standard Specification 72-2: Rock Slope Protection. Refer to the specification for rock conformity requirements and installation methods.
- When using rock slope protection, rock size and installation method should be specified by an Engineer.
- A geotextile fabric should be placed prior to installation.

### **Costs**

- Costs are highly variable depending not only on technique chosen, but also on materials chosen within specific techniques. In addition, availability of certain materials will vary by region/location, which will also affect the cost. Costs of mulches, geotextiles and mats, and soil binders are presented in their respective fact sheets. Costs for decomposed granite, gravel mulch stabilization and rock slope protection may be higher depending on location and availability of materials. Caltrans has provided an estimate for gravel mulch of \$10 - \$15/yd<sup>2</sup> in flat areas and \$11 - \$23/yd<sup>2</sup> on side slopes.

### **Inspection and Maintenance**

#### **General**

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- For permanent installation, require inspection periodically and after major storm events to look for signs of erosion or damage to the stabilization.
- All damage should be repaired immediately.
- Refer to EC-3, EC-6, EC-8, and EC-14 for inspection and maintenance requirements for mulches. Refer to EC-7 for inspection and maintenance requirements for geotextiles and mats. Refer to EC-5 for inspection and maintenance requirements for soil binders.

### **Decomposed Granite and Gravel Mulch Stabilization**

- Rake out and add decomposed granite or gravel as needed to areas subject to rill erosion. Inspect upgradient drainage controls and repair/modify as necessary.

# Non-Vegetative Stabilization

## EC-16

- Should remain stable under loose surface material. Any significant problem areas should be repaired to restore uniformity to the installation.

### References

Arid Zone Forestry: A Guide for Field Technicians. Food and Agriculture Organization of the United Nations, 1989.

Design of Roadside Channels with Flexible Linings, Hydraulic Engineering Circular Number 15, Third Edition, Federal Highway Administration, 2007.

Design Standards for Urban Infrastructure - Soft Landscape Design, Department of Territory and Municipal Services - Australian Capital Territory [http://www.tams.act.gov.au/work/standards\\_and\\_procedures/design\\_standards\\_for\\_urban\\_infrastructure](http://www.tams.act.gov.au/work/standards_and_procedures/design_standards_for_urban_infrastructure)

Erosion and Sediment Control Handbook: A Guide for Protection of State Waters through the use of Best Management Practices during Land Disturbing Activities, Tennessee Department of Environment and Conservation, 2002.

Gravel Mulch, Landscape Architecture Non-Standard Specification 10-2, California Department of Transportation (Caltrans), <http://www.dot.ca.gov/hq/LandArch/roadside/detail-gm.htm>

Maine Erosion and Sediment Control BMPs, DEPLW0588, Maine Department of Environmental Protection: Bureau of Land and Water Quality, 2003.

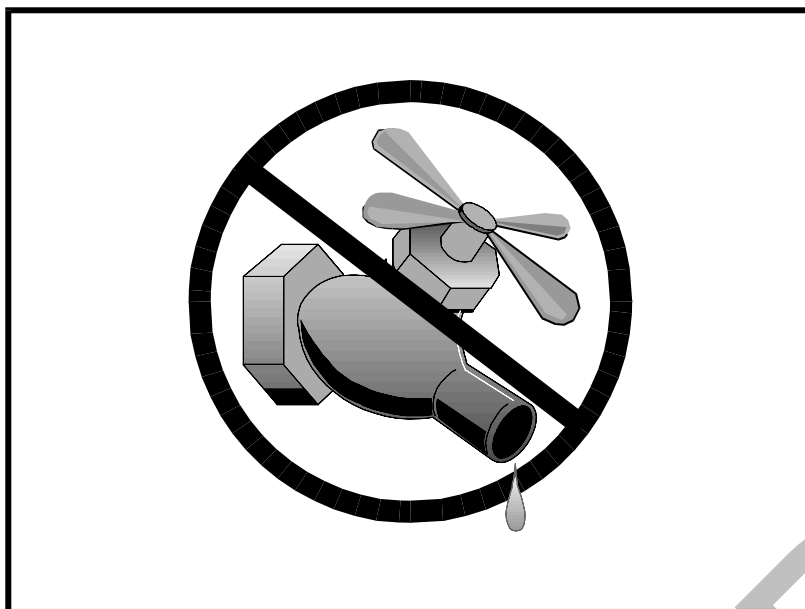
National Menu of Best Management Practices, US Environmental Protection Agency, 2006.

Standard Specification 72-2: Rock Slope Protection. California Department of Transportation, 2006.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

# Water Conservation Practices

## NS-1



### Description and Purpose

Water conservation practices are activities that use water during the construction of a project in a manner that avoids causing erosion and the transport of pollutants offsite. These practices can reduce or eliminate non-stormwater discharges.

### Suitable Applications

Water conservation practices are suitable for all construction sites where water is used, including piped water, metered water, trucked water, and water from a reservoir.

### Limitations

- None identified.

### Implementation

- Keep water equipment in good working condition.
- Stabilize water truck filling area.
- Repair water leaks promptly.
- Washing of vehicles and equipment on the construction site is discouraged.
- Avoid using water to clean construction areas. If water must be used for cleaning or surface preparation, surface should be swept and vacuumed first to remove dirt. This will minimize amount of water required.

### Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

None

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# Water Conservation Practices

## NS-1

- Direct construction water runoff to areas where it can soak into the ground or be collected and reused.
- Authorized non-stormwater discharges to the storm drain system, channels, or receiving waters are acceptable with the implementation of appropriate BMPs.
- Lock water tank valves to prevent unauthorized use.

### Costs

The cost is small to none compared to the benefits of conserving water.

### Inspection and Maintenance

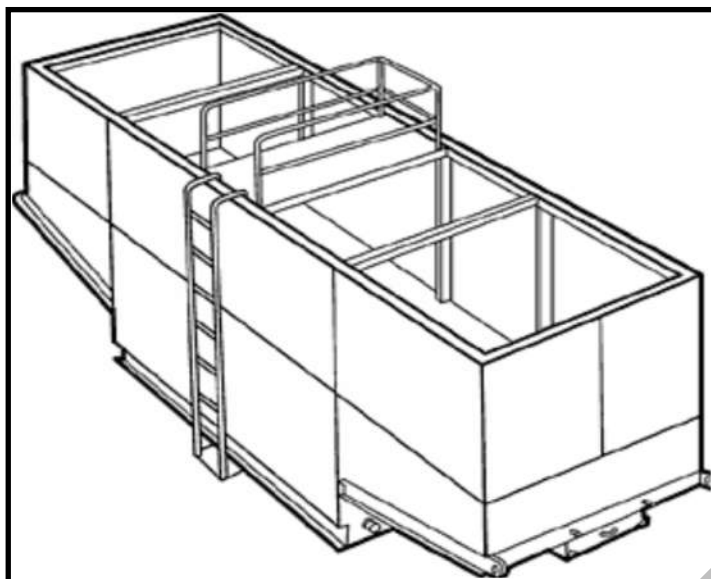
- Inspect and verify that activity based BMPs are in place prior to the commencement of authorized non-stormwater discharges.
- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges are occurring.
- Repair water equipment as needed to prevent unintended discharges.
  - Water trucks
  - Water reservoirs (water buffalos)
  - Irrigation systems
  - Hydrant connections

### References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

# Dewatering Operations

## NS-2



### Categories

EC	Erosion Control	
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ Primary Category  
☒ Secondary Category

### Description and Purpose

Dewatering operations are practices that manage the discharge of pollutants when non-stormwater and accumulated precipitation (stormwater) must be removed from a work location to proceed with construction work or to provide vector control.

The General Permit incorporates Numeric Action Levels (NAL) for turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Discharges from dewatering operations can contain high levels of fine sediment that, if not properly treated, could lead to exceedances of the General Permit requirements or Basin Plan standards.

The dewatering operations described in this fact sheet are not Active Treatment Systems (ATS) and do not include the use of chemical coagulations, chemical flocculation or electrocoagulation.

### Suitable Applications

These practices are implemented for discharges of non-stormwater from construction sites. Non-stormwaters include, but are not limited to, groundwater, water from cofferdams, water diversions, and waters used during construction activities that must be removed from a work area to facilitate construction.

Practices identified in this section are also appropriate for implementation when managing the removal of accumulated

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	

### Potential Alternatives

- SE-5: Fiber Roll  
 SE-6: Gravel Bag Berm

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# Dewatering Operations

## NS-2

precipitation (stormwater) from depressed areas at a construction site.

Stormwater mixed with non-stormwater should be managed as non-stormwater.

### Limitations

- Dewatering operations will require, and should comply with applicable local and project-specific permits and regulations. In some areas, all dewatering activities, regardless of the discharge volume, require a dewatering permit.
- Site conditions will dictate design and use of dewatering operations.
- The controls discussed in this fact sheet primarily address sediment. Other secondary pollutant removal benefits are discussed where applicable.
- The controls detailed in this fact sheet only allow for minimal settling time for sediment particles. Use only when site conditions restrict the use of the other control methods.
- Avoid dewatering discharges where possible by using the water for dust control.

### Implementation

- A Construction Site Monitoring Plan (CSMP) should be included in the project Stormwater Pollution Prevention Plan (SWPPP).
- Regional Water Quality Control Board (RWQCB) Regions may require notification and approval prior to any discharge of water from construction sites.
- The destination of discharge from dewatering activities will typically determine the type of permit required for the discharge. For example, when discharging to a water of the U.S., a dewatering permit may be required through the site's governing RWQCB. When discharging to a sanitary sewer or Municipal Separate Storm Sewer System (MS4), a permit may need to be obtained from the owner of the sanitary sewer or MS4 in addition to obtaining an RWQCB dewatering permit. Additional permits or permissions from other agencies may be required for dewatering cofferdams or diversions.
- Dewatering discharges should not cause erosion at the discharge point. Appropriate BMPs should be implemented to maintain compliance with all applicable permits.
- Maintain dewatering records in accordance with all local and project-specific permits and regulations.

### Sediment Treatment

A variety of methods can be used to treat water during dewatering operations. Several devices are presented below and provide options to achieve sediment removal. The sediment particle size and permit or receiving water limitations on sediment or turbidity are key considerations for selecting sediment treatment option(s); in some cases, the use of multiple devices may be appropriate. Use of other enhanced treatment methods (i.e., introduction of chemicals or electric current to enhance flocculation and removal of sediment) must comply with: 1) for storm drain or surface water discharges, the requirements for Active Treatment Systems (see SE-11); or 2) for sanitary sewer discharges, the requirements of applicable sanitary sewer discharge permits.

# Dewatering Operations

## NS-2

### ***Sediment Basin (see also SE-2)***

#### *Description:*

- A sediment basin is a temporary basin with a controlled release structure that is formed by excavation or construction of an embankment to detain sediment-laden runoff and allow sediment to settle out before discharging. Sediment basins are generally larger than Sediment Traps (SE-3) and have a designed outlet structure.

#### *Appropriate Applications:*

- Effective for the removal of trash, gravel, sand, silt, some metals that settle out with the sediment.

#### *Implementation:*

- Excavation and construction of related facilities is required.
- Temporary sediment basins should be fenced if safety is a concern.
- Outlet protection is required to prevent erosion at the outfall location.

#### *Maintenance:*

- Maintenance is required for safety fencing, vegetation, embankment, inlet and outlet, as well as other features.
- Removal of sediment is required when the storage volume is reduced by one-third.

### ***Sediment Trap (See also SE-3)***

#### *Description:*

- A sediment trap is a temporary basin formed by excavation and/or construction of an earthen embankment across a waterway or low drainage area to detain sediment-laden runoff and allow sediment to settle out before discharging. Sediment traps are generally smaller than Sediment Basins (SE-2) and do not have a designed outlet (but do have a spillway or overflow).

#### *Appropriate Applications:*

Effective for the removal of large and medium sized particles (sand and gravel) and some metals that settle out with the sediment.

#### *Implementation:*

- Excavation and construction of related facilities is required.
- Trap inlets should be located to maximize the travel distance to the trap outlet.
- Use rock or vegetation to protect the trap outlets against erosion.

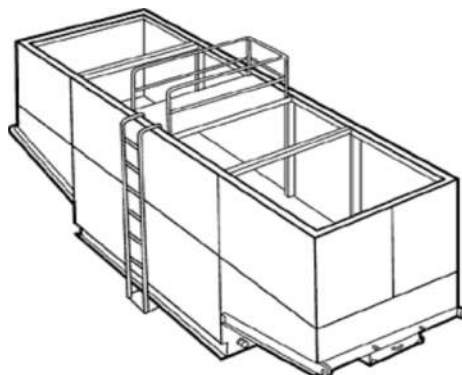
#### *Maintenance:*

- Maintenance is required for vegetation, embankment, inlet and outfall structures, as well as other features.
- Removal of sediment is required when the storage volume is reduced by one-third.

# Dewatering Operations

## NS-2

### **Weir Tanks**



#### *Description:*

- A weir tank separates water and waste by using weirs. The configuration of the weirs (over and under weirs) maximizes the residence time in the tank and determines the waste to be removed from the water, such as oil, grease, and sediments.

#### *Appropriate Applications:*

- The tank removes trash, some settleable solids (gravel, sand, and silt), some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

#### *Implementation:*

- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors should be consulted to appropriately size tank.
- Treatment capacity (i.e., volume and number of tanks) should provide at a minimum the required volume for discrete particle settling for treatment design flows.

#### *Maintenance:*

- Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal should be conducted by a licensed waste disposal company.

# Dewatering Operations

## NS-2

### ***Dewatering Tanks***



#### ***Description:***

- A dewatering tank removes debris and sediment. Flow enters the tank through the top, passes through a fabric filter, and is discharged through the bottom of the tank. The filter separates the solids from the liquids.

#### ***Appropriate Applications:***

- The tank removes trash, gravel, sand, and silt, some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

#### ***Implementation:***

- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors should be consulted to appropriately size tank.

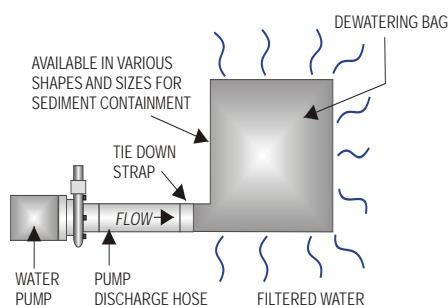
#### ***Maintenance:***

- Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal should be conducted by licensed waste disposal company.

# Dewatering Operations

## NS-2

### Gravity Bag Filter



#### Description:

- A gravity bag filter, also referred to as a dewatering bag, is a square or rectangular bag made of non-woven geotextile fabric that collects gravel, sand, silt, and fines.

#### Appropriate Applications:

- Effective for the removal of sediments (gravel, sand, silt, and fines). Some metals are removed with the sediment.

#### Implementation:

- Water is pumped into one side of the bag and seeps through the top, bottom, and sides of the bag.
- Place filter bag on pavement or a gravel bed or paved surface. Avoid placing a dewatering bag on unprotected bare soil. If placing the bag on bare soil is unavoidable, a secondary barrier should be used, such as a rock filter bed placed beneath and beyond the edges of the bag to, prevent erosion and capture sediments that escape the bag.
- Perimeter control around the downstream end of the bag should be implemented. Secondary sediment controls are important especially in the initial stages of discharge, which tend to allow fines to pass through the bag.

#### Maintenance:

- Inspection of the flow conditions, bag condition, bag capacity, and the secondary barrier (as applicable) is required.
- Replace the bag when it no longer filters sediment or passes water at a reasonable rate.
- Caution should be taken when removing and disposing of the bag, to prevent the release of captured sediment
- Properly dispose of the bag offsite. If sediment is removed from the bag prior to disposal (bags can potentially be reused depending upon their condition), dispose of sediment in accordance with the general maintenance procedures described at the end of this BMP Fact Sheet.

# Dewatering Operations

## NS-2

### ***Sand Media Particulate Filter***



#### ***Description:***

- Water is treated by passing it through canisters filled with sand media. Generally, sand filters provide a final level of treatment. They are often used as a secondary or higher level of treatment after a significant amount of sediment and other pollutants have been removed using other methods.

#### ***Appropriate Applications:***

- Effective for the removal of trash, gravel, sand, and silt and some metals, as well as the reduction of biochemical oxygen demand (BOD) and turbidity.
- Sand filters can be used for stand-alone treatment or in conjunction with bag and cartridge filtration if further treatment is required.
- Sand filters can also be used to provide additional treatment to water treated via settling or basic filtration.

#### ***Implementation:***

- The filters require delivery to the site and initial set up. The vendor can provide assistance with installation and operation.

#### ***Maintenance:***

- The filters require regular service to monitor and maintain the level of the sand media. If subjected to high loading rates, filters can plug quickly.
- Vendors generally provide data on maximum head loss through the filter. The filter should be monitored daily while in use, and cleaned when head loss reaches target levels.
- If cleaned by backwashing, the backwash water may need to be hauled away for disposal, or returned to the upper end of the treatment train for another pass through the series of dewatering BMPs.

# Dewatering Operations

## NS-2

### ***Pressurized Bag Filter***



#### ***Description:***

- A pressurized bag filter is a unit composed of single filter bags made from polyester felt material. The water filters through the unit and is discharged through a header. Vendors provide bag filters in a variety of configurations. Some units include a combination of bag filters and cartridge filters for enhanced contaminant removal.

#### ***Appropriate Applications:***

- Effective for the removal of sediment (sand and silt) and some metals, as well as the reduction of BOD, turbidity, and hydrocarbons. Oil absorbent bags are available for hydrocarbon removal.
- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.

#### ***Implementation:***

- The filters require delivery to the site and initial set up. The vendor can provide assistance with installation and operation.

#### ***Maintenance:***

- The filter bags require replacement when the pressure differential equals or exceeds the manufacturer's recommendation.

# Dewatering Operations

## NS-2

### ***Cartridge Filter***



#### ***Description:***

- Cartridge filters provide a high degree of pollutant removal by utilizing a number of individual cartridges as part of a larger filtering unit. They are often used as a secondary or higher (polishing) level of treatment after a significant amount of sediment and other pollutants are removed. Units come with various cartridge configurations (for use in series with bag filters) or with a larger single cartridge filtration unit (with multiple filters within).

#### ***Appropriate Applications:***

- Effective for the removal of sediment (sand, silt, and some clays) and metals, as well as the reduction of BOD, turbidity, and hydrocarbons. Hydrocarbons can effectively be removed with special resin cartridges.
- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.

#### ***Implementation:***

- The filters require delivery to the site and initial set up. The vendor can provide assistance.

#### ***Maintenance:***

- The cartridges require replacement when the pressure differential equals or exceeds the manufacturer's recommendation.

#### **Costs**

- Sediment control costs vary considerably depending on the dewatering and sediment treatment system that is selected. Pressurized filters tend to be more expensive than gravity settling, but are often more effective. Simple tanks are generally rented on a long-term basis (one or more months) and can range from \$360 per month for a 1,000 gallon tank to \$2,660 per month for a 10,000 gallon tank. Mobilization and demobilization costs vary considerably.

#### **Inspection and Maintenance**

- Inspect and verify that dewatering BMPs are in place and functioning prior to the commencement of activities requiring dewatering.
- Inspect dewatering BMPs daily while dewatering activities are being conducted.

# Dewatering Operations

## NS-2

- Inspect all equipment before use. Monitor dewatering operations to ensure they do not cause offsite discharge or erosion.
- Sample dewatering discharges as required by the General Permit.
- Unit-specific maintenance requirements are included with the description of each unit.
- Sediment removed during the maintenance of a dewatering device may be either spread onsite and stabilized, or disposed of at a disposal site as approved by the owner.
- Sediment that is commingled with other pollutants should be disposed of in accordance with all applicable laws and regulations and as approved by the owner.

### References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003; Updated March 2004.

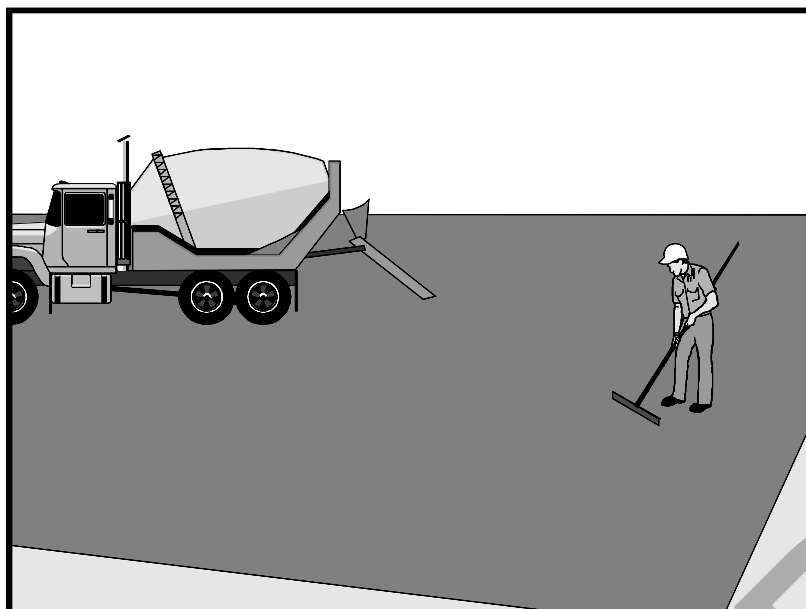
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Labor Surcharge & Equipment Rental Rates, April 1, 2002 through March 31, 2003, California Department of Transportation (Caltrans).

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

# Paving and Grinding Operations

## NS-3



### Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	<input checked="" type="checkbox"/>

### Legend:

- ☒ **Primary Category**  
☒ **Secondary Category**

### Description and Purpose

Prevent or reduce the discharge of pollutants from paving operations, using measures to prevent runoff and runoff pollution, properly disposing of wastes, and training employees and subcontractors.

The General Permit incorporates Numeric Action Levels (NAL) for pH and turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials associated with paving and grinding operations, including mortar, concrete, and cement and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

### Suitable Applications

These procedures are implemented where paving, surfacing, resurfacing, or sawcutting, may pollute stormwater runoff or discharge to the storm drain system or watercourses.

### Limitations

- Paving opportunities may be limited during wet weather.

Discharges of freshly paved surfaces may raise pH to environmentally harmful levels and trigger permit violations.

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	

### Potential Alternatives

None

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# Paving and Grinding Operations

## NS-3

### Implementation

#### *General*

- Avoid paving during the wet season when feasible.
- Reschedule paving and grinding activities if rain is forecasted.
- Train employees and sub-contractors in pollution prevention and reduction.
- Store materials away from drainage courses to prevent stormwater runoff (see WM-1, Material Delivery and Storage).
- Protect drainage courses, particularly in areas with a grade, by employing BMPs to divert runoff or to trap and filter sediment.
- Stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses. These materials should be stored consistent with WM-3, Stockpile Management.
- Disposal of PCC (Portland cement concrete) and AC (asphalt concrete) waste should be in conformance with WM-8, Concrete Waste Management.

#### *Saw Cutting, Grinding, and Pavement Removal*

- Shovel or vacuum saw-cut slurry and remove from site. Cover or barricade storm drains during saw cutting to contain slurry.
- When paving involves AC, the following steps should be implemented to prevent the discharge of grinding residue, uncompacted or loose AC, tack coats, equipment cleaners, or unrelated paving materials:
  - AC grindings, pieces, or chunks used in embankments or shoulder backing should not be allowed to enter any storm drains or watercourses. Install inlet protection and perimeter controls until area is stabilized (i.e. cutting, grinding or other removal activities are complete and loose material has been properly removed and disposed of) or permanent controls are in place. Examples of temporary perimeter controls can be found in EC-9, Earth Dikes and Drainage Swales; SE-1, Silt Fence; SE-5, Fiber Rolls, or SE-13 Compost Socks and Berms
  - Collect and remove all broken asphalt and recycle when practical. Old or spilled asphalt should be recycled or disposed of properly.
- Do not allow saw-cut slurry to enter storm drains or watercourses. Residue from grinding operations should be picked up by a vacuum attachment to the grinding machine, or by sweeping, should not be allowed to flow across the pavement, and should not be left on the surface of the pavement. See also WM-8, Concrete Waste Management, and WM-10, Liquid Waste Management.
- Pavement removal activities should not be conducted in the rain.
- Collect removed pavement material by mechanical or manual methods. This material may be recycled for use as shoulder backing or base material.

# Paving and Grinding Operations

## NS-3

- If removed pavement material cannot be recycled, transport the material back to an approved storage site.

### ***Asphaltic Concrete Paving***

- If paving involves asphaltic cement concrete, follow these steps:
  - Do not allow sand or gravel placed over new asphalt to wash into storm drains, streets, or creeks. Vacuum or sweep loose sand and gravel and properly dispose of this waste by referring to WM-5, Solid Waste Management.
  - Old asphalt should be disposed of properly. Collect and remove all broken asphalt from the site and recycle whenever possible.

### ***Portland Cement Concrete Paving***

- Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect waste materials by dry methods, such as sweeping or shoveling, and return to aggregate base stockpile or dispose of properly. Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in WM-8, Concrete Waste Management, or pump the water to the sanitary sewer if authorized by the local wastewater authority.

### ***Sealing Operations***

- During chip seal application and sweeping operations, petroleum or petroleum covered aggregate should not be allowed to enter any storm drain or water courses. Apply temporary perimeter controls until structure is stabilized (i.e. all sealing operations are complete and cured and loose materials have been properly removed and disposed).
- Inlet protection (SE-10, Storm Drain Inlet Protection) should be used during application of seal coat, tack coat, slurry seal, and fog seal.
- Seal coat, tack coat, slurry seal, or fog seal should not be applied if rainfall is predicted to occur during the application or curing period.

### ***Paving Equipment***

- Leaks and spills from paving equipment can contain toxic levels of heavy metals and oil and grease. Place drip pans or absorbent materials under paving equipment when not in use. Clean up spills with absorbent materials and dispose of in accordance with the applicable regulations. See NS-10, Vehicle and Equipment Maintenance, WM-4, Spill Prevention and Control, and WM-10, Liquid Waste Management.
- Substances used to coat asphalt transport trucks and asphalt spreading equipment should not contain soap and should be non-foaming and non-toxic.
- Paving equipment parked onsite should be parked over plastic to prevent soil contamination.
- Clean asphalt coated equipment offsite whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as described in WM-5, Solid Waste Management. Any cleaning onsite should follow NS-8, Vehicle and Equipment Cleaning.

# Paving and Grinding Operations

## NS-3

### ***Thermoplastic Striping***

- Thermoplastic striper and pre-heater equipment shutoff valves should be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the stormwater drainage system, or watercourses.
- Pre-heaters should be filled carefully to prevent splashing or spilling of hot thermoplastic. Leave six inches of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move.
- Do not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.
- Clean truck beds daily of loose debris and melted thermoplastic. When possible, recycle thermoplastic material.

### ***Raised/Recessed Pavement Marker Application and Removal***

- Do not transfer or load bituminous material near drain inlets, the stormwater drainage system, or watercourses.
- Melting tanks should be loaded with care and not filled to beyond six inches from the top to leave room for splashing.
- When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.
- On large-scale projects, use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.

### **Costs**

- All of the above are low cost measures.

### **Inspection and Maintenance**

- Inspect and verify that activity-based BMPs are in place prior to the commencement of paving and grinding operations.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Sample stormwater runoff required by the General Permit.
- Keep ample supplies of drip pans or absorbent materials onsite.
- Inspect and maintain machinery regularly to minimize leaks and drips.

### **References**

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

# **Paving and Grinding Operations**

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## **NS-3**

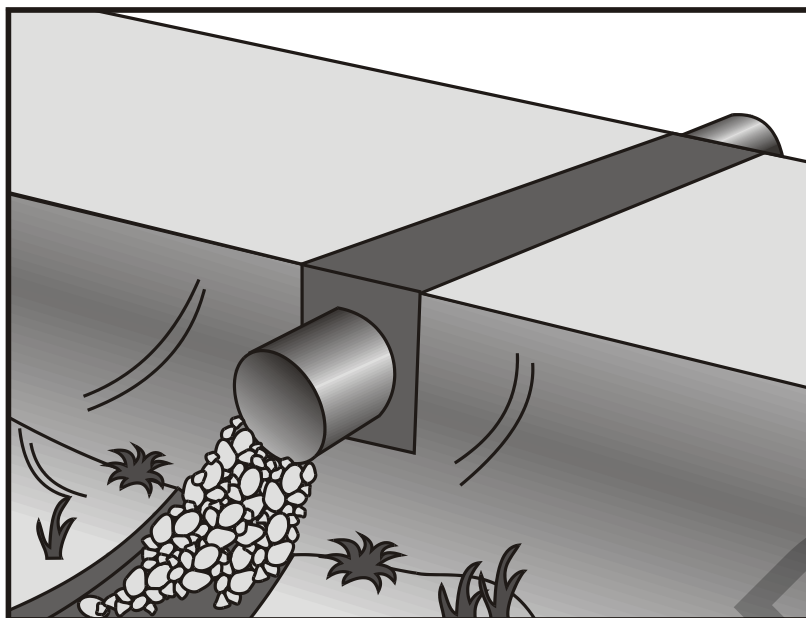
Hot Mix Asphalt-Paving Handbook AC 150/5370-14, Appendix I, U.S. Army Corps of Engineers, July 1991.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

# Temporary Stream Crossing

## NS-4



### Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	<input checked="" type="checkbox"/>
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ **Primary Objective**  
☒ **Secondary Objective**

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

None

### Description and Purpose

A temporary stream crossing is a temporary culvert, ford or bridge placed across a waterway to provide access for construction purposes for a period of less than one year. Temporary access crossings are not intended to maintain traffic for the public. The temporary access will eliminate erosion and downstream sedimentation caused by vehicles.

### Suitable Applications

Temporary stream crossings should be installed at all designated crossings of perennial and intermittent streams on the construction site, as well as for dry channels that may be significantly eroded by construction traffic.

Temporary stream crossings are installed at sites:

- Where appropriate permits have been secured (404 Permits, and 401 Certifications)
- Where construction equipment or vehicles need to frequently cross a waterway
- When alternate access routes impose significant constraints
- When crossing perennial streams or waterways causes significant erosion
- Where construction activities will not last longer than one year

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# Temporary Stream Crossing

## NS-4

- Where appropriate permits have been obtained for the stream crossing

### Limitations

The following limitations may apply:

- Installation and removal will usually disturb the waterway.
- Installation may require Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game. If numerical-based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required.
- Installation may require dewatering or temporary diversion of the stream. See NS-2, Dewatering Operations and NS-5, Clear Water Diversion.
- Installation may cause a constriction in the waterway, which can obstruct flood flow and cause flow backups or washouts. If improperly designed, flow backups can increase the pollutant load through washouts and scouring.
- Use of natural or other gravel in the stream for construction of Cellular Confinement System (CCS) ford crossing will be contingent upon approval by fisheries agencies.
- Ford crossings may degrade water quality due to contact with vehicles and equipment.
- May be expensive for a temporary improvement.
- Requires other BMPs to minimize soil disturbance during installation and removal.
- Fords should only be used in dry weather.

### Implementation

#### General

The purpose of this BMP is to provide a safe, erosion-free access across a stream for construction equipment. Minimum standards and specifications for the design, construction, maintenance, and removal of the structure should be established by an engineer registered in California. Temporary stream crossings may be necessary to prevent construction equipment from causing erosion of the stream and tracking sediment and other pollutants into the stream.

Temporary stream crossings are used as access points to construction sites when other detour routes may be too long or burdensome for the construction equipment. Often heavy construction equipment must cross streams or creeks, and detour routes may impose too many constraints such as being too narrow or poor soil strength for the equipment loadings. Additionally, the contractor may find a temporary stream crossing more economical for light-duty vehicles to use for frequent crossings, and may have less environmental impact than construction of a temporary access road.

Location of the temporary stream crossing should address:

- Site selection where erosion potential is low.

# Temporary Stream Crossing

## NS-4

- Areas where the side slopes from site runoff will not spill into the side slopes of the crossing.

The following types of temporary stream crossings should be considered:

- **Culverts** – A temporary culvert is effective in controlling erosion but will cause erosion during installation and removal. A temporary culvert can be easily constructed and allows for heavy equipment loads.
- **Fords** - Appropriate during the dry season in arid areas. Used on dry washes and ephemeral streams, and low-flow perennial streams. CCS, a type of ford crossing, is also appropriate for use in streams that would benefit from an influx of gravels. A temporary ford provides little sediment and erosion control and is ineffective in controlling erosion in the stream channel. A temporary ford is the least expensive stream crossing and allows for maximum load limits. It also offers very low maintenance. Fords are more appropriate during the dry ice season and in arid areas of California.
- **Bridges** - Appropriate for streams with high flow velocities, steep gradients and where temporary restrictions in the channel are not allowed.

### Design

During the long summer construction season in much of California, rainfall is infrequent and many streams are dry. Under these conditions, a temporary ford may be sufficient. A ford is not appropriate if construction will continue through the winter rainy season, if summer thunderstorms are likely, or if the stream flows during most of the year. Temporary culverts and bridges should then be considered and, if used, should be sized to pass a significant design storm (i.e., at least a 10-year storm). The temporary stream crossing should be protected against erosion, both to prevent excessive sedimentation in the stream and to prevent washout of the crossing.

Design and installation requires knowledge of stream flows and soil strength. Designs should be prepared under direction of, and approved by, a registered civil engineer and for bridges, a registered structural engineer. Both hydraulic and construction loading requirements should be considered with the following:

- Comply with any special requirements for culvert and bridge crossings, particularly if the temporary stream crossing will remain through the rainy season.
- Provide stability in the crossing and adjacent areas to withstand the design flow. The design flow and safety factor should be selected based on careful evaluation of the risks due to over topping, flow backups, or washout.
- Install sediment traps immediately downstream of crossings to capture sediments. See SE-3, Sediment Trap.
- Avoid oil or other potentially hazardous materials for surface treatment.
- Culverts are relatively easy to construct and able to support heavy equipment loads.
- Fords are the least expensive of the crossings, with maximum load limits.

# Temporary Stream Crossing

## NS-4

- CCS crossing structures consist of clean, washed gravel and cellular confinement system blocks. CCS are appropriate for streams that would benefit from an influx of gravel; for example, salmonid streams, streams or rivers below reservoirs, and urban, channelized streams. Many urban stream systems are gravel-deprived due to human influences, such as dams, gravel mines, and concrete channels.
- CCS allow designers to use either angular or naturally occurring rounded gravel, because the cells provide the necessary structure and stability. In fact, natural gravel is optimal for this technique, because of the habitat improvement it will provide after removal of the CCS.
- A gravel depth of 6 to 12 in. for a CCS structure is sufficient to support most construction equipment.
- An advantage of a CCS crossing structure is that relatively little rock or gravel is needed, because the CCS provides the stability.
- Bridges are generally more expensive to design and construct, but provide the least disturbance of the streambed and constriction of the waterway flows.

### ***Construction and Use***

- Stabilize construction roadways, adjacent work area, and stream bottom against erosion.
- Construct during dry periods to minimize stream disturbance and reduce costs.
- Construct at or near the natural elevation of the streambed to prevent potential flooding upstream of the crossing.
- Install temporary erosion control BMPs in accordance with erosion control BMP fact sheets to minimize erosion of embankment into flow lines.
- Any temporary artificial obstruction placed within flowing water should only be built from material, such as clean gravel or sandbags, that will not introduce sediment or silt into the watercourse.
- Temporary water body crossings and encroachments should be constructed to minimize scour. Cobbles used for temporary water body crossings or encroachments should be clean, rounded river cobble.
- Vehicles and equipment should not be driven, operated, fueled, cleaned, maintained, or stored in the wet or dry portions of a water body where wetland vegetation, riparian vegetation, or aquatic organisms may be destroyed.
- The exterior of vehicles and equipment that will encroach on the water body within the project should be maintained free of grease, oil, fuel, and residues.
- Drip pans should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than one hour.

# Temporary Stream Crossing

## NS-4

- Disturbance or removal of vegetation should not exceed the minimum necessary to complete operations. Precautions should be taken to avoid damage to vegetation by people or equipment. Disturbed vegetation should be replaced with the appropriate soil stabilization measures.
- Riparian vegetation, when removed pursuant to the provisions of the work, should be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation should be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble must be removed upon completion of project activities.
- Conceptual temporary stream crossings are shown in the attached figures.

### Costs

Caltrans Construction Cost index for temporary bridge crossings is \$45-\$95/ft<sup>2</sup>.

### Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check for blockage in the channel, sediment buildup or trapped debris in culverts, blockage behind fords or under bridges.
- Check for erosion of abutments, channel scour, riprap displacement, or piping in the soil.
- Check for structural weakening of the temporary crossings, such as cracks, and undermining of foundations and abutments.
- Remove sediment that collects behind fords, in culverts, and under bridges periodically.
- Replace lost or displaced aggregate from inlets and outlets of culverts and cellular confinement systems.
- Remove temporary crossing promptly when it is no longer needed.

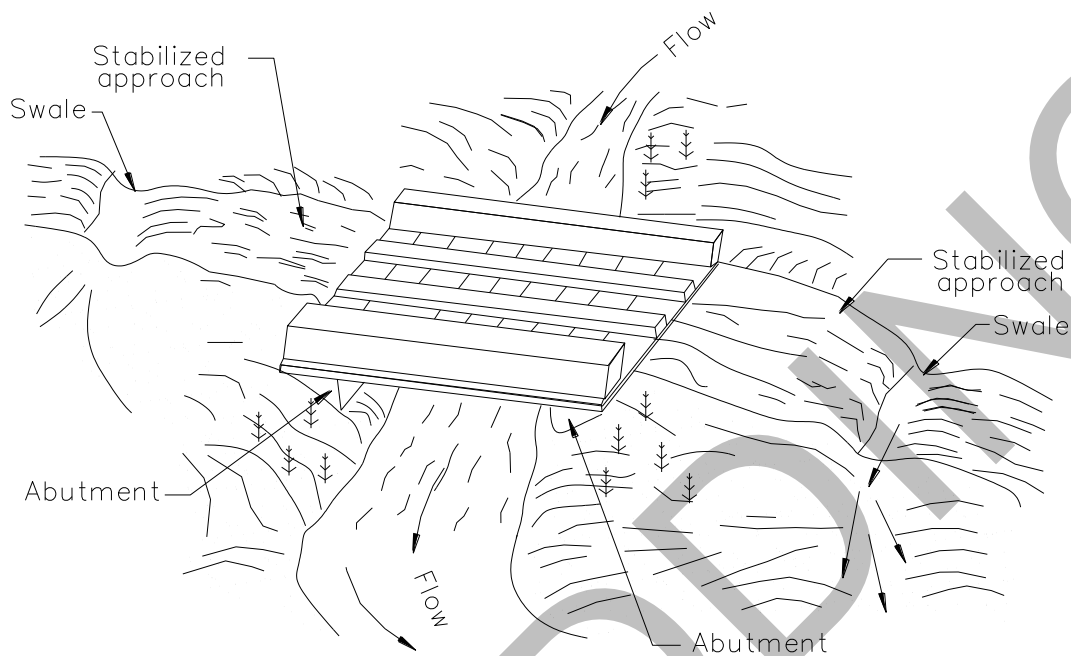
### References

California Bank and Shore Rock Slope Protection Design – Practitioners Guide and Field Evaluations of Riprap Methods, Caltrans Study No. F90TL03, October 2000.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

# Temporary Stream Crossing

## NS-4



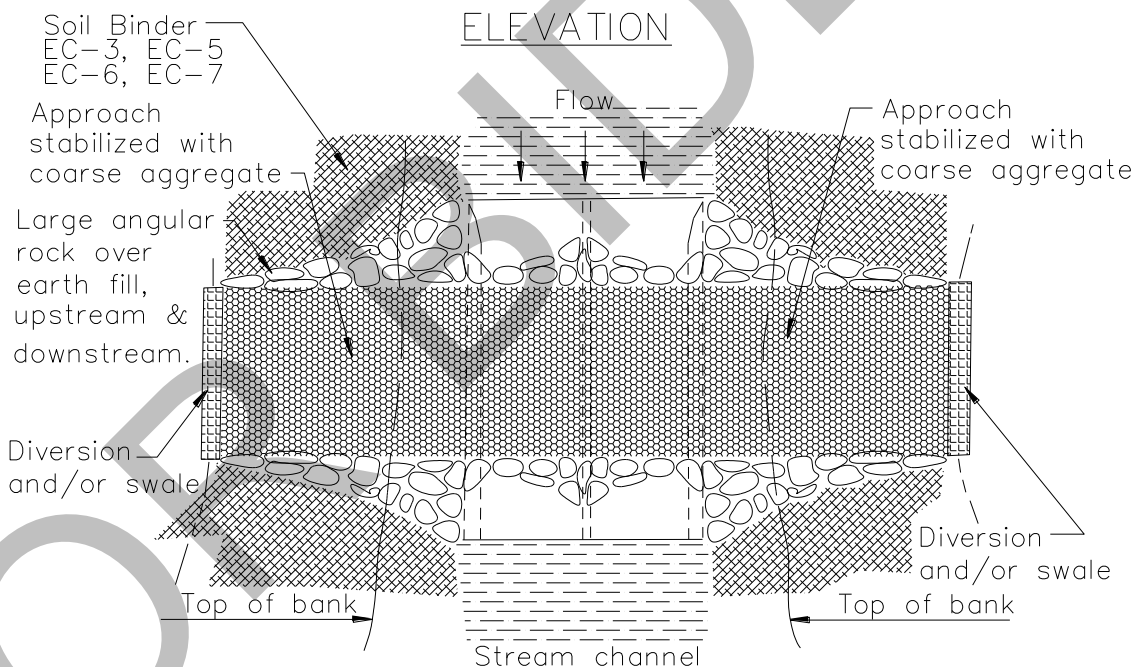
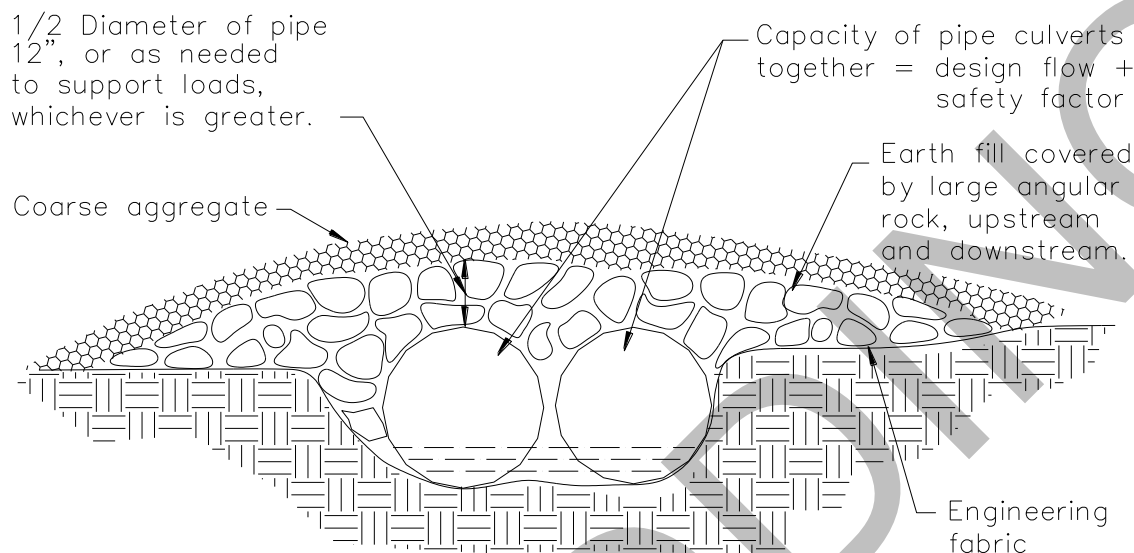
NOTE:

Surface flow of road diverted by swale and/or dike.

TYPICAL BRIDGE CROSSING  
NOT TO SCALE

# Temporary Stream Crossing

# NS-4



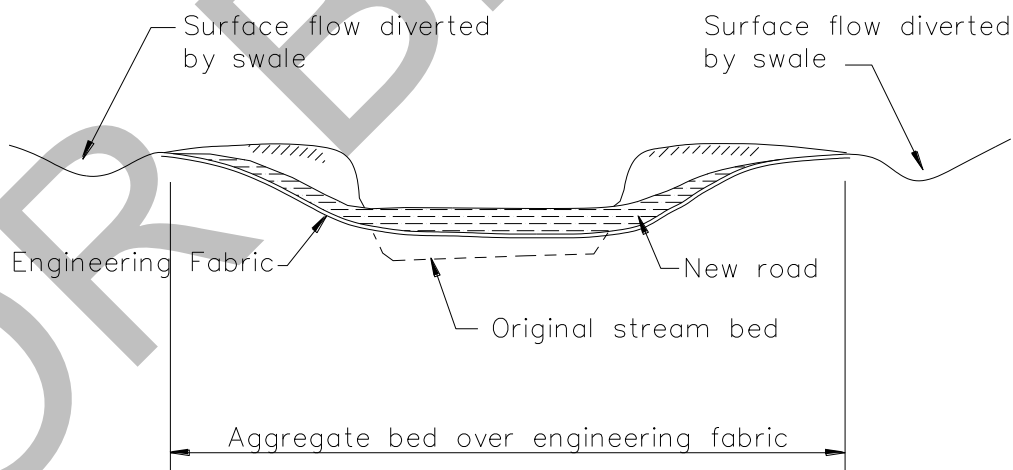
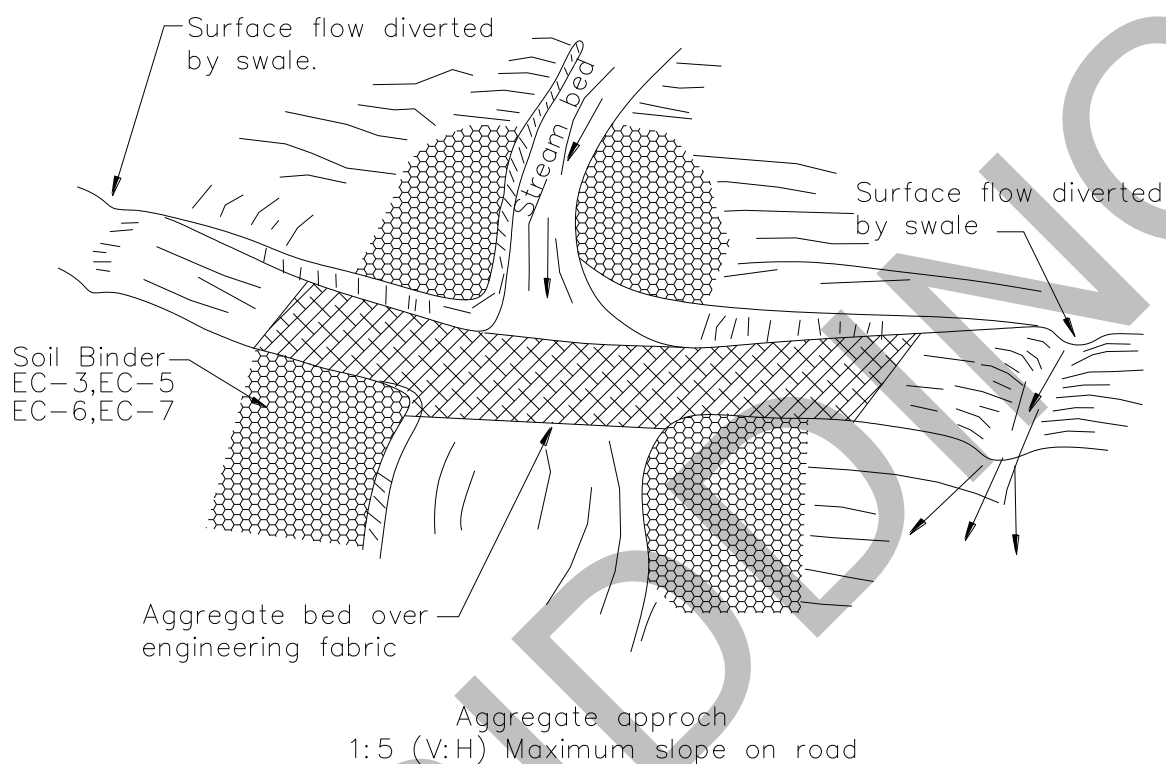
ELEVATION

PLAN VIEW

TYPICAL CULVERT CROSSING  
NOT TO SCALE

# Temporary Stream Crossing

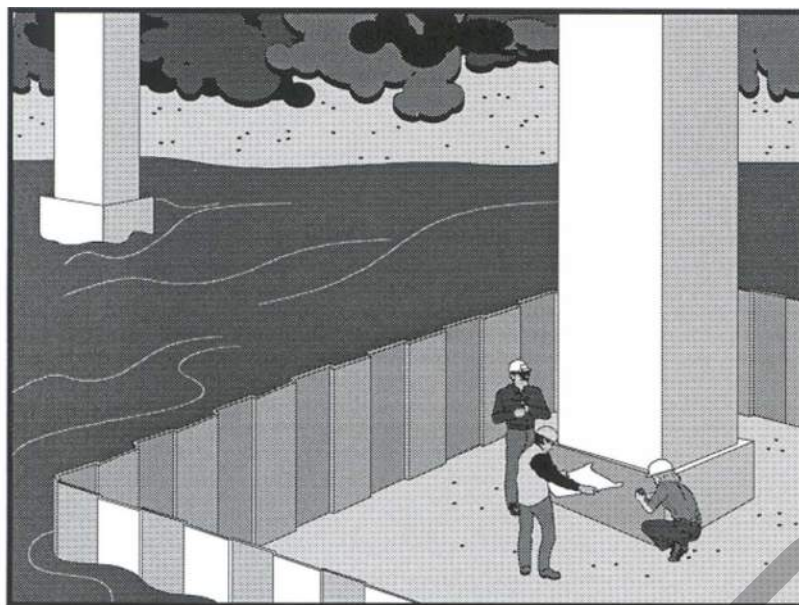
## NS-4



TYPICAL FORD CROSSING  
NOT TO SCALE

# Clear Water Diversion

# NS-5



## Categories

EC	Erosion Control
SE	Sediment Control
TC	Tracking Control
WE	Wind Erosion Control
NS	Non-Stormwater Management Control <input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control

## Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

## Potential Alternatives

None

## Description and Purpose

Clear water diversion consists of a system of structures and measures that intercept clear surface water runoff upstream of a project, transport it around the work area, and discharge it downstream with minimal water quality degradation from either the project construction operations or the construction of the diversion. Clear water diversions are used in a waterway to enclose a construction area and reduce sediment pollution from construction work occurring in or adjacent to water. Structures commonly used as part of this system include diversion ditches, berms, dikes, slope drains, rock, gravel bags, wood, aqua barriers, cofferdams, filter fabric or turbidity curtains, drainage and interceptor swales, pipes, or flumes.

## Suitable Applications

A clear water diversion is typically implemented where appropriate permits (1601 Agreement) have been secured and work must be performed in a flowing stream or water body.

- Clear water diversions are appropriate for isolating construction activities occurring within or near a water body such as streambank stabilization, or culvert, bridge, pier or abutment installation. They may also be used in combination with other methods, such as clear water bypasses and/or pumps.
- Pumped diversions are suitable for intermittent and low flow streams.
- Excavation of a temporary bypass channel, or passing the flow through a heavy pipe (called a "flume") with a trench

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# Clear Water Diversion

# NS-5

excavated under it, is appropriate for the diversion of streams less than 20 ft wide, with flow rates less than 100 cfs.

- Clear water diversions incorporating clean washed gravel may be appropriate for use in salmonid spawning streams.

## Limitations

- Diversion and encroachment activities will usually disturb the waterway during installation and removal of diversion structures.
- Installation may require Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game. If numerical-based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required.
- Diversion and encroachment activities may constrict the waterway, which can obstruct flood flows and cause flooding or washouts. Diversion structures should not be installed without identifying potential impacts to the stream channel.
- Diversion or isolation activities are not appropriate in channels where there is insufficient stream flow to support aquatic species in the area dewatered as a result of the diversion.
- Diversion or isolation activities are inappropriate in deep water unless designed or reviewed by an engineer registered in California.
- Diversion or isolation activities should not completely dam stream flow.
- Dewatering and removal may require additional sediment control or water treatment. See NS-2, Dewatering Operations.
- Not appropriate if installation, maintenance, and removal of the structures will disturb sensitive aquatic species of concern.

## Implementation

### **General**

- Implement guidelines presented in EC-12, Streambank Stabilization to minimize impacts to streambanks.
- Where working areas encroach on flowing streams, barriers adequate to prevent the flow of muddy water into streams should be constructed and maintained between working areas and streams. During construction of the barriers, muddying of streams should be held to a minimum.
- Diversion structures must be adequately designed to accommodate fluctuations in water depth or flow volume due to tides, storms, flash floods, etc.
- Heavy equipment driven in wet portions of a water body to accomplish work should be completely clean of petroleum residue, and water levels should be below the fuel tanks, gearboxes, and axles of the equipment unless lubricants and fuels are sealed such that inundation by water will not result in discharges of fuels, oils, greases, or hydraulic fluids.

# Clear Water Diversion

## NS-5

- Excavation equipment buckets may reach out into the water for the purpose of removing or placing fill materials. Only the bucket of the crane/ excavator/backhoe may operate in a water body. The main body of the crane/excavator/backhoe should not enter the water body except as necessary to cross the stream to access the work site.
- Stationary equipment such as motors and pumps located within or adjacent to a water body, should be positioned over drip pans.
- When any artificial obstruction is being constructed, maintained, or placed in operation, sufficient water should, at all times, be allowed to pass downstream to maintain aquatic life.
- Equipment should not be parked below the high water mark unless allowed by a permit.
- Disturbance or removal of vegetation should not exceed the minimum necessary to complete operations. Precautions should be taken to avoid damage to vegetation by people or equipment. Disturbed vegetation should be replaced with the appropriate erosion control measures.
- Riparian vegetation approved for trimming as part of the project should be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation should be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble should be removed upon completion of project activities.
- Drip pans should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.
- Where possible, avoid or minimize diversion and encroachment impacts by scheduling construction during periods of low flow or when the stream is dry. Scheduling should also consider seasonal releases of water from dams, fish migration and spawning seasons, and water demands due to crop irrigation.
- Construct diversion structures with materials free of potential pollutants such as soil, silt, sand, clay, grease, or oil.

### ***Temporary Diversions and Encroachments***

- Construct diversion channels in accordance with EC-9, Earth Dikes and Drainage Swales.
- In high flow velocity areas, stabilize slopes of embankments and diversion ditches using an appropriate liner, in accordance with EC-7, Geotextiles and Mats, or use rock slope protection.
- Where appropriate, use natural streambed materials such as large cobbles and boulders for temporary embankment and slope protection, or other temporary soil stabilization methods.
- Provide for velocity dissipation at transitions in the diversion, such as the point where the stream is diverted to the channel and the point where the diverted stream is returned to its natural channel. See also EC-10, Velocity Dissipation Devices.

# Clear Water Diversion

## NS-5

### ***Temporary Dry Construction Areas***

- When dewatering behind temporary structures to create a temporary dry construction area, such as cofferdams, pass pumped water through a sediment-settling device, such as a portable tank or settling basin, before returning water to the water body. See also NS-2, Dewatering Operations.
- Any substance used to assemble or maintain diversion structures, such as form oil, should be non-toxic and non-hazardous.
- Any material used to minimize seepage underneath diversion structures, such as grout, should be non-toxic, non-hazardous, and as close to a neutral pH as possible.

### ***Comparison of Diversion and Isolation Techniques:***

- Gravel bags are relatively inexpensive, but installation and removal can be labor intensive. It is also difficult to dewater the isolated area. Sandbags should not be used for this technique in rivers or streams, as sand should never be put into or adjacent to a stream, even if encapsulated in geotextile.
- Gravel Bag Berms (SE-6) used in conjunction with an impermeable membrane are cost effective, and can be dewatered relatively easily. If spawning gravel is used, the impermeable membrane can be removed from the stream, and the gravel can be spread out and left as salmonid spawning habitat if approved in the permit. Only clean, washed gravel should be used for both the gravel bag and gravel berm techniques.
- Cofferdams are relatively expensive, but frequently allow full dewatering. Also, many options now available are relatively easy to install.
- Sheet pile enclosures are a much more expensive solution, but do allow full dewatering. This technique is not well suited to small streams, but can be effective on large rivers or lakes, and where staging and heavy equipment access areas are available.
- K-rails are an isolation method that does not allow full dewatering, but can be used in small to large watercourses, and in fast-water situations.
- A relatively inexpensive isolation method is filter fabric isolation. This method involves placement of gravel bags or continuous berms to 'key-in' the fabric, and subsequently staking the fabric in place. This method should be used in relatively calm water, and can be used in smaller streams. Note that this is not a dewatering method, but rather a sediment isolation method.
- Turbidity curtains should be used where sediment discharge to a stream is unavoidable. They can also be used for in-stream construction, when dewatering an area is not required.
- When used in watercourses or streams, cofferdams must be used in accordance with permit requirements.
- Manufactured diversion structures should be installed following manufacturer's specifications.

# Clear Water Diversion

# NS-5

- Filter fabric and turbidity curtain isolation installation methods can be found in the specific technique descriptions that follow.

## ***Filter Fabric Isolation Technique***

### *Definition and Purpose*

A filter fabric isolation structure is a temporary structure built into a waterway to enclose a construction area and reduce sediment pollution from construction work in or adjacent to water. This structure is composed of filter fabric, gravel bags, and steel t-posts.

### *Appropriate Applications*

- Filter fabric may be used for construction activities such as streambank stabilization, or culvert, bridge, pier or abutment installation. It may also be used in combination with other methods, such as clean water bypasses and/or pumps.
- Filter fabric isolation is relatively inexpensive. This method involves placement of gravel bags or continuous berms to 'key-in' the fabric, and subsequently staking the fabric in place.
- If spawning gravel is used, all other components of the isolation can be removed from the stream, and the gravel may be spread out and left as salmonid spawning habitat if approved in the permit. Whether spawning gravel or other types of gravel are used, only clean washed gravel should be used as infill for the gravel bags or continuous berm.
- This method should be used in relatively calm water, and can be used in smaller streams. This is not a dewatering method, but rather a sediment isolation method.
- Water levels inside and outside the fabric curtain must be about the same, as differential heads will cause the curtain to collapse.

### *Limitations*

- Do not use if the installation, maintenance and removal of the structures will disturb sensitive aquatic species of concern.
- Filter fabrics are not appropriate for projects where dewatering is necessary.
- Filter fabrics are not appropriate to completely dam stream flow.

### *Design and Installation*

- For the filter fabric isolation method, a non-woven or heavy-duty fabric is recommended over standard silt fence. Using rolled geotextiles allows non-standard widths to be used.
- Anchor filter fabric with gravel bags filled with clean, washed gravel. Do not use sand. If a bag should split open, the gravel can be left in the stream, where it can provide aquatic habitat benefits. If a sandbag splits open in a watercourse, the sand could cause a decrease in water quality, and could bury sensitive aquatic habitat.
- Another anchor alternative is a continuous berm, made with the Continuous Berm Machine. This is a gravel-filled bag that can be made in very long segments. The length of the berms is usually limited to 18 ft for ease of handling (otherwise, it gets too heavy to move).

# Clear Water Diversion

# NS-5

- Place the fabric on the bottom of the stream, and place either a bag of clean, washed gravel or a continuous berm over the bottom of the silt fence fabric, such that a bag-width of fabric lies on the stream bottom. The bag should be placed on what will be the outside of the isolation area.
- Pull the fabric up, and place a metal t-post immediately behind the fabric, on the inside of the isolation area; attach the silt fence to the post with three diagonal nylon ties.
- Continue placing fabric as described above until the entire work area has been isolated, staking the fabric at least every 6 ft.

## *Inspection and Maintenance*

- Immediately repair any gaps, holes or scour.
- Remove and properly dispose of sediment buildup.
- Remove BMP upon completion of construction activity. Recycle or reuse if applicable.
- Revegetate areas disturbed by BMP removal if needed.

## ***Turbidity Curtain Isolation Technique***

### *Definition and Purpose*

A turbidity curtain is a fabric barrier used to isolate the near shore work area. The barriers are intended to confine the suspended sediment. The curtain is a floating barrier, and thus does not prevent water from entering the isolated area; rather, it prevents suspended sediment from getting out.

### *Appropriate Applications*

Turbidity curtains should be used where sediment discharge to a stream is unavoidable. They are used when construction activities adjoin quiescent waters, such as lakes, ponds, and slow flowing rivers. The curtains are designed to deflect and contain sediment within a limited area and provide sufficient retention time so that the sediment particles will fall out of suspension.

### *Limitations*

- Turbidity curtains should not be used in flowing water; they are best suited for use in ponds, lakes, and very slow-moving rivers.
- Turbidity curtains should not be placed across the width of a channel.
- Removing sediment that has been deflected and settled out by the curtain may create a discharge problem through the resuspension of particles and by accidental dumping by the removal equipment.

### *Design and Installation*

- Turbidity curtains should be oriented parallel to the direction of flow.
- The curtain should extend the entire depth of the watercourse in calm-water situations.
- In wave conditions, the curtain should extend to within 1 ft of the bottom of the watercourse, such that the curtain does not stir up sediment by hitting the bottom repeatedly. If it is

# Clear Water Diversion

## NS-5

desirable for the curtain to reach the bottom in an active-water situation, a pervious filter fabric may be used for the bottom 1 ft.

- The top of the curtain should consist of flexible flotation buoys, and the bottom should be held down by a load line incorporated into the curtain fabric. The fabric should be a brightly colored impervious mesh.
- The curtain should be held in place by anchors placed at least every 100 ft.
- First, place the anchors, then tow the fabric out in a furled condition, and connect to the anchors. The anchors should be connected to the flotation devices, and not to the bottom of the curtain. Once in place, cut the furling lines, and allow the bottom of the curtain to sink.
- Consideration must be given to the probable outcome of the removal procedure. It must be determined if it will create more of a sediment problem through re-suspension of the particles or by accidental dumping of material during removal. It is recommended that the soil particles trapped by the turbidity curtain only be removed if there has been a significant change in the original contours of the affected area in the watercourse.
- Particles should always be allowed to settle for a minimum of 6 to 12 hours prior to their removal or prior to removal of the turbidity curtain.

### *Maintenance and Inspection:*

- The curtain should be inspected for holes or other problems, and any repairs needed should be made promptly.
- Allow sediment to settle for 6 to 12 hours prior to removal of sediment or curtain. This means that after removing sediment, wait an additional 6 to 12 hours before removing the curtain.
- To remove, install furling lines along the curtain, detach from anchors, and tow out of the water.

### ***K-rail River Isolation***

#### *Definition and Purpose*

This temporary sediment control or stream isolation method uses K-rails to form the sediment deposition area, or to isolate the in-stream or near-bank construction area.

Barriers are placed end-to-end in a pre-designed configuration and gravel-filled bags are used at the toe of the barrier and at their abutting ends to seal and prevent movement of sediment beneath or through the barrier walls.

#### *Appropriate Applications*

The K-rail isolation can be used in streams with higher water velocities than many other isolation techniques.

- This technique is also useful at the toe of embankments, and cut or fill slopes.

# Clear Water Diversion

# NS-5

## *Limitations*

- The K-rail method should not be used to dewater a project site, as the barrier is not watertight.

## *Design and Installation*

- To create a floor for the K-rail, move large rocks and obstructions. Place washed gravel and gravel-filled bags to create a level surface for K-rails to sit. Washed gravel should always be used.
- Place the bottom two K-rails adjacent to each other, and parallel to the direction of flow; fill the center portion with gravel bags. Then place the third K-rail on top of the bottom two. There should be sufficient gravel bags between the bottom K-rails such that the top rail is supported by the gravel. Place plastic sheeting around the K-rails, and secure at the bottom with gravel bags.
- Further support can be added by pinning and cabling the K-rails together. Also, large riprap and boulders can be used to support either side of the K-rail, especially where there is strong current.

## *Inspection and Maintenance:*

- The barrier should be inspected and any leaks, holes, or other problems should be addressed immediately.
- Sediment should be allowed to settle for at least 6 to 12 hours prior to removal of sediment, and for 6 to 12 hours prior to removal of the barrier.

## ***Stream Diversions***

The selection of which stream diversion technique to use will depend upon the type of work involved, physical characteristics of the site, and the volume of water flowing through the project.

### *Advantages of a Pumped Diversion*

- Downstream sediment transport can be nearly eliminated.
- Dewatering of the work area is possible.
- Pipes can be moved around to allow construction operations.
- The dams can serve as temporary access to the site.
- Increased flows can be managed by adding more pumping capacity.

### *Disadvantages of a Pumped Diversion*

- Flow volume is limited by pump capacity.
- A pumped diversion requires 24 hour monitoring of pumps.
- Sudden rain could overtop dams.
- Erosion at the outlet.

# Clear Water Diversion

## NS-5

- Minor in-stream disturbance is required to install and remove dams.

### *Advantages of Excavated Channels and Flumes*

- Excavated channels isolate work from water flow and allow dewatering.
- Excavated channels can handle larger flows than pumps.

### *Disadvantages of Excavated Channels and Flumes*

- Bypass channel or flume must be sized to handle flows, including possible floods.
- Channels must be protected from erosion.
- Flow diversion and re-direction with small dams involves in-stream disturbance and mobilization of sediment.

### *Design and Installation*

- Installation guidelines will vary based on existing site conditions and type of diversion used.
- Pump capacity must be sufficient for design flow.
- A standby pump is required in case a primary pump fails.
- Dam materials used to create dams upstream and downstream of diversion should be erosion resistant; materials such as steel plate, sheet pile, sandbags, continuous berms, inflatable water bladders, etc., would be acceptable.

When constructing a diversion channel, begin excavation of the channel at the proposed downstream end, and work upstream. Once the watercourse to be diverted is reached and the excavated channel is stable, breach the upstream end and allow water to flow down the new channel. Once flow has been established in the diversion channel, install the diversion weir in the main channel; this will force all water to be diverted from the main channel.

### *Inspection and Maintenance*

- Pumped diversions require 24 hour monitoring of pumps.
- Inspect embankments and diversion channels for damage to the linings, accumulating debris, sediment buildup, and adequacy of the slope protection. Remove debris and repair linings and slope protection as required. Remove holes, gaps, or scour.
- Upon completion of work, the diversion or isolation structure should be removed and flow should be redirected through the new culvert or back into the original stream channel. Recycle or reuse if applicable.
- Revegetate areas disturbed by BMP removal if needed.

### **Costs**

Costs of clear water diversion vary considerably and can be very high.

# Clear Water Diversion

## NS-5

### Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Refer to BMP-specific inspection and maintenance requirements.

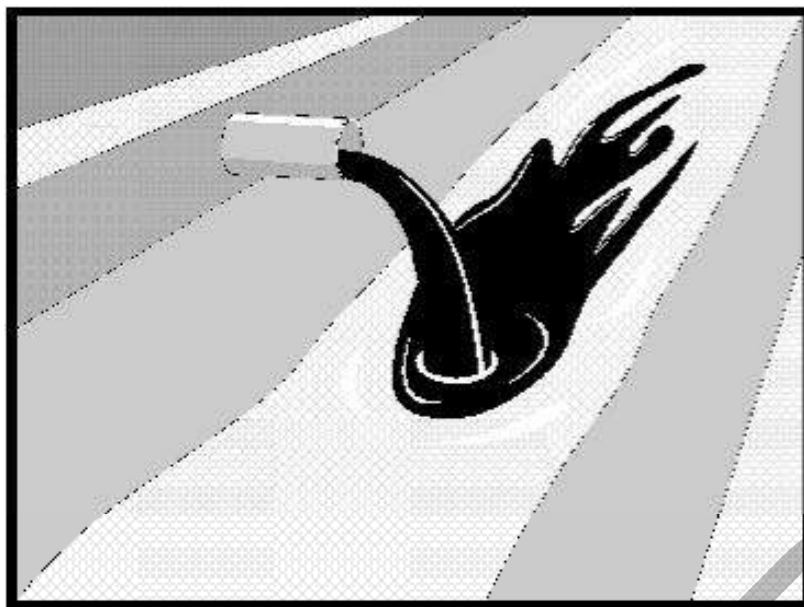
### References

California Bank and Shore Rock Slope Protection Design – Practitioners Guide and Field Evaluations of Riprap Methods, Caltrans Study No. F90TL03, October, 2000.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

# Illicit Connection/Discharge

# NS-6



## Categories

EC	Erosion Control
SE	Sediment Control
TC	Tracking Control
WE	Wind Erosion Control
NS	Non-Stormwater Management Control <input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control

## Legend:

- ☒ **Primary Objective**  
☒ **Secondary Objective**

## Description and Purpose

Procedures and practices designed for construction contractors to recognize illicit connections or illegally dumped or discharged materials on a construction site and report incidents.

## Suitable Applications

This best management practice (BMP) applies to all construction projects. Illicit connection/discharge and reporting is applicable anytime an illicit connection or discharge is discovered or illegally dumped material is found on the construction site.

## Limitations

Illicit connections and illegal discharges or dumping, for the purposes of this BMP, refer to discharges and dumping caused by parties other than the contractor. If pre-existing hazardous materials or wastes are known to exist onsite, they should be identified in the SWPPP and handled as set forth in the SWPPP.

## Implementation

### Planning

- Review the SWPPP. Pre-existing areas of contamination should be identified and documented in the SWPPP.
- Inspect site before beginning the job for evidence of illicit connections, illegal dumping or discharges. Document any pre-existing conditions and notify the owner.

## Targeted Constituents

Sediment	
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

## Potential Alternatives

None

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# Illicit Connection/Discharge

## NS-6

- Inspect site regularly during project execution for evidence of illicit connections, illegal dumping or discharges.
- Observe site perimeter for evidence for potential of illicitly discharged or illegally dumped material, which may enter the job site.

### ***Identification of Illicit Connections and Illegal Dumping or Discharges***

- **General** – unlabeled and unidentifiable material should be treated as hazardous.
- **Solids** - Look for debris, or rubbish piles. Solid waste dumping often occurs on roadways with light traffic loads or in areas not easily visible from the traveled way.
- **Liquids** - signs of illegal liquid dumping or discharge can include:
  - Visible signs of staining or unusual colors to the pavement or surrounding adjacent soils
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Abnormal water flow during the dry weather season
- **Urban Areas** - Evidence of illicit connections or illegal discharges is typically detected at storm drain outfall locations or at manholes. Signs of an illicit connection or illegal discharge can include:
  - Abnormal water flow during the dry weather season
  - Unusual flows in sub drain systems used for dewatering
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Excessive sediment deposits, particularly adjacent to or near active offsite construction projects
- **Rural Areas** - Illicit connections or illegal discharges involving irrigation drainage ditches are detected by visual inspections. Signs of an illicit discharge can include:
  - Abnormal water flow during the non-irrigation season
  - Non-standard junction structures
  - Broken concrete or other disturbances at or near junction structures

### ***Reporting***

Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery. For illicit connections or discharges to the storm drain system, notify the local stormwater management agency. For illegal dumping, notify the local law enforcement agency.

### ***Cleanup and Removal***

The responsibility for cleanup and removal of illicit or illegal dumping or discharges will vary by location. Contact the local stormwater management agency for further information.

# Illicit Connection/Discharge

## NS-6

### Costs

Costs to look for and report illicit connections and illegal discharges and dumping are low. The best way to avoid costs associated with illicit connections and illegal discharges and dumping is to keep the project perimeters secure to prevent access to the site, to observe the site for vehicles that should not be there, and to document any waste or hazardous materials that exist onsite before taking possession of the site.

### Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect the site regularly to check for any illegal dumping or discharge.
- Prohibit employees and subcontractors from disposing of non-job related debris or materials at the construction site.
- Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery.

### References

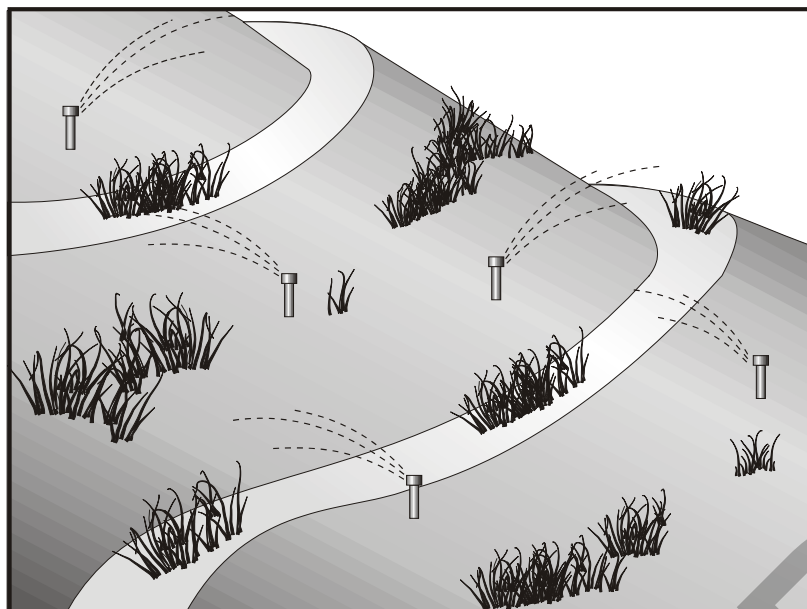
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

# Potable Water/Irrigation

# NS-7



## Categories

EC	Erosion Control
SE	Sediment Control
TC	Tracking Control
WE	Wind Erosion Control
NS	Non-Stormwater Management Control <input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control

## Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

## Description and Purpose

Potable Water/Irrigation consists of practices and procedures to manage the discharge of potential pollutants generated during discharges from irrigation water lines, landscape irrigation, lawn or garden watering, planned and unplanned discharges from potable water sources, water line flushing, and hydrant flushing.

## Suitable Applications

Implement this BMP whenever potable water or irrigation water discharges occur at or enter a construction site.

## Limitations

None identified.

## Implementation

- Direct water from offsite sources around or through a construction site, where feasible, in a way that minimizes contact with the construction site.
- Discharges from water line flushing should be reused for landscaping purposes where feasible.
- Shut off the water source to broken lines, sprinklers, or valves as soon as possible to prevent excess water flow.
- Protect downstream stormwater drainage systems and watercourses from water pumped or bailed from trenches excavated to repair water lines.

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	
Organics	<input checked="" type="checkbox"/>

## Potential Alternatives

None

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# Potable Water/Irrigation

## NS-7

- Inspect irrigated areas within the construction limits for excess watering. Adjust watering times and schedules to ensure that the appropriate amount of water is being used and to minimize runoff. Consider factors such as soil structure, grade, time of year, and type of plant material in determining the proper amounts of water for a specific area.

### Costs

Cost to manage potable water and irrigation are low and generally considered to be a normal part of related activities.

### Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events..
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Repair broken water lines as soon as possible.
- Inspect irrigated areas regularly for signs of erosion and/or discharge.

### References

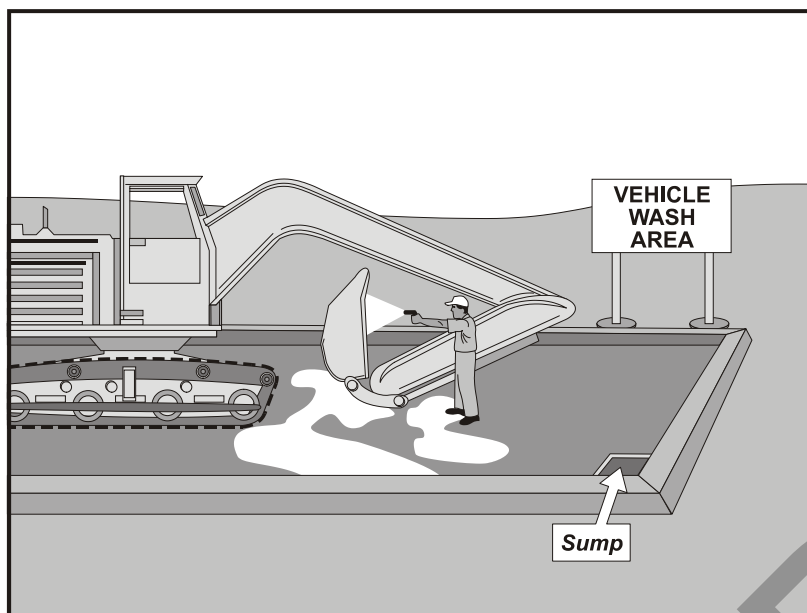
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

# Vehicle and Equipment Cleaning

## NS-8



### Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

### Description and Purpose

Vehicle and equipment cleaning procedures and practices eliminate or reduce the discharge of pollutants to stormwater from vehicle and equipment cleaning operations. Procedures and practices include but are not limited to: using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors in proper cleaning procedures.

### Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment cleaning is performed.

### Limitations

Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

### Implementation

Other options to washing equipment onsite include contracting with either an offsite or mobile commercial washing business. These businesses may be better equipped to handle and dispose of the wash waters properly. Performing this work offsite can also be economical by eliminating the need for a separate washing operation onsite.

If washing operations are to take place onsite, then:

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	
Metals	
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

### Potential Alternatives

None

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# Vehicle and Equipment Cleaning

## NS-8

- Use phosphate-free, biodegradable soaps.
- Educate employees and subcontractors on pollution prevention measures.
- Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates.
- Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site unless resulting wastes are fully contained and disposed of. Resulting wastes should not be discharged or buried, and must be captured and recycled or disposed according to the requirements of WM-10, Liquid Waste Management or WM-6, Hazardous Waste Management, depending on the waste characteristics. Minimize use of solvents. Use of diesel for vehicle and equipment cleaning is prohibited.
- All vehicles and equipment that regularly enter and leave the construction site must be cleaned offsite.
- When vehicle and equipment washing and cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area should have the following characteristics:
  - Located away from storm drain inlets, drainage facilities, or watercourses
  - Paved with concrete or asphalt and bermed to contain wash waters and to prevent runoff
  - Configured with a sump to allow collection and disposal of wash water
  - No discharge of wash waters to storm drains or watercourses
  - Used only when necessary
- When cleaning vehicles and equipment with water:
  - Use as little water as possible. High-pressure sprayers may use less water than a hose and should be considered
  - Use positive shutoff valve to minimize water usage
  - Facility wash racks should discharge to a sanitary sewer, recycle system or other approved discharge system and must not discharge to the storm drainage system, watercourses, or to groundwater

### Costs

Cleaning vehicles and equipment at an offsite facility may reduce overall costs for vehicle and equipment cleaning by eliminating the need to provide similar services onsite. When onsite cleaning is needed, the cost to establish appropriate facilities is relatively low on larger, long-duration projects, and moderate to high on small, short-duration projects.

# Vehicle and Equipment Cleaning

# NS-8

## Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspection and maintenance is minimal, although some berm repair may be necessary.
- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
- Inspect sump regularly and remove liquids and sediment as needed.
- Prohibit employees and subcontractors from washing personal vehicles and equipment on the construction site.

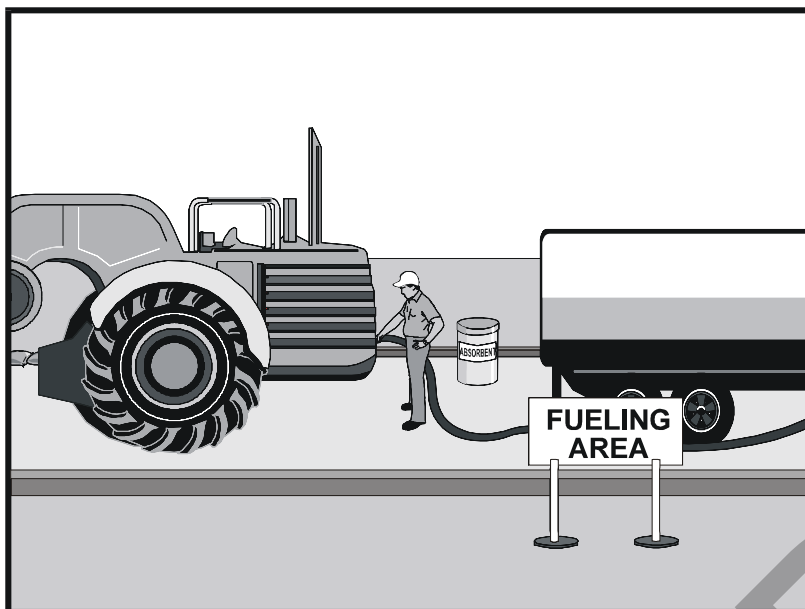
## References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Swisher, R.D. Surfactant Biodegradation, Marcel Decker Corporation, 1987.

# Vehicle and Equipment Fueling

## NS-9



### Categories

EC	Erosion Control
SE	Sediment Control
TC	Tracking Control
WE	Wind Erosion Control
NS	Non-Stormwater Management Control <input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control

### Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

### Description and Purpose

Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of stormwater. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

### Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment fueling takes place.

### Limitations

Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/ Exit.

### Implementation

- Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.
- Discourage "topping-off" of fuel tanks.

### Targeted Constituents

Sediment
Nutrients
Trash
Metals
Bacteria
Oil and Grease <input checked="" type="checkbox"/>
Organics

### Potential Alternatives

None

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# Vehicle and Equipment Fueling

## NS-9

- Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks, and should be disposed of properly after use.
- Drip pans or absorbent pads should be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the adsorbent materials promptly and dispose of properly.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- When fueling must take place onsite, designate an area away from drainage courses to be used. Fueling areas should be identified in the SWPPP.
- Dedicated fueling areas should be protected from stormwater runoff and should be located at least 50 ft away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Protect fueling areas with berms and dikes to prevent runoff, and to contain spills.
- Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.
- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).
- Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

### Costs

- All of the above measures are low cost except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.

### Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.
- Keep ample supplies of spill cleanup materials onsite.

# Vehicle and Equipment Fueling

## NS-9

- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

### References

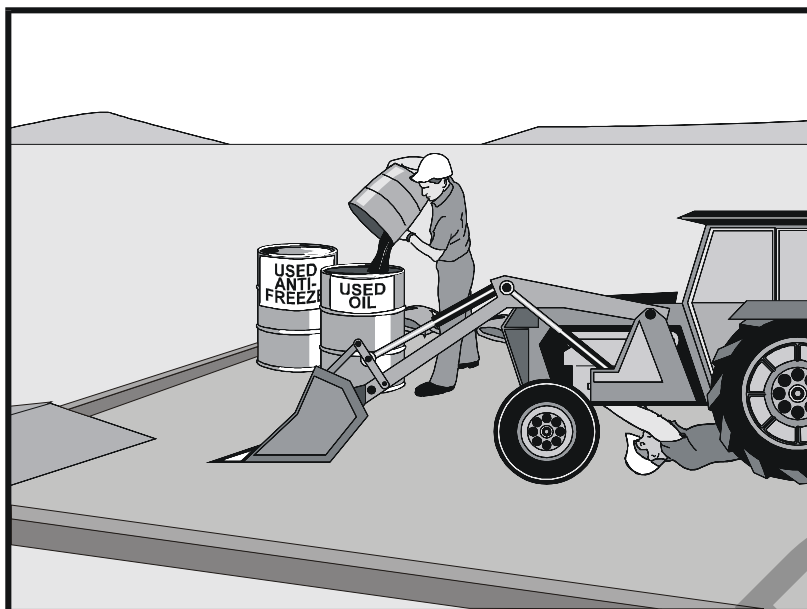
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

# Vehicle & Equipment Maintenance NS-10



## Categories

EC	Erosion Control
SE	Sediment Control
TC	Tracking Control
WE	Wind Erosion Control
NS	Non-Stormwater Management Control <input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control

## Legend:

- ☒ Primary Objective  
☒ Secondary Objective

## Description and Purpose

Prevent or reduce the contamination of stormwater resulting from vehicle and equipment maintenance by running a “dry and clean site”. The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures.

## Suitable Applications

These procedures are suitable on all construction projects where an onsite yard area is necessary for storage and maintenance of heavy equipment and vehicles.

## Limitations

Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Outdoor vehicle or equipment maintenance is a potentially significant source of stormwater pollution. Activities that can contaminate stormwater include engine repair and service, changing or replacement of fluids, and outdoor equipment storage and parking (engine fluid leaks). For further information on vehicle or equipment servicing, see NS-8,

## Targeted Constituents

Sediment	
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

## Potential Alternatives

None

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# Vehicle & Equipment Maintenance NS-10

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Vehicle and Equipment Cleaning, and NS-9, Vehicle and Equipment Fueling.

## Implementation

- Use offsite repair shops as much as possible. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate maintenance area.
- If maintenance must occur onsite, use designated areas, located away from drainage courses. Dedicated maintenance areas should be protected from stormwater runoff and runoff, and should be located at least 50 ft from downstream drainage facilities and watercourses.
- Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.
- Use adsorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- Inspect onsite vehicles and equipment daily at startup for leaks, and repair immediately.
- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.
- Train employees and subcontractors in proper maintenance and spill cleanup procedures.
- Drip pans or plastic sheeting should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.
- For long-term projects, consider using portable tents or covers over maintenance areas if maintenance cannot be performed offsite.
- Consider use of new, alternative greases and lubricants, such as adhesive greases, for chassis lubrication and fifth-wheel lubrication.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose of or recycle used batteries.
- Do not bury used tires.

# Vehicle & Equipment Maintenance NS-10

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- Repair leaks of fluids and oil immediately.

Listed below is further information if you must perform vehicle or equipment maintenance onsite.

## ***Safer Alternative Products***

- Consider products that are less toxic or hazardous than regular products. These products are often sold under an “environmentally friendly” label.
- Consider use of grease substitutes for lubrication of truck fifth-wheels. Follow manufacturers label for details on specific uses.
- Consider use of plastic friction plates on truck fifth-wheels in lieu of grease. Follow manufacturers label for details on specific uses.

## ***Waste Reduction***

Parts are often cleaned using solvents such as trichloroethylene, trichloroethane, or methylene chloride. Many of these cleaners are listed in California Toxic Rule as priority pollutants. These materials are harmful and must not contaminate stormwater. They must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, one solvent can perform a job as well as two different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check the list of active ingredients to see whether it contains chlorinated solvents. The “chlor” term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

## ***Recycling and Disposal***

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous wastes separate, do not mix used oil solvents, and keep chlorinated solvents (like, -trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around. Provide cover and secondary containment until these materials can be removed from the site.

Oil filters can be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

## ***Costs***

All of the above are low cost measures. Higher costs are incurred to setup and maintain onsite maintenance areas.

# Vehicle & Equipment Maintenance NS-10

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## Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Keep ample supplies of spill cleanup materials onsite.
- Maintain waste fluid containers in leak proof condition.
- Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately or the problem vehicle(s) or equipment should be removed from the project site.
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

## References

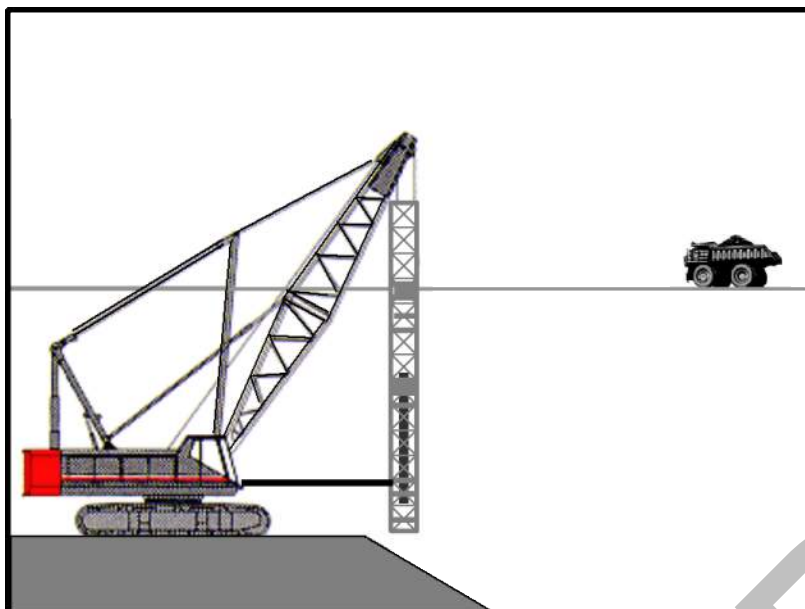
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Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

# Pile Driving Operations

# NS-11



## Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	

## Legend:

- ☒ **Primary Objective**  
☒ **Secondary Objective**

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	

## Potential Alternatives

None

## Description and Purpose

The construction and retrofit of bridges and retaining walls often include driving piles for foundation support and shoring operations. Driven piles are typically constructed of precast concrete, steel, or timber. Driven sheet piles are also used for shoring and cofferdam construction. Proper control and use of equipment, materials, and waste products from pile driving operations will reduce or eliminate the discharge of potential pollutants to the storm drain system, watercourses, and waters of the United States.

## Suitable Applications

These procedures apply to all construction sites near or adjacent to a watercourse or groundwater where permanent and temporary pile driving (impact and vibratory) takes place, including operations using pile shells as well as construction of cast-in-steel-shell and cast-in-drilled-hole piles.

## Limitations

None identified.

## Implementation

- Use drip pans or absorbent pads during vehicle and equipment operation, maintenance, cleaning, fueling, and storage. Refer to NS-8, Vehicle and Equipment Cleaning, NS-9, Vehicle and Equipment Fueling, and NS-10, Vehicle and Equipment Maintenance.

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# Pile Driving Operations

## NS-11

- Have spill kits and cleanup materials available at all locations of pile driving. Refer to WM-4, Spill Prevention and Control.
- Equipment that is stored or in use in streambeds, or on docks, barges, or other structures over water bodies should be kept leak free.
- Park equipment over plastic sheeting or equivalent where possible. Plastic is not a substitute for drip pans or absorbent pads. The storage or use of equipment in streambeds or other bodies of water must comply with all applicable permits.
- Implement other BMPs as applicable, such as NS-2, Dewatering Operations, WM-5, Solid Waste Management, WM-6, Hazardous Waste Management, and WM-10, Liquid Waste Management.
- When not in use, store pile-driving equipment away from concentrated flows of stormwater, drainage courses, and inlets. Protect hammers and other hydraulic attachments from runoff and runoff by placing them on plywood and covering them with plastic or a comparable material prior to the onset of rain.
- Use less hazardous products, e.g., vegetable oil, when practicable.

### Costs

All of the above measures can be low cost.

### Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect equipment every day at startup and repair equipment as needed (i.e., worn or damaged hoses, fittings, and gaskets). Recheck equipment at shift changes or at the end of the day and scheduled repairs as needed.

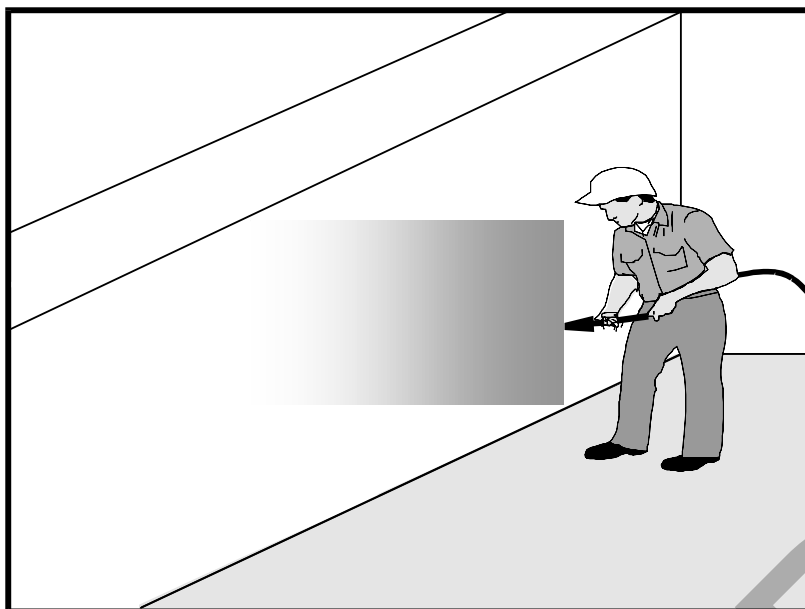
### References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

# Concrete Curing

## NS-12



### Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	<input checked="" type="checkbox"/>

### Legend:

- ☒ Primary Category  
☒ Secondary Category

### Description and Purpose

Concrete curing is used in the construction of structures such as bridges, retaining walls, pump houses, large slabs, and structured foundations. Concrete curing includes the use of both chemical and water methods.

Concrete and its associated curing materials have basic chemical properties that can raise the pH of water to levels outside of the permitted range. Discharges of stormwater and non-stormwater exposed to concrete during curing may have a high pH and may contain chemicals, metals, and fines. The General Permit incorporates Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Proper procedures and care should be taken when managing concrete curing materials to prevent them from coming into contact with stormwater flows, which could result in a high pH discharge.

### Suitable Applications

Suitable applications include all projects where Portland Cement Concrete (PCC) and concrete curing chemicals are placed where they can be exposed to rainfall, runoff from other areas, or where runoff from the PCC will leave the site.

### Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	

### Potential Alternatives

None

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# Concrete Curing

# NS-12

## Implementation

### ***Chemical Curing***

- Avoid over spray of curing compounds.
- Minimize the drift by applying the curing compound close to the concrete surface. Apply an amount of compound that covers the surface, but does not allow any runoff of the compound.
- Use proper storage and handling techniques for concrete curing compounds. Refer to WM-1, Material Delivery and Storage.
- Protect drain inlets prior to the application of curing compounds.
- Refer to WM-4, Spill Prevention and Control.

### ***Water Curing for Bridge Decks, Retaining Walls, and other Structures***

- Direct cure water away from inlets and watercourses to collection areas for evaporation or other means of removal in accordance with all applicable permits. See WM-8 Concrete Waste Management.
- Collect cure water at the top of slopes and transport to a concrete waste management area in a non-erosive manner. See EC-9 Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Utilize wet blankets or a similar method that maintains moisture while minimizing the use and possible discharge of water.

### ***Education***

- Educate employees, subcontractors, and suppliers on proper concrete curing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete curing procedures.

### **Costs**

All of the above measures are generally low cost.

### **Inspection and Maintenance**

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.

# Concrete Curing

## NS-12

- Sample non-stormwater discharges and stormwater runoff that contacts uncured and partially cured concrete as required by the General Permit.
- Ensure that employees and subcontractors implement appropriate measures for storage, handling, and use of curing compounds.
- Inspect cure containers and spraying equipment for leaks.

### References

Blue Print for a Clean Bay-Construction-Related Industries: Best Management Practices for Stormwater Pollution Prevention; Santa Clara Valley Non Point Source Pollution Control Program, 1992.

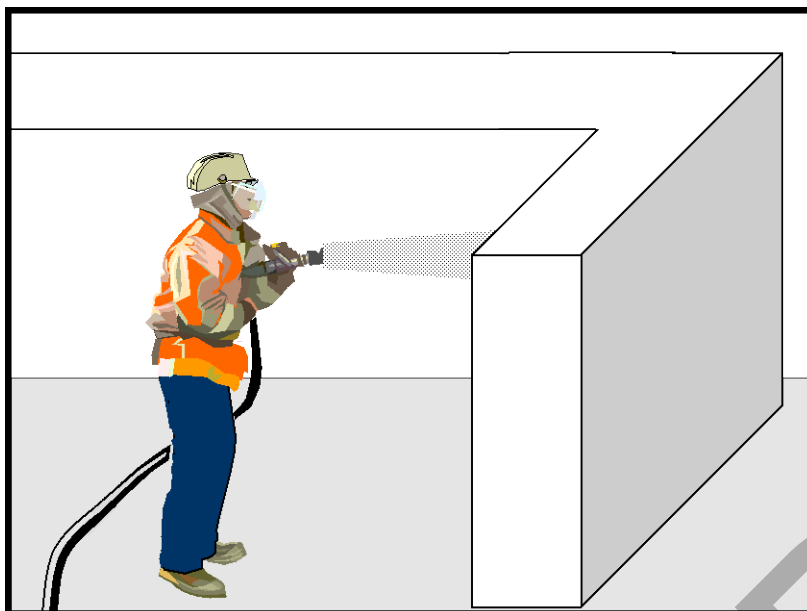
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

# Concrete Finishing

## NS-13



### Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	<input checked="" type="checkbox"/>

### Legend:

- ☒ Primary Category  
☒ Secondary Category

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	
Organics	<input checked="" type="checkbox"/>

### Potential Alternatives

None

### Description and Purpose

Concrete finishing methods are used for bridge deck rehabilitation, paint removal, curing compound removal, and final surface finish appearances. Methods include sand blasting, shot blasting, grinding, or high pressure water blasting. Stormwater and non-stormwater exposed to concrete finishing by-products may have a high pH and may contain chemicals, metals, and fines. Proper procedures and implementation of appropriate BMPs can minimize the impact that concrete-finishing methods may have on stormwater and non-stormwater discharges.

The General Permit incorporates Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Concrete and its associated curing materials have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

### Suitable Applications

These procedures apply to all construction locations where concrete finishing operations are performed.

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# Concrete Finishing

# NS-13

## Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

## Implementation

- Collect and properly dispose of water from high-pressure water blasting operations.
- Collect contaminated water from blasting operations at the top of slopes. Transport or dispose of contaminated water while using BMPs such as those for erosion control. Refer to EC-9, Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Direct water from blasting operations away from inlets and watercourses to collection areas for infiltration or other means of removal (dewatering). Refer to NS-2 Dewatering Operations.
- Protect inlets during sandblasting operations. Refer to SE-10, Storm Drain Inlet Protection.
- Refer to WM-8, Concrete Waste Management for disposal of concrete debris.
- Minimize the drift of dust and blast material as much as possible by keeping the blasting nozzle close to the surface.
- When blast residue contains a potentially hazardous waste, refer to WM-6, Hazardous Waste Management.

## Education

- Educate employees, subcontractors, and suppliers on proper concrete finishing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete finishing procedures.

## Costs

These measures are generally of low cost.

## Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts concrete dust and debris as required by the General Permit.

# Concrete Finishing

## NS-13

- Sweep or vacuum up debris from sandblasting at the end of each shift.
- At the end of each work shift, remove and contain liquid and solid waste from containment structures, if any, and from the general work area.
- Inspect containment structures for damage prior to use and prior to onset of forecasted rain.

### References

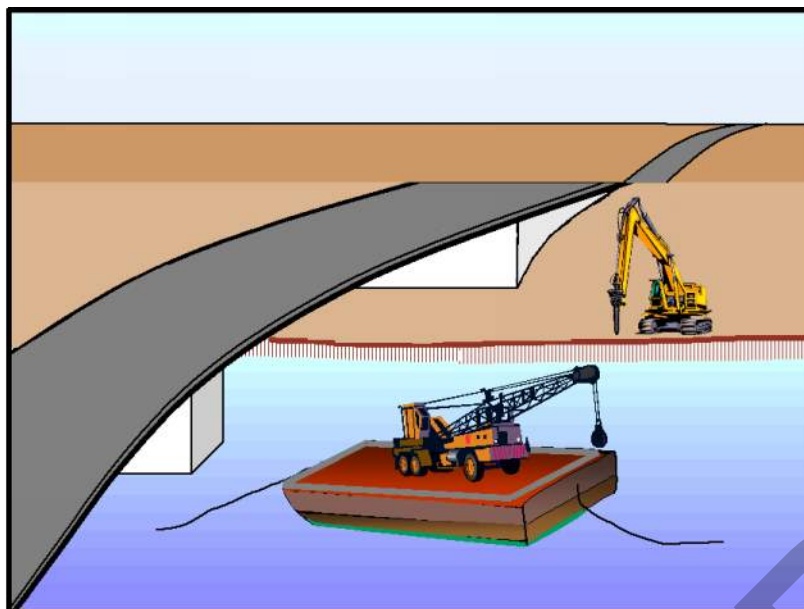
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

# Material Over Water

## NS-14



### Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	<input checked="" type="checkbox"/>

### Legend:

- ☒ **Primary Objective**  
☒ **Secondary Objective**

### Description and Purpose

Procedures for the proper use, storage, and disposal of materials and equipment on barges, boats, temporary construction pads, or similar locations that minimize or eliminate the discharge of potential pollutants to a watercourse.

### Suitable Applications

Applies where materials and equipment are used on barges, boats, docks, and other platforms over or adjacent to a watercourse including waters of the United States. These procedures should be implemented for construction materials and wastes (solid and liquid), soil or dredging materials, or any other materials that may cause or contribute to exceedances of water quality standards.

### Limitations

Dredge and fill activities are regulated by the US Army Corps of Engineers and Regional Boards under Section 404/401 of the Clean Water Act.

### Implementation

- Refer to WM-1, Material Delivery and Storage and WM-4, Spill Prevention and Control.
- Use drip pans and absorbent materials for equipment and vehicles and ensure that an adequate supply of spill clean up materials is available.
- Drip pans should be placed under all vehicles and equipment placed on docks, barges, or other structures over

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

### Potential Alternatives

None

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# Material Over Water

# NS-14

water bodies when the vehicle or equipment is expected to be idle for more than 1 hour.

- Maintain equipment in accordance with NS-10, Vehicle and Equipment Maintenance. If a leaking line cannot be repaired, remove equipment from over the water.
- Provide watertight curbs or toe boards to contain spills and prevent materials, tools, and debris from leaving the barge, platform, dock, etc.
- Secure all materials to prevent discharges to receiving waters via wind.
- Identify types of spill control measures to be employed, including the storage of such materials and equipment. Ensure that staff is trained regarding the use of the materials, deployment and access of control measures, and reporting measures.
- In case of spills, contact the local Regional Board as soon as possible but within 48 hours.
- Refer to WM-5, Solid Waste Management (non-hazardous) and WM-6, Hazardous Waste Management. Ensure the timely and proper removal of accumulated wastes
- Comply with all necessary permits required for construction within or near the watercourse, such as Regional Water Quality Control Board, U.S. Army Corps of Engineers, Department of Fish and Game or and other local permitting.
- Discharges to waterways should be reported to the Regional Water Quality Control Board immediately upon discovery. A written discharge notification must follow within 7 days. Follow the spill reporting procedures contained in SWPPP.

## Costs

These measures are generally of low to moderate cost. Exceptions are areas for temporary storage of materials, engine fluids, or wastewater pump out.

## Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Ensure that employees and subcontractors implement the appropriate measures for storage and use of materials and equipment.
- Inspect and maintain all associated BMPs and perimeter controls to ensure continuous protection of the water courses, including waters of the United States.

## References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

# Material Over Water

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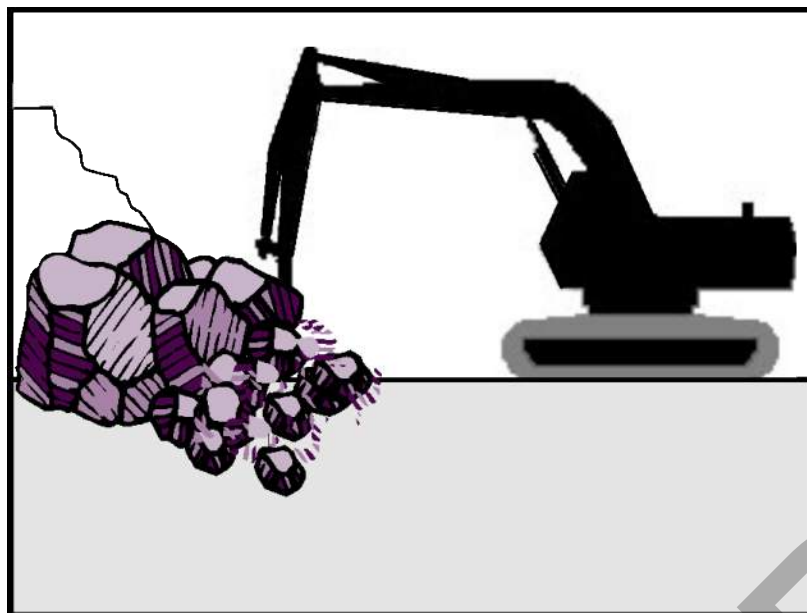
**NS-14**

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

FOR BIDDING

# Demolition Adjacent to Water

## NS-15



### Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ Primary Objective  
☒ Secondary Objective

### Description and Purpose

Procedures to protect water bodies from debris and wastes associated with structure demolition or removal over or adjacent to watercourses.

### Suitable Applications

Full bridge demolition and removal, partial bridge removal (barrier rail, edge of deck) associated with bridge widening projects, concrete channel removal, or any other structure removal that could potentially affect water quality.

### Limitations

None identified.

### Implementation

- Refer to NS-5, Clear Water Diversion, to direct water away from work areas.
- Use attachments on construction equipment such as backhoes to catch debris from small demolition operations.
- Use covers or platforms to collect debris.
- Platforms and covers are to be approved by the owner.
- Stockpile accumulated debris and waste generated during demolition away from watercourses and in accordance with WM-3, Stockpile Management.
- Ensure safe passage of wildlife, as necessary.

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

### Potential Alternatives

None

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# Demolition Adjacent to Water

# NS-15

- Discharges to waterways shall be reported to the Regional Water Quality Control Board immediately upon discovery. A written discharge notification must follow within 7 days. Follow the spill reporting procedures in the SWPPP.
- For structures containing hazardous materials, i.e., lead paint or asbestos, refer to BMP WM-6, Hazardous Waste Management. For demolition work involving soil excavation around lead-painted structures, refer to WM-7, Contaminated Soil Management.

## Costs

Cost may vary according to the combination of practices implemented.

## Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Any debris-catching devices shall be emptied regularly. Collected debris shall be removed and stored away from the watercourse and protected from runoff.

## References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

# Temporary Batch Plants

# NS-16



## Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	

## Legend:

- ☒ Primary Category
- ☒ Secondary Category

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	
Organics	

## Potential Alternatives

None

## Description and Purpose

The construction of roads, bridges, retaining walls, and other large structures in remote areas, often requires temporary batch plant facilities to manufacture Portland Cement Concrete (PCC) or asphalt cement (AC). Temporary batch plant facilities typically consist of silos containing fly ash, lime, and cement; heated tanks of liquid asphalt; sand and gravel material storage areas; mixing equipment; above ground storage tanks containing concrete additives and water; and designated areas for sand and gravel truck unloading, concrete truck loading, and concrete truck washout. Proper control and use of equipment, materials, and waste products from temporary batch plant facilities will reduce the discharge of potential pollutants to the storm drain system or watercourses, reduce air emissions, and mitigate noise impacts.

The General Permit draft incorporates Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements). Many types of batch plant materials, including mortar, concrete, cement and block and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows which may cause an exceedance of the General Permit requirements.

## Suitable Applications

These procedures typically apply to construction sites where temporary batch plant facilities are used; however, some of the

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# Temporary Batch Plants

# NS-16

practices described are applicable to construction sites with general concrete use.

## Limitations

The General Permit for discharges of stormwater associated with industrial activities (General Industrial Permit) may be applicable to temporary batch plants.

Specific permit requirements or mitigation measures such as Air Resources Board (ARB), Air Quality Management District (AQMD), Air Pollution Control District (APCD, Regional Water Quality Control Board (RWQCB), county ordinances and city ordinances may require alternative mitigation measures for temporary batch plants. Contact the local regulatory agencies to determine if a permit is required.

## Implementation

### Planning

- Temporary batch plants may be subject to the General Industrial Permit. To obtain a copy of this permit and the application forms, visit <http://www.waterboards.ca.gov> or contact the State Water Resources Control Board.
- Proper planning, design, and construction of temporary batch plants should be implemented to minimize potential water quality, air pollution, and noise impacts associated with temporary batch plants.
- BMPs and a Construction Site Monitoring Plan (CSMP) should be included in the project Stormwater Pollution Prevention Plan (SWPPP). BMPs should be implemented, inspected, and maintained in accordance with these plans.
- Temporary batch plants should be managed to comply with AQMD Statewide Registration Program and/or local AQMD Portable Equipment Registration requirements.
- Construct temporary batch plants downwind of existing developments whenever possible.
- Placement of access roads should be planned to mitigate water and air quality impacts.

### Layout and Design

- Temporary batch plants should be properly located and designed to mitigate water quality impacts to receiving water bodies. Batch plants should be located away from watercourses, drainage courses, and drain inlets. Batch plants should be located to minimize the potential for stormwater runoff onto the site.
- Temporary batch plant facilities (including associated stationary equipment and stockpiles) should be located at least 300 ft from any recreational area, school, residence, or other structure not associated with the construction project.
- Construct continuous interior AC or PCC berms around batch plant equipment (mixing equipment, silos, concrete drop points, conveyor belts, admixture tanks, etc.) to facilitate proper containment and cleanup of releases. Rollover or flip top curbs or dikes should be placed at ingress and egress points (SE-12, Temporary Silt Dike).
- Direct runoff from the paved or unpaved portion of the batch plant into a sump and pipe to a lined washout area or dewatering tank.

# Temporary Batch Plants

## NS-16

- Direct stormwater and non-stormwater runoff from unpaved portions of batch plant facility to catchment ponds or tanks.
- Construct and remove concrete washout facilities in accordance with WM-8, Concrete Waste Management.
- Layout of a typical batch plant and associated BMP is located at the end of this BMP fact sheet.

### ***Operational Procedures***

- Washout of concrete trucks should be conducted in a designated area in accordance with WM-8, Concrete Waste Management.
- Do not dispose of concrete into drain inlets, the stormwater drainage system, or watercourses.
- Washing of concrete mixing and transport equipment (including concrete truck washout) should occur in a designated area in accordance with WM-8, Concrete Waste Management.
- Washing equipment, tools, or vehicles to remove PCC should be conducted in accordance with NS-7, Potable Water/Irrigation, NS-8, Vehicle and Equipment Cleaning, and WM-8, Concrete Waste Management..
- All dry material transfer points should be ducted through a fabric or cartridge type filter unless there are no visible emissions from the transfer point.
- Equip all bulk storage silos, including auxiliary bulk storage trailers, with fabric or cartridge type filter(s).
- Maintain silo vent filters in proper operating condition.
- Equip silos and auxiliary bulk storage trailers with dust-tight service hatches.
- Fabric dust collection system should be capable of controlling particulate matter in accordance with the California Air Resources Control Board and local Air Pollution Control District Regulations.
- Fabric dust collectors (except for vent filters) should be equipped with an operational pressure differential gauge to measure the pressure drop across the filters.
- All transfer points should be equipped with a wet suppression system to control fugitive particulate emissions unless there are no visible emissions.
- All conveyors should be covered, unless the material being transferred results in no visible emissions.
- There should be no visible emissions beyond the property line, while the equipment is being operated.
- Collect dust emissions from the loading of open-bodied trucks, at the drip point of dry batch plants, or dust emissions from the drum feed for central mix plants.

# Temporary Batch Plants

# NS-16

- Equip silos and auxiliary bulk storage trailers with a visible and/or audible warning mechanism to warn operators that the silo or trailer is full.
- All open-bodied vehicles transporting material should be loaded with a final layer of wet sand and the truck should be covered with a tarp to reduce emissions.

## ***Tracking Control***

- Plant roads (batch truck and material delivery truck roads) and areas between stockpiles and conveyor hoppers should be stabilized (TC-2, Stabilized Construction Roadway), watered, treated with dust-suppressant chemicals (WE-1, Wind Erosion Control), or paved with a cohesive hard surface that can be repeatedly swept, maintained intact, and cleaned as necessary to control dust emissions.
- Trucks should not track PCC from plants onto public roads. Use appropriate practices from TC-1, Stabilized Construction Entrance/Exit, to prevent tracking.

## ***Materials Storage***

- WM-1, Material Delivery and Storage, should be implemented at all batch plants using concrete components or compounds. An effective strategy is to cover and contain materials.
- WM-2, Material Use should be conducted in a way to minimize or eliminate the discharge of materials to storm drain system or watercourse.
- Ensure that finer materials are not dispersed into the air during operations, such as unloading of cement delivery trucks.
- Stockpiles should be covered and enclosed with perimeter sediment barriers per WM-3, Stockpile Management. Uncovered stockpiles should be sprayed with water and/or dust-suppressant chemicals as necessary to control dust emissions, unless the stockpiled material results in no visible emissions. An operable stockpile watering system should be onsite at all times.
- Store bagged and boxed materials on pallets and cover or store in a completely enclosed storage area on non-working days and prior to rain.
- Minimize stockpiles of demolished PCC by recycling them in a timely manner.
- Provide secondary containment for liquid materials (WM-1, Material Delivery and Storage, WM-10, Liquid Waste Management). Containment should provide sufficient volume to contain precipitation from a 25-year storm plus 10% of the aggregate volume of all containers or plus 100% of the largest container, whichever is greater.
- Handle solid and liquid waste in accordance with WM-5, Solid Waste Management, WM-10, Liquid Waste Management, and WM-8, Concrete Waste Management.
- Maintain adequate supplies of spill cleanup materials and train staff to respond to spills per WM-4, Spill Prevention and Control.
- Immediately contain and clean up spilled cement and fly ash and contain.

# Temporary Batch Plants

# NS-16

## ***Equipment Maintenance***

- Equipment should be maintained to prevent fluid leaks and spills per NS-9, Vehicle and Equipment Fueling, and NS-10, Vehicle and Equipment Maintenance.
- Maintain adequate supplies of spill cleanup materials and train staff to respond to spills per WM-4, Spill Prevention and Control.
- Incorporate other BMPs such as WM-5, Solid Waste Management, WM-6, Hazardous Waste Management, and WM-10, Liquid Waste Management.

## **Costs**

Costs will vary depending on the size of the facility and combination of BMPs implemented.

## **Inspection and Maintenance**

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts cementitious materials or fly ash as required by the General Permit.
- Inspect and repair equipment (for damaged hoses, fittings, and gaskets).
- Inspect and maintain a Stabilized Construction Entrance/Exit (TC-1) as needed.
- Inspect and maintain stabilized haul roads as needed (TC-2, Stabilized Construction Roadway).
- Inspect and maintain materials and waste storage areas as needed.

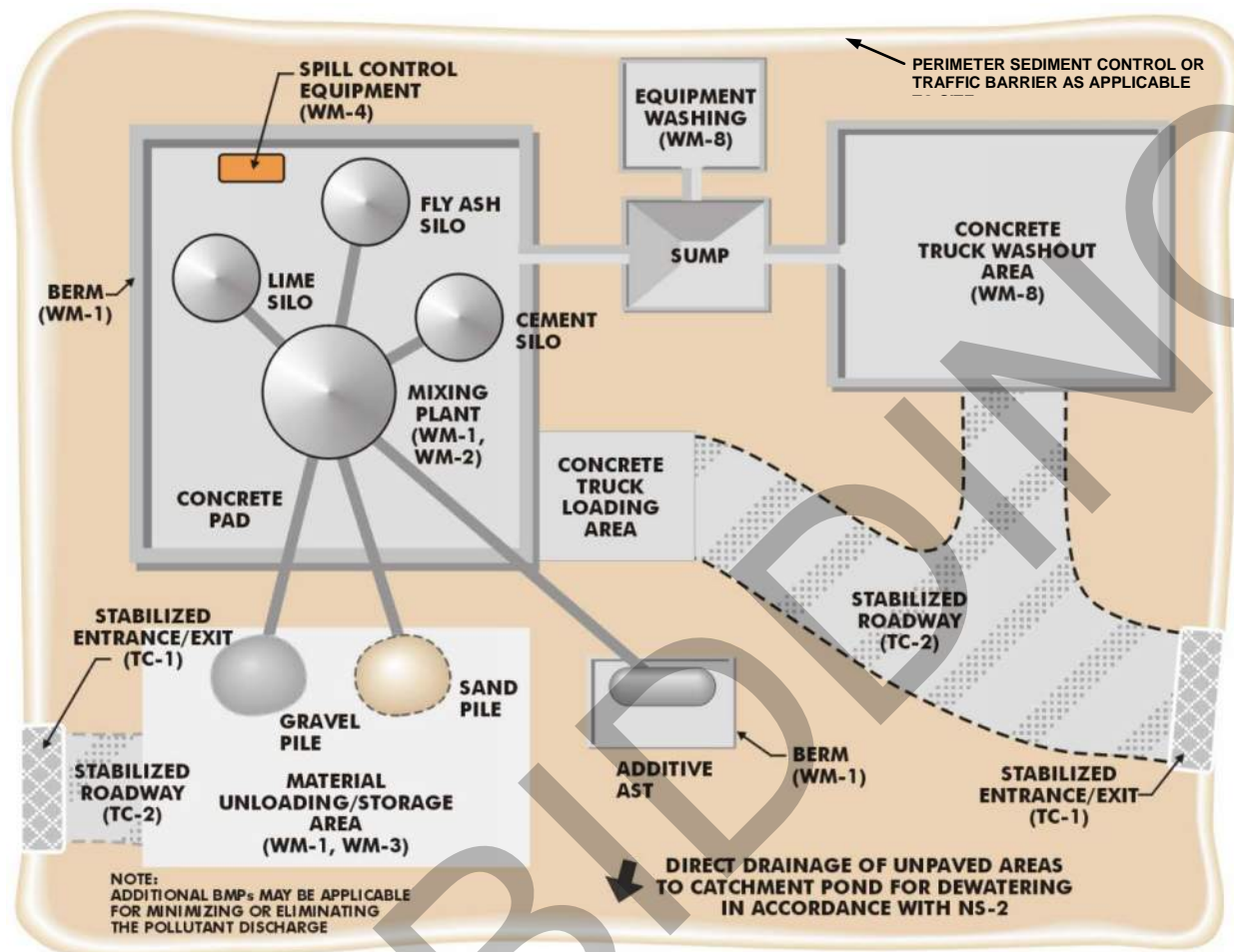
## **References**

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

# Temporary Batch Plants

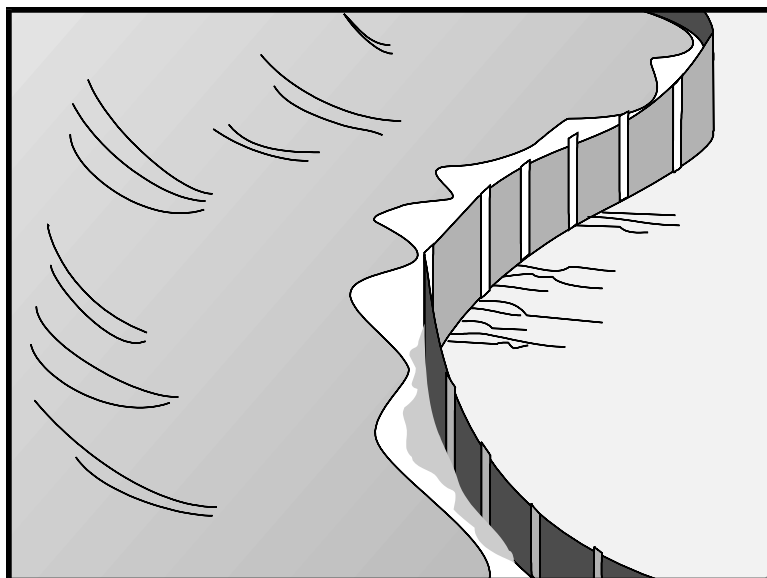
## NS-16



**Typical Temporary Batch**

# Silt Fence

## SE-1



### Categories

EC	Erosion Control	
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ **Primary Category**  
☒ **Secondary Category**

### Description and Purpose

A silt fence is made of a woven geotextile that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains water, promoting sedimentation of coarse sediment behind the fence. Silt fence does not retain soil fine particles like clays or silts.

### Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They could also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion and around inlets within disturbed areas (SE-10). Silt fences should not be used in locations where the flow is concentrated. Silt fences should always be used in combination with erosion controls. Suitable applications include:

- At perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Around inlets.
- Below other small cleared areas.

### Targeted Constituents

Sediment (coarse sediment)	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

SE-5 Fiber Rolls  
 SE-6 Gravel Bag Berm SE-12  
 Manufactured Linear Sediment Controls  
 SE-13 Compost Socks and Berms  
 SE-14 Biofilter Bags

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# Silt Fence

# SE-1

## Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.
- Do not use in locations where ponded water may cause a flooding hazard.
- Do not use silt fence to divert water flows or place across any contour line.
- Improperly installed fences are subject to failure from undercutting, overtopping, or collapsing.
- Must be trenched and keyed in.
- Not intended for use as a substitute for Fiber Rolls (SE-5), when fiber rolls are being used as a slope interruption device.
- Do not use on slopes subject to creeping, slumping, or landslides.

## Implementation

### General

A silt fence is a temporary sediment barrier consisting of woven geotextile stretched across and attached to supporting posts, trenched-in, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap coarse sediment by intercepting and detaining sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

The following layout and installation guidance can improve performance and should be followed:

- Silt fence should be used in combination with erosion controls up-slope in order to provide the most effective sediment control.
- Silt fence alone is not effective at reducing turbidity. (Barrett and Malina, 2004)
- Designers should consider diverting sediment laden water to a temporary sediment basin or trap. (EPA, 2012)
- Use principally in areas where sheet flow occurs.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft<sup>2</sup> of ponding area should be provided for every acre draining to the fence.
- Efficiency of silt fences is primarily dependent on the detention time of the runoff behind the control. (Barrett and Malina, 2004)
- The drainage area above any fence should not exceed a quarter of an acre. (Rule of Thumb- 100-feet of silt fence per 10,000 square feet of disturbed area.) (EPA 2012)

# Silt Fence

# SE-1

- The maximum length of slope draining to any point along the silt fence should be 100 ft per foot of silt fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.
- Silt fences should remain in place until the disturbed area draining to the silt fence is permanently stabilized, after which, the silt fence fabric and posts should be removed and properly disposed.
- J-Hooks, which have ends turning up the slope to break up long runs of fence and provide multiple storage areas that work like mini-retention areas, may be used to increase the effectiveness of silt fence.
- Be aware of local regulations regarding the type and installation requirements of silt fence, which may differ from those presented in this fact sheet.

## ***Design and Layout***

In areas where high winds are anticipated the fence should be supported by a plastic or wire mesh. The geotextile fabric of the silt fence should contain ultraviolet inhibitors and stabilizers to provide longevity equivalent to the project life or replacement schedule.

- Layout in accordance with the attached figures.
- For slopes that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to protect silt fence from rocks (e.g., rockfall netting) ensure the integrity of the silt fence installation.

## ***Standard vs. Heavy Duty Silt Fence***

### ***Standard Silt Fence***

- Generally applicable in cases where the area draining to fence produces moderate sediment loads.

### ***Heavy Duty Silt Fence***

- Heavy duty silt fence usually has 1 or more of the following characteristics, not possessed by standard silt fence.
  - Fabric is reinforced with wire backing or additional support.
  - Posts are spaced closer than pre-manufactured, standard silt fence products.
- Use is generally limited to areas affected by high winds.
- Area draining to fence produces moderate sediment loads.

## ***Materials***

### ***Standard Silt Fence***

- Silt fence material should be woven geotextile with a minimum width of 36 in. The fabric should conform to the requirements in ASTM designation D6461.
- Wooden stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the

# Silt Fence

# SE-1

thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

## *Heavy-Duty Silt Fence*

- Some silt fence has a wire backing to provide additional support, and there are products that may use prefabricated plastic holders for the silt fence and use metal posts instead of wood stakes.

## **Installation Guidelines – Traditional Method**

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line of the proposed silt fence (trenches should not be excavated wider or deeper than necessary for proper silt fence installation).
- Bottom of the silt fence should be keyed-in a minimum of 12 in.
- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.
- When standard strength geotextile is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy-duty wire staples at least 1 in. long. The mesh should extend into the trench.
- When extra-strength geotextile and closer post spacing are used, the mesh support fence may be eliminated.
- Woven geotextile should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, geotextile should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.
- The trench should be backfilled with native material and compacted.
- Construct the length of each reach so that the change in base elevation along the reach does not exceed  $\frac{1}{3}$  the height of the barrier; in no case should the reach exceed 500 ft.
- Cross barriers should be a minimum of  $\frac{1}{3}$  and a maximum of  $\frac{1}{2}$  the height of the linear barrier.
- See typical installation details at the end of this fact sheet.

# Silt Fence

# SE-1

## ***Installation Guidelines - Static Slicing Method***

- Static Slicing is defined as insertion of a narrow blade pulled behind a tractor, similar to a plow blade, at least 10 inches into the soil while at the same time pulling silt geotextile fabric into the ground through the opening created by the blade to the depth of the blade. Once the geotextile is installed, the soil is compacted using tractor tires.
- This method will not work with pre-fabricated, wire backed silt fence.
- Benefits:
  - Ease of installation (most often done with a 2 person crew).
  - Minimal soil disturbance.
  - Better level of compaction along fence, less susceptible to undercutting
  - Uniform installation.
- Limitations:
  - Does not work in shallow or rocky soils.
  - Complete removal of geotextile material after use is difficult.
  - Be cautious when digging near potential underground utilities.

## **Costs**

- It should be noted that costs vary greatly across regions due to available supplies and labor costs.
- Average annual cost for installation using the traditional silt fence installation method (assumes 6 month useful life) is \$7 per linear foot based on vendor research. Range of cost is \$3.50 - \$9.10 per linear foot.

## **Inspection and Maintenance**

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair undercut silt fences.
- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches 1/3 of the barrier height.
- Silt fences should be left in place until the upgradient area is permanently stabilized. Until then, the silt fence should be inspected and maintained regularly.

# Silt Fence

# SE-1

- Remove silt fence when upgradient areas are stabilized. Fill and compact post holes and anchor trench, remove sediment accumulation, grade fence alignment to blend with adjacent ground, and stabilize disturbed area.

## References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Monitoring Data on Effectiveness of Sediment Control Techniques, Proceedings of World Water and Environmental Resources Congress, Barrett M. and Malina J. 2004.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control Practices, and Inventory of Current Practices (Draft), USEPA, 1990.

Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Report No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

U.S. Environmental Protection Agency (USEPA). Stormwater Best Management Practices: Silt Fences. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 2012.

U.S. Environmental Protection Agency (USEPA). Stormwater Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1992.

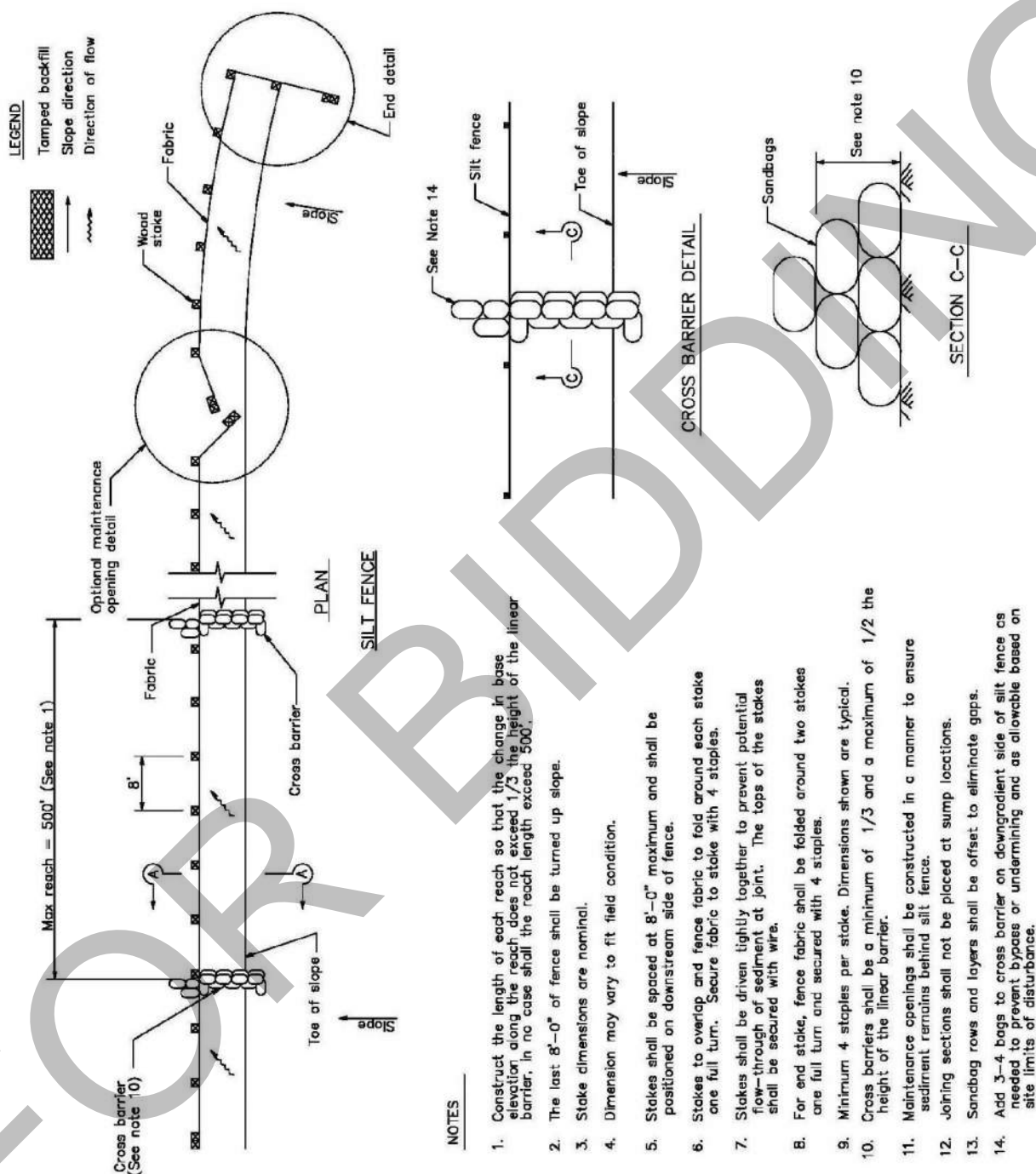
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

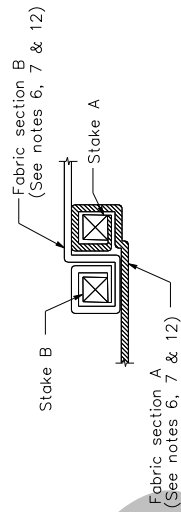
# Silt Fence

## SE-1

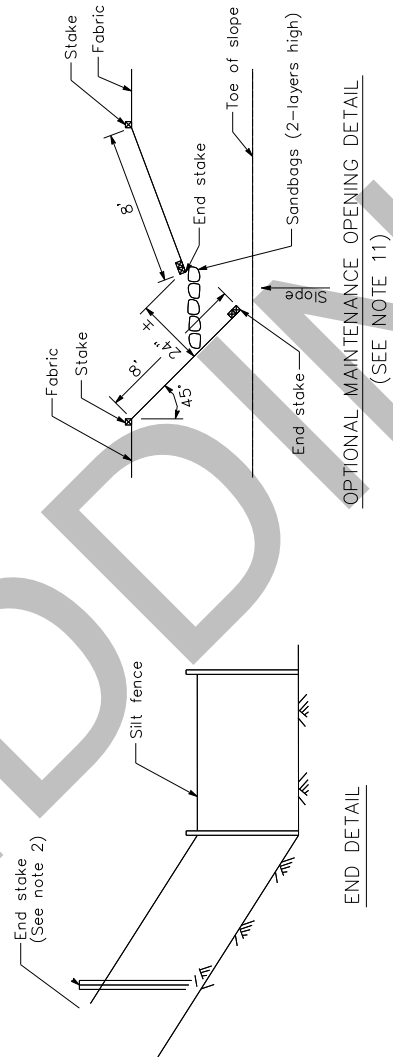
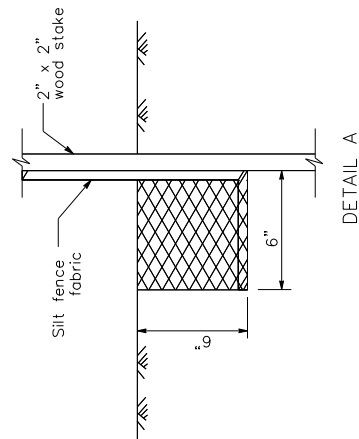
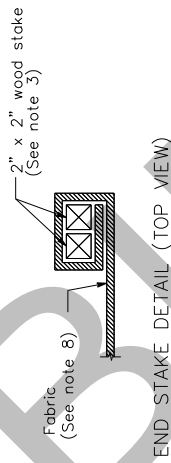
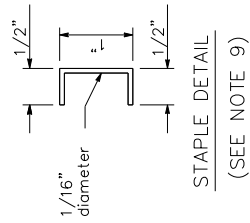
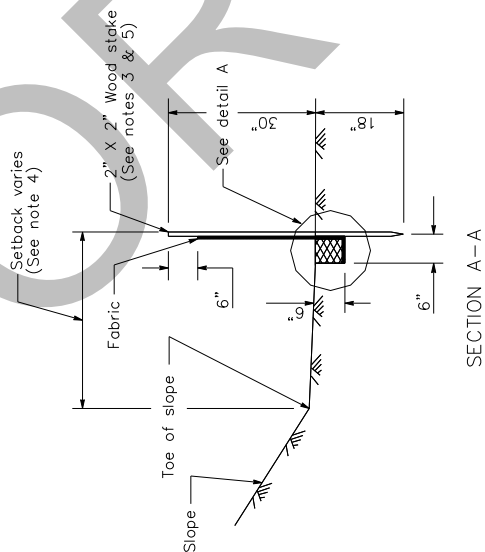


# Silt Fence

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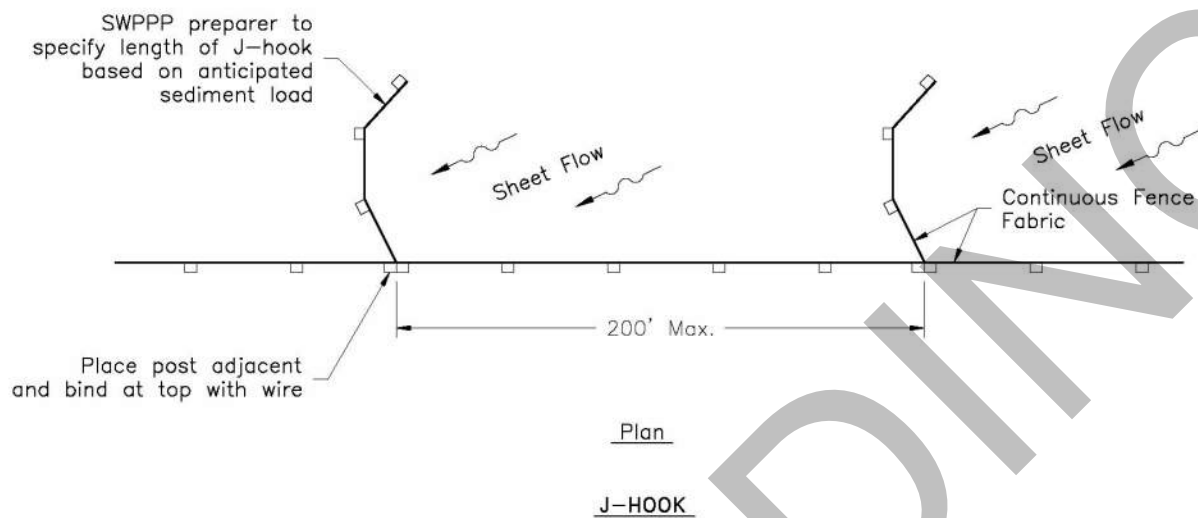
JOINING SECTION DETAIL (TOP VIEW)



END DETAIL

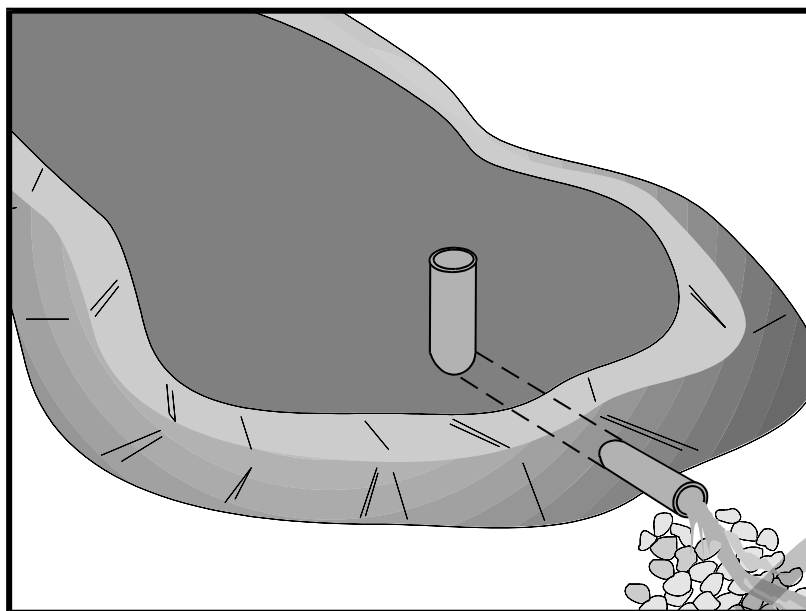
# Silt Fence

# SE-1



# Sediment Basin

## SE-2



### Description and Purpose

A sediment basin is a temporary basin formed by excavation or by constructing an embankment so that sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out before the runoff is released.

Sediment basin design guidance presented in this fact sheet is intended to provide options, methods, and techniques to optimize temporary sediment basin performance and basin sediment removal. Basin design guidance provided in this fact sheet is not intended to guarantee basin effluent compliance with numeric discharge limits (numeric action levels or numeric effluent limits for turbidity). Compliance with discharge limits requires a thoughtful approach to comprehensive BMP planning, implementation, and maintenance. Therefore, optimally designed and maintained sediment basins should be used in conjunction with a comprehensive system of BMPs that includes:

- Diverting runoff from undisturbed areas away from the basin
- Erosion control practices to minimize disturbed areas on-site and to provide temporary stabilization and interim sediment controls (e.g., stockpile perimeter control, check dams, perimeter controls around individual lots) to reduce the basin's influent sediment concentration.

At some sites, sediment basin design enhancements may be required to adequately remove sediment. Traditional

### Categories

EC	Erosion Control	
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ **Primary Category**  
☒ **Secondary Category**

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	<input checked="" type="checkbox"/>
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

SE-3 Sediment Trap (for smaller areas)

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# Sediment Basin

# SE-2

(a.k.a. “physical”) enhancements such as alternative outlet configurations or flow deflection baffles increase detention time and other techniques such as outlet skimmers preferentially drain flows with lower sediment concentrations. These “physical” enhancement techniques are described in this fact sheet. To further enhance sediment removal particularly at sites with fine soils or turbidity sensitive receiving waters, some projects may need to consider implementing Active Treatment Systems (ATS) whereby coagulants and flocculants are used to enhance settling and removal of suspended sediments. Guidance on implementing ATS is provided in SE-11.

## Suitable Applications

Sediment basins may be suitable for use on larger projects with sufficient space for constructing the basin. Sediment basins should be considered for use:

- Where sediment-laden water may enter the drainage system or watercourses
- On construction projects with disturbed areas during the rainy season
- At the outlet of disturbed watersheds between 5 acres and 75 acres and evaluated on a site by site basis
- Where post construction detention basins are required
- In association with dikes, temporary channels, and pipes used to convey runoff from disturbed areas

## Limitations

Sediment basins must be installed only within the property limits and where failure of the structure will not result in loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities. In addition, sediment basins are attractive to children and can be very dangerous. Local ordinances regarding health and safety must be adhered to. If fencing of the basin is required, the type of fence and its location should be shown in the SWPPP and in the construction specifications.

- As a general guideline, sediment basins are suitable for drainage areas of 5 acres or more, but not appropriate for drainage areas greater than 75 acres. However, the tributary area should be evaluated on a site by site basis.
- Sediment basins may become an “attractive nuisance” and care must be taken to adhere to all safety practices. If safety is a concern, basin may require protective fencing.
- Sediment basins designed according to this fact sheet are only effective in removing sediment down to about the silt size fraction. Sediment-laden runoff with smaller size fractions (fine silt and clay) may not be adequately treated unless chemical (or other appropriate method) treatment is used in addition to the sediment basin.
- Basins with a height of 25 ft or more or an impounding capacity of 50 ac-ft or more must obtain approval from California Department of Water Resources Division of Safety of Dams (<http://www.water.ca.gov/damsafety/>).

# Sediment Basin

# SE-2

- Water that stands in sediment basins longer than 96 hours may become a source of mosquitoes (and midges), particularly along perimeter edges, in shallow zones, in scour or below-grade pools, around inlet pipes, along low-flow channels, and among protected habitats created by emergent or floating vegetation (e.g. cattails, water hyacinth), algal mats, riprap, etc.
- Basins require large surface areas to permit settling of sediment. Size may be limited by the available area.

## Implementation

### General

A sediment basin is a controlled stormwater release structure formed by excavation or by construction of an embankment of compacted soil across a drainage way, or other suitable location. It is intended to trap sediment before it leaves the construction site. The basin is a temporary measure expected to be used during active construction in most cases and is to be maintained until the site area is permanently protected against erosion or a permanent detention basin is constructed.

Sediment basins are suitable for nearly all types of construction projects. Whenever possible, construct the sediment basins before clearing and grading work begins. Basins should be located at the stormwater outlet from the site but not in any natural or undisturbed stream. A typical application would include temporary dikes, pipes, and/or channels to convey runoff to the basin inlet.

Many development projects in California are required by local ordinances to provide a stormwater detention basin for post-construction flood control, desilting, or stormwater pollution control. A temporary sediment basin may be constructed by rough grading the post-construction control basins early in the project.

Sediment basins if properly designed and maintained can trap a significant amount of the sediment that flows into them. However, traditional basins do not remove all inflowing sediment. Therefore, they should be used in conjunction with erosion control practices such as temporary seeding, mulching, diversion dikes, etc., to reduce the amount of sediment flowing into the basin.

### Planning

To improve the effectiveness of the basin, it should be located to intercept runoff from the largest possible amount of disturbed area. Locations best suited for a sediment basin are generally in lower elevation areas of the site (or basin tributary area) where site drainage would not require significant diversion or other means to direct water to the basin but outside jurisdictional waterways. However, as necessary, drainage into the basin can be improved by the use of earth dikes and drainage swales (see BMP EC-9). The basin should not be located where its failure would result in the loss of life or interruption of the use or service of public utilities or roads.

Construct before clearing and grading work begins when feasible.

- Do not locate the basin in a jurisdictional stream.

# Sediment Basin

## SE-2

- Basin sites should be located where failure of the structure will not cause loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities.
- Basins with a height of 25 ft or more or an impounding capacity of 50 ac-ft must obtain approval from the Division of Dam Safety. Local dam safety requirements may be more stringent.
- Limit the contributing area to the sediment basin to only the runoff from the disturbed soil areas. Use temporary concentrated flow conveyance controls to divert runoff from undisturbed areas away from the sediment basin.
- The basin should be located: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where post-construction (permanent) detention basins will be constructed, and (3) where the basins can be maintained on a year-round basis to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area, and to maintain the basin to provide the required capacity.

### Design

When designing a sediment basin, designers should evaluate the site constraints that could affect the efficiency of the BMP. Some of these constraints include: the relationship between basin capacity, anticipated sediment load, and freeboard, available footprint for the basin, maintenance frequency and access, and hydraulic capacity and efficiency of the temporary outlet infrastructure. Sediment basins should be designed to maximize sediment removal and to consider sediment load retained by the basin as it affects basin performance.

Three Basin Design Options (Part A) are presented below along with a Typical Sediment/Detention Basin Design Methodology (Part B). Regardless of the design option that is selected, designers also need to evaluate the sediment basin capacity with respect to sediment accumulation (See “*Step 3. Evaluate the Capacity of the Sediment Basin*”), and should incorporate approaches identified in “*Step 4. Other Design Considerations*” to enhance basin performance.

### A) Basin Design Options:

#### Option 1:

Design sediment basin(s) using the standard equation:

$$A_s = \frac{1.2Q}{V_s} \quad (\text{Eq. 1})$$

Where:

$A_s$  = Minimum surface area for trapping soil particles of a certain size

$V_s$  = Settling velocity of the design particle size chosen ( $V_s = 0.00028$  ft/s for a design particle size of 0.01 mm at 68°F)

1.2 = Factor of safety recommended by USEPA to account for the reduction in basin efficiency caused due to turbulence and other non ideal conditions.

# Sediment Basin

# SE-2

$$Q = CIA \quad (\text{Eq.2})$$

Where

Q = Peak basin influent flow rate measured in cubic feet per second (ft<sup>3</sup>/s)

C = Runoff coefficient (unitless)

I = Peak rainfall intensity for the 10-year, 6-hour rain event (in/hr)

A = Area draining into the sediment basin in acres

The design particle size should be the smallest soil grain size determined by wet sieve analysis, or the fine silt sized (0.01 mm [or 0.0004 in.]) particle, and the Vs used should be 100 percent of the calculated settling velocity.

This sizing basin method is dependent on the outlet structure design or the total basin length with an appropriate outlet. If the designer chooses to utilize the outlet structure to control the flow duration in the basin, the basin length (distance between the inlet and the outlet) should be a minimum of twice the basin width; the depth should not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency (2 ft of sediment storage, 2 ft of capacity). If the designer chooses to utilize the basin length (with appropriate basin outlet) to control the flow duration in the basin, the basin length (distance between the inlet and the outlet) should be a specifically designed to capture 100% of the design particle size; the depth should not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency (2 ft of sediment storage, 2 ft of capacity).

Basin design guidance provided herein assumes standard water properties (e.g., estimated average water temperature, kinematic viscosity, etc.) as a basis of the design. Designers can use an alternative design (Option 3) with site specific water properties as long as the design is as protective as Option 1.

The design guidance uses the peak influent flow rate to size sediment basins. Designers can use an alternative design (Option 3) with site specific average flow rates as long as the design is as protective as Option 1.

The basin should be located on the site where it can be maintained on a year-round basis and should be maintained on a schedule to retain the 2 ft of capacity.

## Option 2:

Design pursuant to local ordinance for sediment basin design and maintenance, provided that the design efficiency is as protective or more protective of water quality than Option 1.

## Option 3:

The use of an equivalent surface area design or equation provided that the design efficiency is as protective or more protective of water quality than Option 1.

# Sediment Basin

# SE-2

## ***B) Typical Sediment/Detention Basin Design Methodology:***

Design of a sediment basin requires the designer to have an understanding of the site constraints, knowledge of the local soil (e.g., particle size distribution of potentially contributing soils), drainage area of the basin, and local hydrology. Designers should not assume that a sediment basin for location A is applicable to location B. Therefore, designers can use this factsheet as guidance but will need to apply professional judgment and knowledge of the site to design an effective and efficient sediment basin. The following provides a general overview of typical design methodologies:

### *Step 1. Hydrologic Design*

- Evaluate the site constraints and assess the drainage area for the sediment basin. Designers should consider on- and off-site flows as well as changes in the drainage area associated with site construction/disturbance. To minimize additional construction during the course of the project, the designer should consider identifying the maximum drainage area when calculating the basin dimensions.
- If a local hydrology manual is not available it is recommended to follow standard rational method procedures to estimate the flow rate. The references section of this factsheet provides a reference to standard hydrology textbooks that can provide standard methodologies. If local rainfall depths are not available, values can be obtained from standard precipitation frequency maps from NOAA (downloaded from <http://www.wrcc.dri.edu/pcpnfreq.html>).

### *Step 2. Hydraulic Design*

- Calculate the surface area required for the sediment basin using Equation 1. In which the flow rate is estimated for a 10-yr 6-hr event using rational method procedure listed in local hydrology manual and  $V_s$  is estimated using Stokes Law presented in Equation 3.

$$V_s = 2.81d^2 \quad (\text{Eq.3})$$

Where

$V_s$  = Settling velocity in feet per second at 68°F

$d$  = diameter of sediment particle in millimeters (smallest soil grain size determined by wet sieve analysis or fine silt [0.01 mm [or 0.0004 in.]])

- In general the basin outlet design requires an iterative trial and error approach that considered the maximum water surface elevation, the elevation versus volume (stage-storage) relationship, the elevation versus basin outflow (a.k.a.-discharge) relationship, and the estimated inflow hydrograph. To adequately design the basins to settle sediment, the outlet configuration and associated outflow rates can be estimated by numerous methodologies. The following provides some guidance for design the basin outlet:
  - An outlet should have more than one orifice.
  - An outlet design typically utilizes multiple horizontal rows of orifices (approximately 3 or more) with at least 2 orifices per row (see Figures 1 and 2 at the end of this fact sheet).

# Sediment Basin

## SE-2

- Orifices can vary in shape.
- Select the appropriate orifice diameter and number of perforations per row with the objective of minimizing the number of rows while maximizing the detention time.
- The diameter of each orifice is typically a maximum of 3-4 inches and a minimum of 0.25-0.5 inches.
- If a rectangular orifice is used, it is recommended to have minimum height of 0.5 inches and a maximum height of 6 inches.
- Rows are typically spaced at three times the diameter center to center vertically with a minimum distance of approximately 4 inches on center and a maximum distance of 1 foot on center.
- To estimate the outflow rate, each row is calculated separately based on the flow through a single orifice then multiplied by the number of orifices in the row. This step is repeated for each of the rows. Once all of the orifices are estimated, the total outflow rate versus elevation (stage-discharge curve) is developed to evaluate the detention time within the basin.
- Flow through a single orifice can be estimated using an Equation 4:

$$Q = BC' A(2gH)^{0.5} \quad (\text{Eq.4})$$

Where

Q = Outflow rate in ft<sup>3</sup>/s

C' = Orifice coefficient (unitless)

A = Area of the orifice (ft<sup>2</sup>)

g = acceleration due to gravity (ft<sup>3</sup>/s)

H = Head above the orifice (ft)

B = Anticipated Blockage or clogging factor (unitless), It is dependent on anticipated sediment and debris load, trash rack configuration etc, so the value is dependent on design engineers professional judgment and/or local requirements (B is never greater than 1 and a value of 0.5 is generally used)

- Care must be taken in the selection of orifice coefficient ("C'"); 0.60 is most often recommended and used. However, based on actual tests, Young and Graziano (1989), "Outlet Hydraulics of Extended Detention Facilities for Northern Virginia Planning District Commission", recommends the following:
  - C' = 0.66 for thin materials; where the thickness is equal to or less than the orifice diameter, or
  - C' = 0.80 when the material is thicker than the orifice diameter
- If different sizes of orifices are used along the riser then they have to be sized such that not more than 50 percent of the design storm event drains in one-third of the drawdown time (to provide adequate settling time for events smaller than the design storm event)

# Sediment Basin

## SE-2

and the entire volume drains within 96 hours or as regulated by the local vector control agency. If a basin fails to drain within 96 hours, the basin must be pumped dry.

- Because basins are not maintained for infiltration, water loss by infiltration should be disregarded when designing the hydraulic capacity of the outlet structure.
- **Floating Outlet Skimmer:** The floating skimmer (see Figure 3 at the end of this fact sheet is an alternative outlet configuration (patented) that drains water from upper portion of the water column. This configuration has been used for temporary and permanent basins and can improve basin performance by eliminating bottom orifices which have the potential of discharging solids. Some design considerations for this alternative outlet device includes the addition of a sand filter or perforated under drain at the low point in the basin and near the floating skimmer. These secondary drains allow the basin to fully drain. More detailed guidelines for sizing the skimmer can be downloaded from <http://www.fairclothskimmer.com/>.
- **Hold and Release Valve:** An ideal sediment/detention basin would hold all flows to the design storm level for sufficient time to settle solids, and then slowly release the storm water. Implementing a reliable valve system for releasing detention basins is critical to eliminate the potential for flooding in such a system. Some variations of hold and release valves include manual valves, bladder devices or electrically operated valves. When a precipitation event is forecast, the valve would be close for the duration of the storm and appropriate settling time. When the settling duration is met (approximately 24 or 48 hours), the valve would be opened and allow the stormwater to be released at a rate that does not resuspend settled solids and in a non-erosive manner. If this type of system is used the valve should be designed to empty the entire basin within 96 hours or as stipulated by local vector control regulations.

### *Step 3. Evaluate the Capacity of the Sediment Basin*

- Typically, sediment basins do not perform as designed when they are not properly maintained or the sediment yield to the basin is larger than expected. As part of a good sediment basin design, designers should consider maintenance cycles, estimated soil loss and/or sediment yield, and basin sediment storage volume. The two equations below can be used to quantify the amount of soil entering the basin.
- The Revised Universal Soil Loss Equation (RUSLE, Eq.5) can be used to estimate annual soil loss and the Modified Universal Soil Equation (MUSLE, Eq.6) can be used to estimate sediment yield from a single storm event.

$$A = R \times K \times LS \times C \times P \quad (\text{Eq.5})$$

$$Y = 95 \times Q \times q_p^{0.56} \times K \times LS \times C \times P \quad (\text{Eq.6})$$

Where:

A = annual soil loss, tons/acre-year

R = rainfall erosion index, in 100 ft.tons/acre.in/hr

# Sediment Basin

## SE-2

$K$  = soil erodibility factor, tons/acre per unit of  $R$

$LS$  = slope length and steepness factor (unitless)

$C$  = vegetative cover factor (unitless)

$P$  = erosion control practice factor (unitless)

$Y$  = single storm sediment yield in tons

$Q$  = runoff volume in acre-feet

$q_p$  = peak flow in cfs

- Detailed descriptions and methodologies for estimating the soil loss can be obtained from standard hydrology text books (See References section).
- Determination of the appropriate equation should consider construction duration and local environmental factors (soils, hydrology, etc.). For example, if a basin is planned for a project duration of 1 year and the designer specifies one maintenance cycle, RUSLE could be used to estimate the soil loss and thereby the designer could indicate that the sediment storage volume would be half of the soil loss value estimated. As an example for use of MUSLE, a project may have a short construction duration thereby requiring fewer maintenance cycles and a reduced sediment storage volume. MUSLE would be used to estimate the anticipated soil loss based on a specific storm event to evaluate the sediment storage volume and appropriate maintenance frequency.
- The soil loss estimates are an essential step in the design and it is essential that the designer provide construction contractors with enough information to understand maintenance frequency and/or depths within the basin that would trigger maintenance. Providing maintenance methods, frequency and specification should be included in design bid documents such as the SWPPP Site Map.
- Once the designer has quantified the amount of soil entering the basin, the depth required for sediment storage can be determined by dividing the estimated sediment loss by the surface area of the basin.

### *Step 4. Other Design Considerations*

- Consider designing the volume of the settling zone for the total storm volume associated with the 2-year event or other appropriate design storms specified by the local agency. This volume can be used as a guide for sizing the basin without iterative routing calculations. The depth of the settling zone can be estimated by dividing the estimated 2-yr storm volume by the surface area of the basin.
- The basin volume consists of two zones:
  - A sediment storage zone at least 1 ft deep.
  - A settling zone at least 2 ft deep.

# Sediment Basin

## SE-2

- The basin depth must be no less than 3 ft (not including freeboard).
- Proper hydraulic design of the outlet is critical to achieving the desired performance of the basin. The outlet should be designed to drain the basin within 24 to 96 hours (also referred to as “drawdown time”). The 24-hour limit is specified to provide adequate settling time; the 96-hour limit is specified to mitigate vector control concerns.
- Confirmation of the basin performance can be evaluated by routing the design storm (10-yr 6-hr, or as directed by local regulations) through the basin based on the basin volume (stage-storage curve) and the outlet design (stage-discharge curve based on the orifice configuration or equivalent outlet design).
- Sediment basins, regardless of size and storage volume, should include features to accommodate overflow or bypass flows that exceed the design storm event.
  - Include an emergency spillway to accommodate flows not carried by the principal spillway. The spillway should consist of an open channel (earthen or vegetated) over undisturbed material (not fill) or constructed of a non-erodible riprap (or equivalent protection) on fill slopes.
  - The spillway control section, which is a level portion of the spillway channel at the highest elevation in the channel, should be a minimum of 20 ft in length.
- Rock, vegetation or appropriate erosion control should be used to protect the basin inlet, outlet, and slopes against erosion.
- The total depth of the sediment basin should include the depth required for sediment storage, depth required for settling zone and freeboard of at least 1 foot or as regulated by local flood control agency for a flood event specified by the local agency.
- The basin alignment should be designed such that the length of the basin is more than twice the width of the basin; the length should be determined by measuring the distance between the inlet and the outlet. If the site topography does not allow for this configuration baffles should be installed so that the ratio is satisfied. If a basin has more than one inflow point, any inflow point that conveys more than 30 percent of the total peak inflow rate has to meet the required length to width ratio.
- An alternative basin sizing method proposed by Fifield (2004) can be consulted to estimate an alternative length to width ratio and basin configuration. These methods can be considered as part of Option 3 which allows for alternative designs that are protective or more protective of water quality.
- Baffles (see Figure 4 at the end of this fact sheet) can be considered at project sites where the existing topography or site constraints limit the length to width ratio. Baffles should be constructed of earthen berms or other structural material within the basin to divert flow in the basin, thus increasing the effective flow length from the basin inlet to the outlet riser. Baffles also reduce the change of short circuiting and allows for settling throughout the basin.

# Sediment Basin

## SE-2

- Baffles are typically constructed from the invert of the basin to the crest of the emergency spillway (i.e., design event flows are meant to flow around the baffles and flows greater than the design event would flow over the baffles to the emergency spillway).
- Use of other materials for construction of basin baffles (such as silt fence) may not be appropriate based on the material specifications and will require frequent maintenance (maintain after every storm event). Maintenance may not be feasible when required due to flooded conditions resulting from frequent (i.e., back to back) storm events. Use of alternative baffle materials should not deviate from the intended purpose of the material, as described by the manufacturer.
- Sediment basins are best used in conjunction with erosion controls.
- Basins with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and basins capable of impounding more than 35,000 ft<sup>3</sup>, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the basin outlet and bypass structures.
- A forebay, constructed upstream of the basin, may be provided to remove debris and larger particles.
- The outflow from the sediment basin should be provided with velocity dissipation devices (see BMP EC-10) to prevent erosion and scouring of the embankment and channel.
- The principal outlet should consist of a corrugated metal, high density polyethylene (HDPE), or reinforced concrete riser pipe with dewatering holes and an anti-vortex device and trash rack attached to the top of the riser, to prevent floating debris from flowing out of the basin or obstructing the system. This principal structure should be designed to accommodate the inflow design storm.
- A rock pile or rock-filled gabions can serve as alternatives to the debris screen, although the designer should be aware of the potential for extra maintenance involved should the pore spaces in the rock pile clog.
- The outlet structure should be placed on a firm, smooth foundation with the base securely anchored with concrete or other means to prevent floatation.
- Attach riser pipe (watertight connection) to a horizontal pipe (barrel). Provide anti-seep collars on the barrel.
- Cleanout level should be clearly marked on the riser pipe.

### **Installation**

- Securely anchor and install an anti-seep collar on the outlet pipe/riser and provide an emergency spillway for passing major floods (see local flood control agency).
- Areas under embankments must be cleared and stripped of vegetation.

# Sediment Basin

## SE-2

- Chain link fencing should be provided around each sediment basin to prevent unauthorized entry to the basin or if safety is a concern.

### Costs

The cost of a sediment basin is highly variable and is dependent of the site configuration. To decrease basin construction costs, designers should consider using existing site features such as berms or depressed area to site the sediment basin. Designers should also consider potential savings associated with designing the basin to minimize the number of maintenance cycles and siting the basin in a location where a permanent BMP (e.g., extended detention basin) is required for the project site.

### Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level and as required by local requirements. It is recommended that at a minimum, basins be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Examine basin banks for seepage and structural soundness.
- Check inlet and outlet structures and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.
- Check inlet and outlet area for erosion and stabilize if required.
- Check fencing for damage and repair as needed.
- Sediment that accumulates in the basin must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-half the designated sediment storage volume. Sediment removed during maintenance should be managed properly. The sediment should be appropriately evaluated and used or disposed of accordingly. Options include: incorporating sediment into earthwork on the site (only if there is no risk that sediment is contaminated); or off-site export/disposal at an appropriate location (e.g., sediment characterization and disposal to an appropriate landfill).
- Remove standing water from basin within 96 hours after accumulation.
- If the basin does not drain adequately (e.g., due to storms that are more frequent or larger than the design storm or other unforeseen site conditions), dewatering should be conducted in accordance with appropriate dewatering BMPs (see NS-2) and in accordance with local permits as applicable.
- To minimize vector production:
  - Remove accumulation of live and dead floating vegetation in basins during every inspection.
  - Remove excessive emergent and perimeter vegetation as needed or as advised by local or state vector control agencies.

# Sediment Basin

# SE-2

## References

A Current Assessment of Urban Best Management Practices: Techniques for Reducing Nonpoint Source Pollution in the Coastal Zones, Metropolitan Washington Council of Governments, March 1992.

Draft-Sedimentation and Erosion Control, an Inventory of Current Practices, USEPA. April 1990.

U.S. Environmental Protection Agency (USEPA). Erosion and Sediment Control, Surface Mining in the Eastern U.S., U.S. Environmental Protection Agency, Office of Water, Washington, DC, Washington, D.C., 1976.

Fifield, J.S. Designing for Effective Sediment and Erosion Control on Construction Sites. Forester Press, Santa Barbara, CA. 2004.

Goldman S.J., Jackson K. and Bursztynsky T.A. Erosion and Sediment Control Handbook. McGraw-Hill Book Company, 1986.

U.S. Environmental Protection Agency (USEPA). Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters. EPA 840-B-9-002. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1993.

Guidelines for the Design and Construction of Small Embankment Dams, Division of Safety of Dams, California Department of Water Resources, March 1986.

Haan C.T., Barfield B.J. and Hayes J.C. Design Hydrology and Sedimentology for Small Catchments. Academic Press. 1994.

Inlet/Outlet Alternatives for Extended Detention Basins. State of California Department of Transportation (Caltrans), 2001.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

McLean, J., 2000. Mosquitoes in Constructed Wetlands: A Management Bugaboo? In T.R. Schueler and H.K. Holland [eds.], The Practice of Watershed Protection. pp. 29-33. Center for Watershed Protection, Ellicott City, MD, 2000.

Metzger, M.E., D. F. Messer, C. L. Beitia, C. M. Myers, and V. L. Kramer. The Dark Side of Stormwater Runoff Management: Disease Vectors Associated with Structural BMPs, 2002.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Water, Work Group-Working Paper, USEPA, April 1992.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

# Sediment Basin

## SE-2

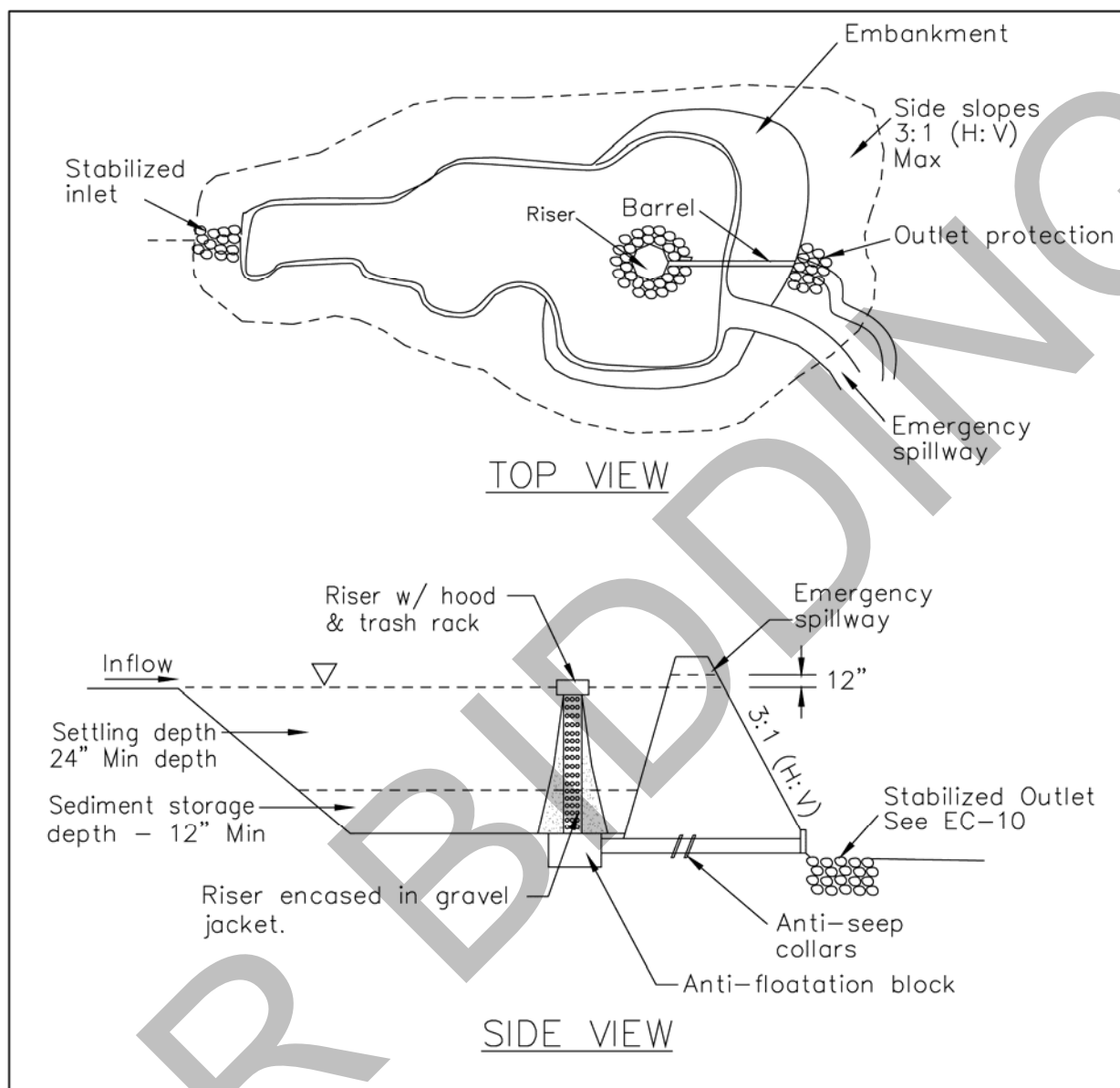
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Water Quality Management Plan for the Lake Tahoe Region, Volume II Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Young, G.K. and Graziano, F., Outlet Hydraulics of Extended Detention Facilities for Northern Virginia Planning District Commission, 1989.

# Sediment Basin

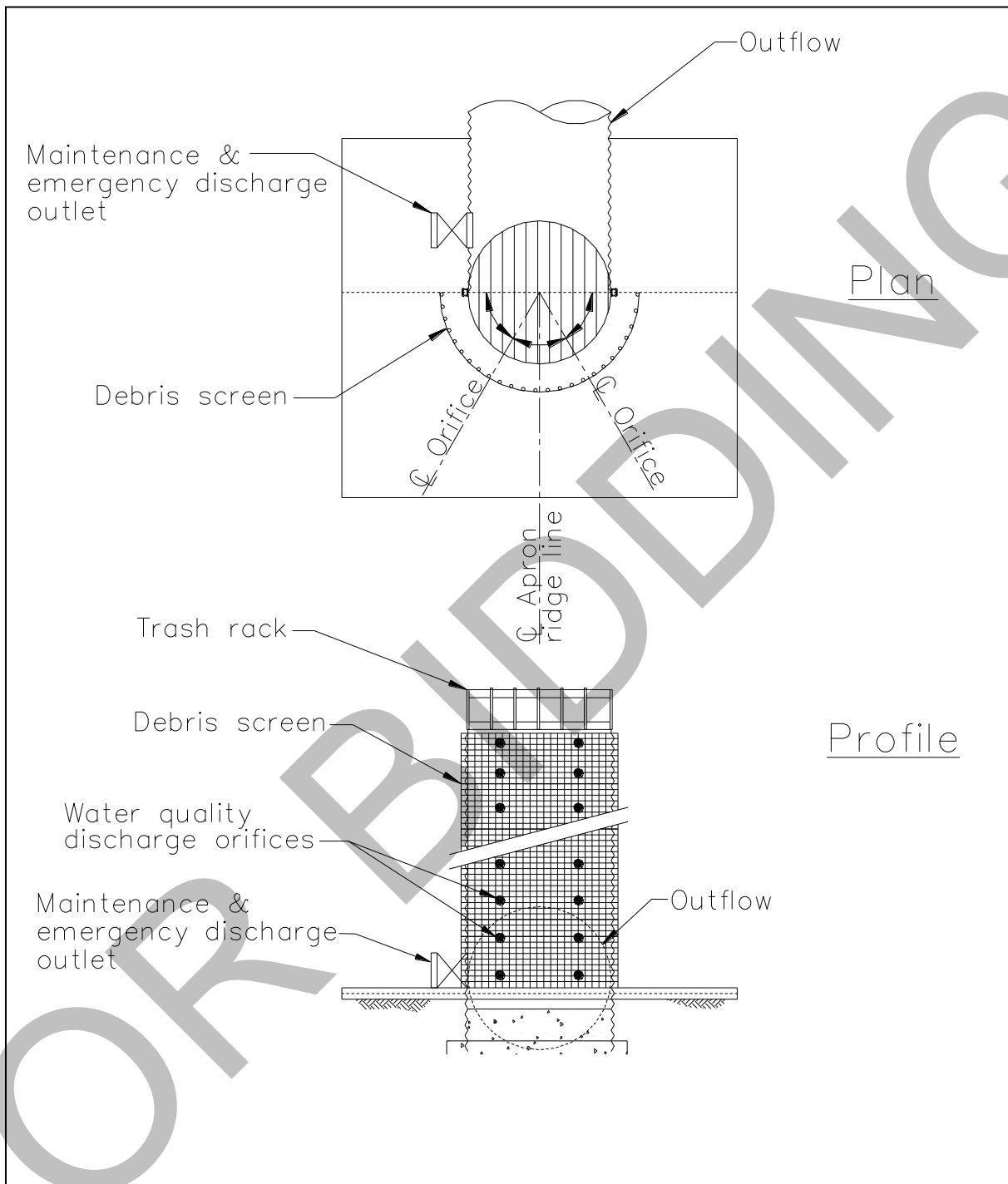
## SE-2



**FIGURE 1: TYPICAL TEMPORARY SEDIMENT BASIN**  
**MULTIPLE ORIFICE DESIGN**  
 NOT TO SCALE

# Sediment Basin

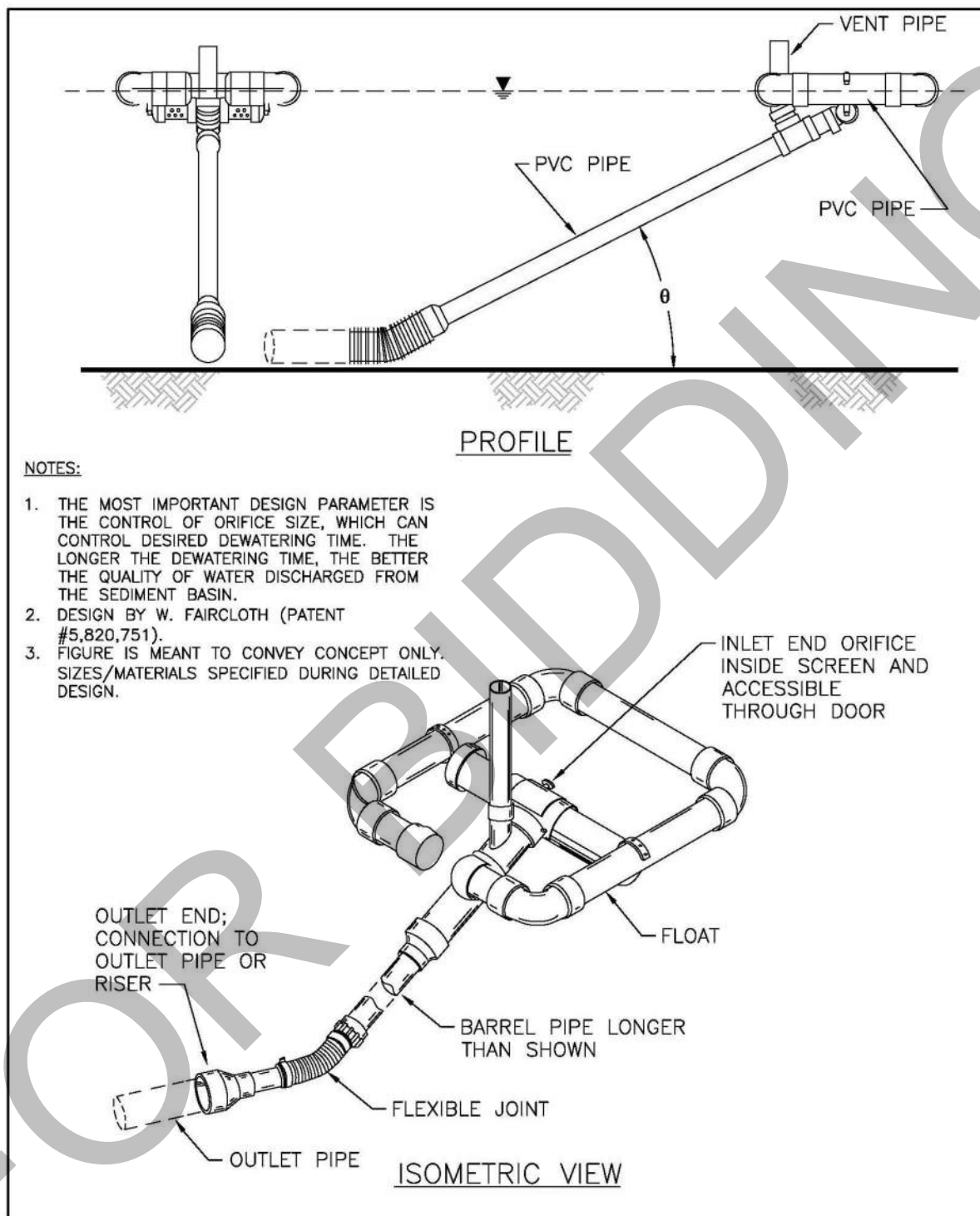
## SE-2



**FIGURE 2: MULTIPLE ORIFICE OUTLET RISER**  
NOT TO SCALE

# Sediment Basin

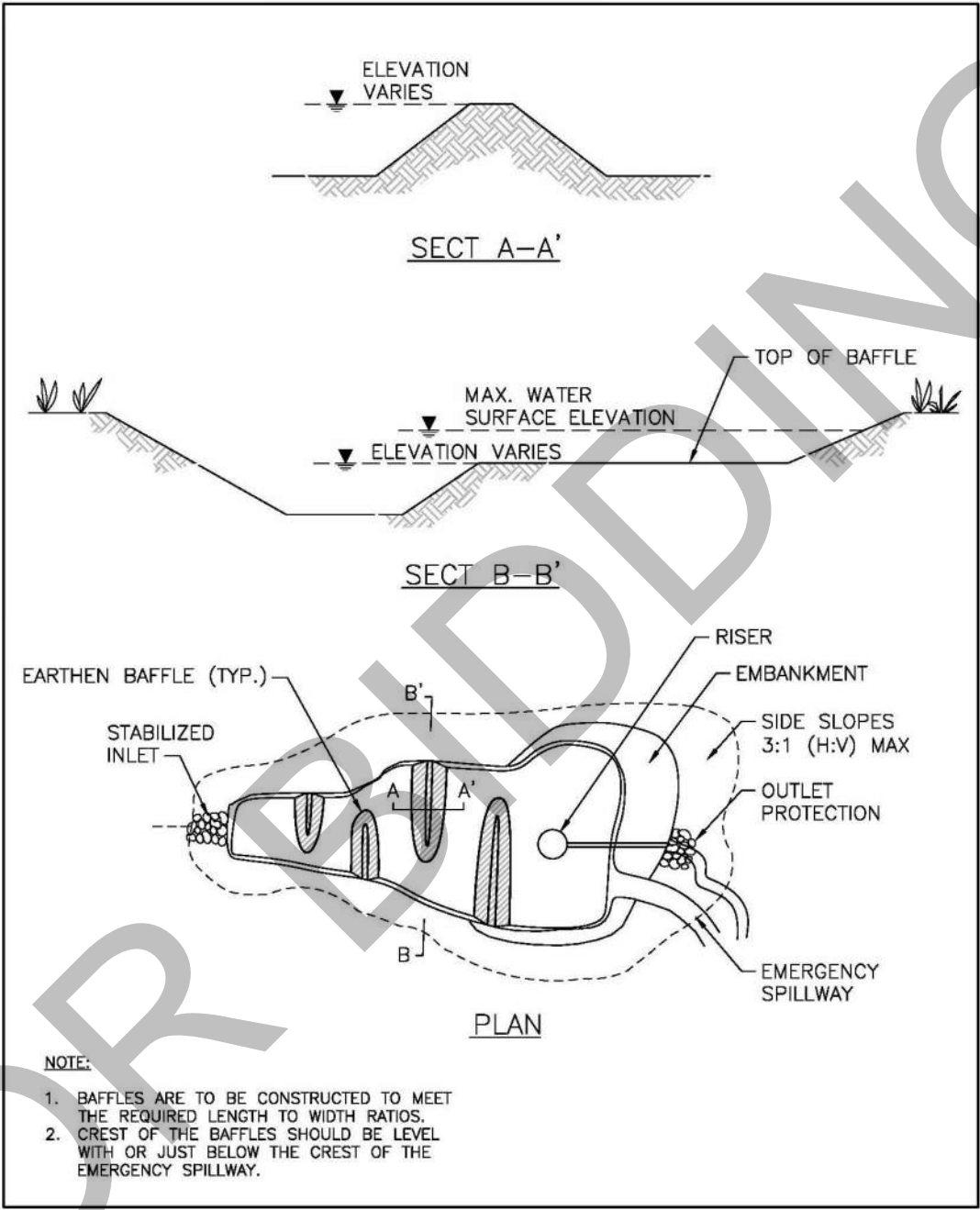
## SE-2



**FIGURE 3: TYPICAL SKIMMER**  
NOT TO SCALE

# Sediment Basin

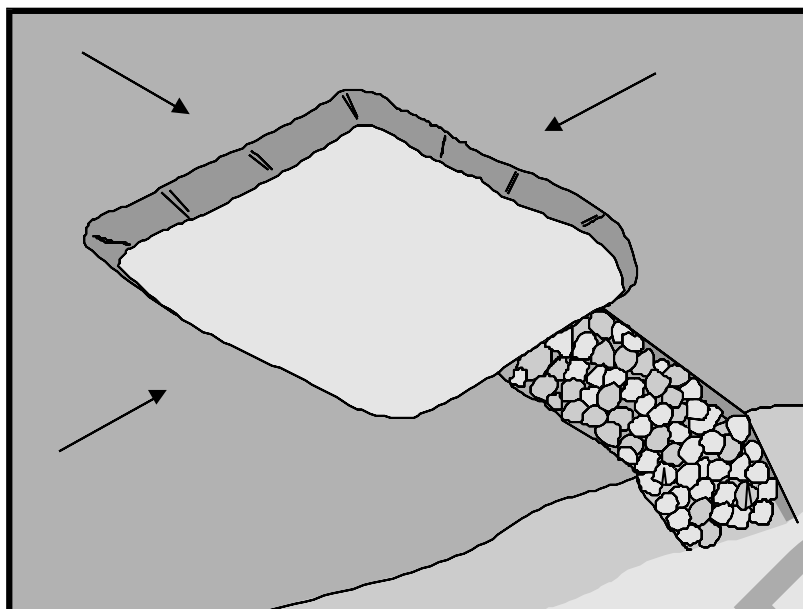
# SE-2



**FIGURE 4: TYPICAL TEMPORARY SEDIMENT BASIN  
WITH BAFFLES  
NOT TO SCALE**

# Sediment Trap

## SE-3



### Categories

EC	Erosion Control	
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

### Legend:

<input checked="" type="checkbox"/>	<b>Primary Objective</b>
<input checked="" type="checkbox"/>	<b>Secondary Objective</b>

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	<input checked="" type="checkbox"/>
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

SE-2 Sediment Basin (for larger areas)

### Description and Purpose

A sediment trap is a containment area where sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out or before the runoff is discharged by gravity flow. Sediment traps are formed by excavating or constructing an earthen embankment across a waterway or low drainage area.

Trap design guidance provided in this fact sheet is not intended to guarantee compliance with numeric discharge limits (numeric action levels or numeric effluent limits for turbidity). Compliance with discharge limits requires a thoughtful approach to comprehensive BMP planning, implementation, and maintenance. Therefore, optimally designed and maintained sediment traps should be used in conjunction with a comprehensive system of BMPs.

### Suitable Applications

Sediment traps should be considered for use:

- At the perimeter of the site at locations where sediment-laden runoff is discharged offsite.
- At multiple locations within the project site where sediment control is needed.
- Around or upslope from storm drain inlet protection measures.
- Sediment traps may be used on construction projects where the drainage area is less than 5 acres. Traps would be

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# Sediment Trap

## SE-3

placed where sediment-laden stormwater may enter a storm drain or watercourse. SE-2, Sediment Basins, must be used for drainage areas greater than 5 acres.

- As a supplemental control, sediment traps provide additional protection for a water body or for reducing sediment before it enters a drainage system.

### Limitations

- Requires large surface areas to permit infiltration and settling of sediment.
- Not appropriate for drainage areas greater than 5 acres.
- Only removes large and medium sized particles and requires upstream erosion control.
- Attractive and dangerous to children, requiring protective fencing.
- Conducive to vector production.
- Should not be located in live streams.

### Implementation

#### Design

A sediment trap is a small temporary ponding area, usually with a gravel outlet, formed by excavation or by construction of an earthen embankment. Its purpose is to collect and store sediment from sites cleared or graded during construction. It is intended for use on small drainage areas with no unusual drainage features and projected for a quick build-out time. It should help in removing coarse sediment from runoff. The trap is a temporary measure with a design life of approximately six months to one year and is to be maintained until the site area is permanently protected against erosion by vegetation and/or structures.

Sediment traps should be used only for small drainage areas. If the contributing drainage area is greater than 5 acres, refer to SE-2, Sediment Basins, or subdivide the catchment area into smaller drainage basins.

Sediment usually must be removed from the trap after each rainfall event. The SWPPP should detail how this sediment is to be disposed, such as in fill areas onsite, or removal to an approved offsite dump. Sediment traps used as perimeter controls should be installed before any land disturbance takes place in the drainage area.

Sediment traps are usually small enough that a failure of the structure would not result in a loss of life, damage to home or buildings, or interruption in the use of public roads or utilities. However, sediment traps are attractive to children and can be dangerous. The following recommendations should be implemented to reduce risks:

- Install continuous fencing around the sediment trap or pond. Consult local ordinances regarding requirements for maintaining health and safety.
- Restrict basin side slopes to 3:1 or flatter.

Sediment trap size depends on the type of soil, size of the drainage area, and desired sediment removal efficiency (see SE-2, Sediment Basin). As a rule of thumb, the larger the basin volume

# Sediment Trap

## SE-3

the greater the sediment removal efficiency. Sizing criteria are typically established under the local grading ordinance or equivalent. The runoff volume from a 2-year storm is a common design criteria for a sediment trap. The sizing criteria below assume that this runoff volume is 0.042 acre-ft/acre (0.5 in. of runoff). While the climatic, topographic, and soil type extremes make it difficult to establish a statewide standard, the following criteria should trap moderate to high amounts of sediment in most areas of California:

- Locate sediment traps as near as practical to areas producing the sediment.
- Trap should be situated according to the following criteria: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where failure would not cause loss of life or property damage, and (3) to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area.
- Trap should be sized to accommodate a settling zone and sediment storage zone with recommended minimum volumes of 67 yd<sup>3</sup>/acre and 33 yd<sup>3</sup>/acre of contributing drainage area, respectively, based on 0.5 in. of runoff volume over a 24-hour period. In many cases, the size of an individual trap is limited by available space. Multiple traps or additional volume may be required to accommodate specific rainfall, soil, and site conditions.
- Traps with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and traps capable of impounding more than 35,000 ft<sup>3</sup>, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the trap outlet and bypass structures.
- The outlet pipe or open spillway must be designed to convey anticipated peak flows.
- Use rock or vegetation to protect the trap outlets against erosion.
- Fencing should be provided to prevent unauthorized entry.

### **Installation**

Sediment traps can be constructed by excavating a depression in the ground or creating an impoundment with a small embankment. Sediment traps should be installed outside the area being graded and should be built prior to the start of the grading activities or removal of vegetation. To minimize the area disturbed by them, sediment traps should be installed in natural depressions or in small swales or drainage ways. The following steps must be followed during installation:

- The area under the embankment must be cleared, grubbed, and stripped of any vegetation and root mat. The pool area should be cleared.
- The fill material for the embankment must be free of roots or other woody vegetation as well as oversized stones, rocks, organic material, or other objectionable material. The embankment may be compacted by traversing with equipment while it is being constructed.
- All cut-and-fill slopes should be 3:1 or flatter.
- When a riser is used, all pipe joints must be watertight.

# Sediment Trap

## SE-3

- When a riser is used, at least the top two-thirds of the riser should be perforated with 0.5 in. diameter holes spaced 8 in. vertically and 10 to 12 in. horizontally. See SE-2, Sediment Basin.
- When an earth or stone outlet is used, the outlet crest elevation should be at least 1 ft below the top of the embankment.
- When crushed stone outlet is used, the crushed stone used in the outlet should meet AASHTO M43, size No. 2 or 24, or its equivalent such as MSHA No. 2. Gravel meeting the above gradation may be used if crushed stone is not available.

### Costs

Average annual cost per installation and maintenance (18 month useful life) is \$0.73 per ft<sup>3</sup> (\$1,300 per drainage acre). Maintenance costs are approximately 20% of installation costs.

### Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect outlet area for erosion and stabilize if required.
- Inspect trap banks for seepage and structural soundness, repair as needed.
- Inspect outlet structure and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.
- Inspect fencing for damage and repair as needed.
- Inspect the sediment trap for area of standing water during every visit. Corrective measures should be taken if the BMP does not dewater completely in 96 hours or less to prevent vector production.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the trap capacity. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed of at an appropriate location.
- Remove vegetation from the sediment trap when first detected to prevent pools of standing water and subsequent vector production.
- BMPs that require dewatering shall be continuously attended while dewatering takes place. Dewatering BMPs per NS-2 shall be implemented at all times during dewatering activities.

### References

Brown, W., and T. Schueler. The Economics of Stormwater BMPs in the Mid-Atlantic Region. Prepared for Chesapeake Research Consortium, Edgewater, MD, by the Center for Watershed Protection, Ellicott City, MD, 1997.

# Sediment Trap

## SE-3

Draft – Sedimentation and Erosion Control, an Inventory of Current Practices, USEPA, April 1990.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Metzger, M.E., D.F. Messer, C.L. Beitia, C.M. Myers, and V.L. Kramer, The Dark Side of Stormwater Runoff Management: Disease Vectors Associated with Structural BMPs, 2002.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

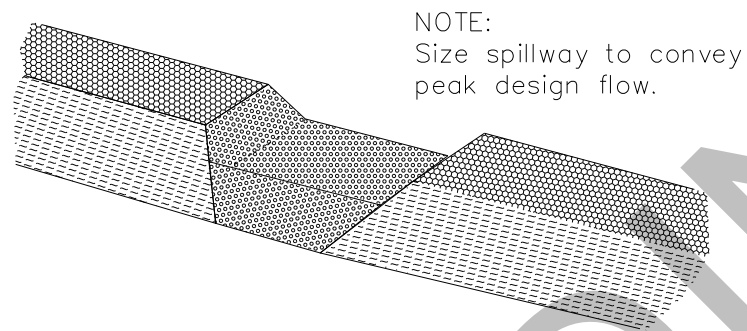
Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

U.S. Environmental Protection Agency (USEPA). Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters. EPA 840-B-9-002. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1993.

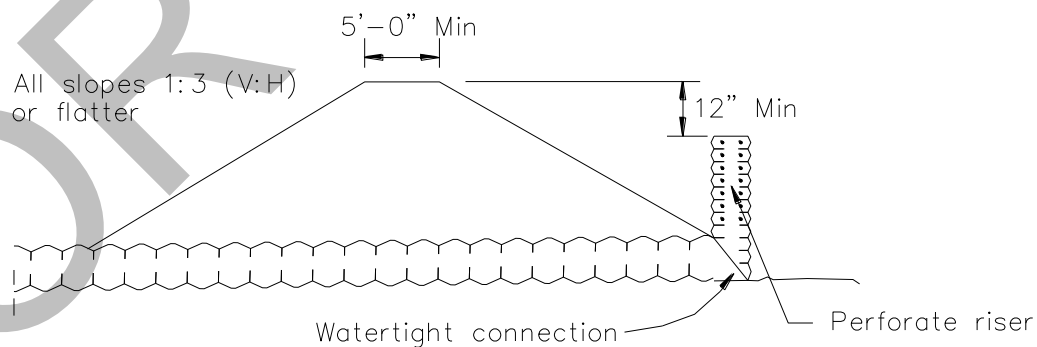
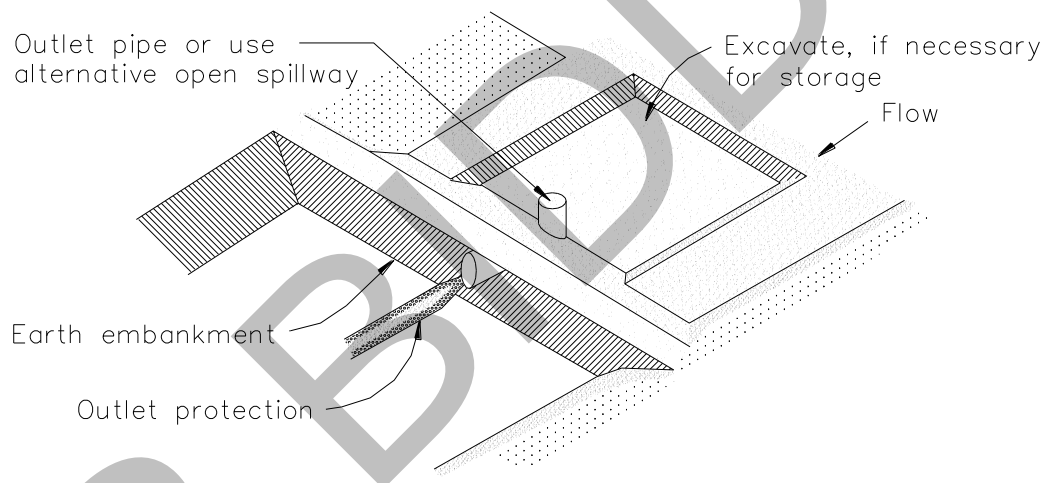
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

# Sediment Trap

## SE-3



TYPICAL OPEN SPILLWAY

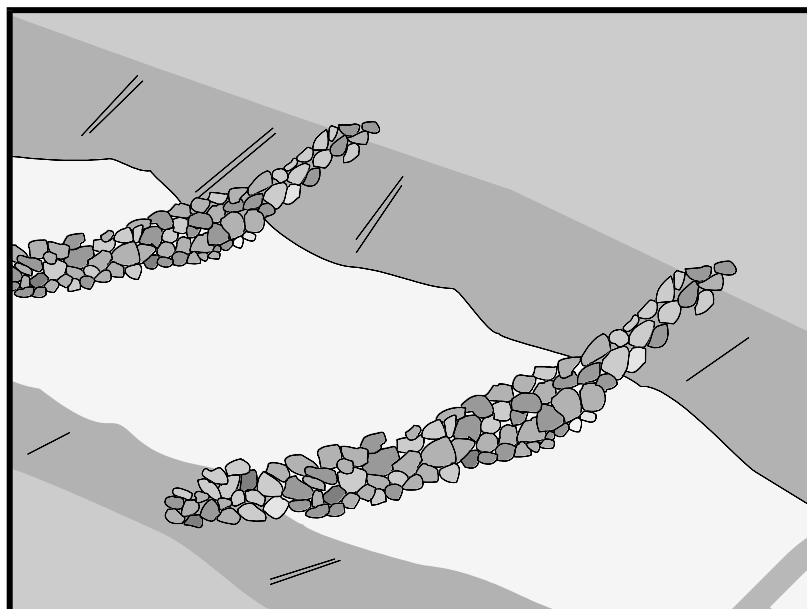


EMBANKMENT SECTION THRU RISER

TYPICAL SEDIMENT TRAP  
NOT TO SCALE

# Check Dams

# SE-4



## Description and Purpose

A check dam is a small barrier constructed of rock, gravel bags, sandbags, fiber rolls, or other proprietary products, placed across a constructed swale or drainage ditch. Check dams reduce the effective slope of the channel, thereby reducing scour and channel erosion by reducing flow velocity and increasing residence time within the channel, allowing sediment to settle.

## Suitable Applications

Check dams may be appropriate in the following situations:

- To promote sedimentation behind the dam.
- To prevent erosion by reducing the velocity of channel flow in small intermittent channels and temporary swales.
- In small open channels that drain 10 acres or less.
- In steep channels where stormwater runoff velocities exceed 5 ft/s.
- During the establishment of grass linings in drainage ditches or channels.
- In temporary ditches where the short length of service does not warrant establishment of erosion-resistant linings.
- To act as a grade control structure.

## Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

## Legend:

- ☒ **Primary Category**  
☒ **Secondary Category**

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

## Potential Alternatives

SE-5 Fiber Rolls  
 SE-6 Gravel Bag Berm  
 SE-8 Sandbag Barrier  
 SE-12 Manufactured Linear Sediment Controls  
 SE-14 Biofilter Bags

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# Check Dams

## SE-4

### Limitations

- Not to be used in live streams or in channels with extended base flows.
- Not appropriate in channels that drain areas greater than 10 acres.
- Not appropriate in channels that are already grass-lined unless erosion potential or sediment-laden flow is expected, as installation may damage vegetation.
- Require extensive maintenance following high velocity flows.
- Promotes sediment trapping which can be re-suspended during subsequent storms or removal of the check dam.
- Do not construct check dams with straw bales or silt fence.
- Water suitable for mosquito production may stand behind check dams, particularly if subjected to daily non-stormwater discharges.

### Implementation

#### *General*

Check dams reduce the effective slope and create small pools in swales and ditches that drain 10 acres or less. Using check dams to reduce channel slope reduces the velocity of stormwater flows, thus reducing erosion of the swale or ditch and promoting sedimentation. Thus, check dams are dual-purpose and serve an important role as erosion controls as well as as sediment controls. Note that use of 1-2 isolated check dams for sedimentation will likely result in little net removal of sediment because of the small detention time and probable scour during longer storms. Using a series of check dams will generally increase their effectiveness. A sediment trap (SE-3) may be placed immediately upstream of the check dam to increase sediment removal efficiency.

#### *Design and Layout*

Check dams work by decreasing the effective slope in ditches and swales. An important consequence of the reduced slope is a reduction in capacity of the ditch or swale. This reduction in capacity should be considered when using this BMP, as reduced capacity can result in overtopping of the ditch or swale and resultant consequences. In some cases, such as a “permanent” ditch or swale being constructed early and used as a “temporary” conveyance for construction flows, the ditch or swale may have sufficient capacity such that the temporary reduction in capacity due to check dams is acceptable. When check dams reduce capacities beyond acceptable limits, either:

- Don't use check dams. Consider alternative BMPs, or.
- Increase the size of the ditch or swale to restore capacity.

Maximum slope and velocity reduction is achieved when the toe of the upstream dam is at the same elevation as the top of the downstream dam (see “Spacing Between Check Dams” detail at the end of this fact sheet). The center section of the dam should be lower than the edge sections (at least 6 inches), acting as a spillway, so that the check dam will direct flows to the center of

# Check Dams

## SE-4

the ditch or swale (see “Typical Rock Check Dam” detail at the end of this fact sheet). Bypass or side-cutting can occur if a sufficient spillway is not provided in the center of the dam.

Check dams are usually constructed of rock, gravel bags, sandbags, and fiber rolls. A number of products can also be used as check dams (e.g. HDPE check dams, temporary silt dikes (SE-12)), and some of these products can be removed and reused. Check dams can also be constructed of logs or lumber, and have the advantage of a longer lifespan when compared to gravel bags, sandbags, and fiber rolls. Check dams should not be constructed from straw bales or silt fences, since concentrated flows quickly wash out these materials.

Rock check dams are usually constructed of 8 to 12 in. rock. The rock is placed either by hand or mechanically, but never just dumped into the channel. The dam should completely span the ditch or swale to prevent washout. The rock used should be large enough to stay in place given the expected design flow through the channel. It is recommended that abutments be extended 18 in. into the channel bank. Rock can be graded such that smaller diameter rock (e.g. 2-4 in) is located on the upstream side of larger rock (holding the smaller rock in place); increasing residence time.

Log check dams are usually constructed of 4 to 6 in. diameter logs, installed vertically. The logs should be embedded into the soil at least 18 in. Logs can be bolted or wired to vertical support logs that have been driven or buried into the soil.

See fiber rolls, SE-5, for installation of fiber roll check dams.

Gravel bag and sand bag check dams are constructed by stacking bags across the ditch or swale, shaped as shown in the drawings at the end of this fact sheet (see “Gravel Bag Check Dam” detail at the end of this fact sheet).

Manufactured products, such as temporary silt dikes (SE-12), should be installed in accordance with the manufacturer’s instructions. Installation typically requires anchoring or trenching of products, as well as regular maintenance to remove accumulated sediment and debris.

If grass is planted to stabilize the ditch or swale, the check dam should be removed when the grass has matured (unless the slope of the swales is greater than 4%).

The following guidance should be followed for the design and layout of check dams:

- Install the first check dam approximately 16 ft from the outfall device and at regular intervals based on slope gradient and soil type.
- Check dams should be placed at a distance and height to allow small pools to form between each check dam.
- For multiple check dam installation, backwater from a downstream check dam should reach the toes of the upstream check dam.
- A sediment trap provided immediately upstream of the check dam will help capture sediment. Due to the potential for this sediment to be resuspended in subsequent storms, the sediment trap should be cleaned following each storm event.

# Check Dams

## SE-4

- High flows (typically a 2-year storm or larger) should safely flow over the check dam without an increase in upstream flooding or damage to the check dam.
- Where grass is used to line ditches, check dams should be removed when grass has matured sufficiently to protect the ditch or swale.

### **Materials**

- Rock used for check dams should typically be 8-12 in rock and be sufficiently sized to stay in place given expected design flows in the channel. Smaller diameter rock (e.g. 2 to 4 in) can be placed on the upstream side of larger rock to increase residence time.
- Gravel bags used for check dams should conform to the requirements of SE-6, Gravel Bag Berms.
- Sandbags used for check dams should conform to SE-8, Sandbag Barrier.
- Fiber rolls used for check dams should conform to SE-5, Fiber Rolls.
- Temporary silt dikes used for check dams should conform to SE-12, Temporary Silt Dikes.

### **Installation**

- Rock should be placed individually by hand or by mechanical methods (no dumping of rock) to achieve complete ditch or swale coverage.
- Tightly abut bags and stack according to detail shown in the figure at the end of this section (pyramid approach). Gravel bags and sandbags should not be stacked any higher than 3 ft.
- Upper rows of gravel and sand bags shall overlap joints in lower rows.
- Fiber rolls should be trenched in, backfilled, and firmly staked in place.
- Install along a level contour.
- HDPE check dams, temporary silt dikes, and other manufactured products should be used and installed per manufacturer specifications.

### **Costs**

Cost consists of labor costs if materials are readily available (such as gravel on-site). If material must be imported, costs will increase. For other material and installation costs, see SE-5, SE-6, SE-8, SE-12, and SE-14.

### **Inspection and Maintenance**

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Replace missing rock, bags, rolls, etc. Replace bags or rolls that have degraded or have become damaged.

# Check Dams

## SE-4

- If the check dam is used as a sediment capture device, sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- If the check dam is used as a grade control structure, sediment removal is not required as long as the system continues to control the grade.
- Inspect areas behind check dams for pools of standing water, especially if subjected to daily non-stormwater discharges.
- Remove accumulated sediment prior to permanent seeding or soil stabilization.
- Remove check dam and accumulated sediment when check dams are no longer needed.

### References

Draft – Sedimentation and Erosion Control, and Inventory of Current Practices, USEPA, April 1990.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

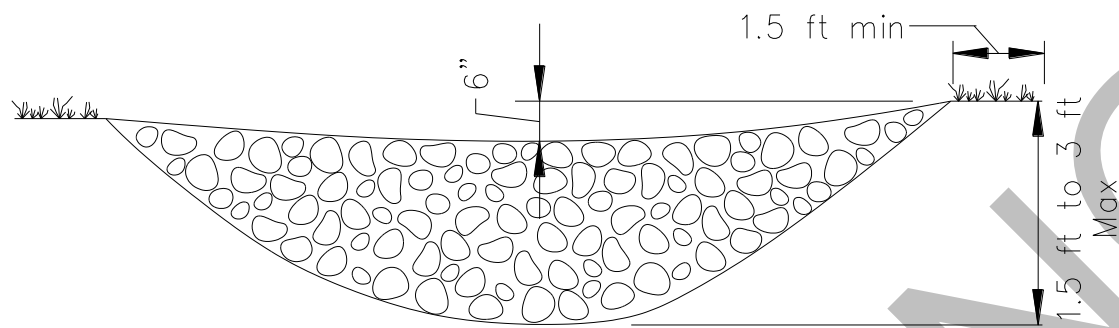
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

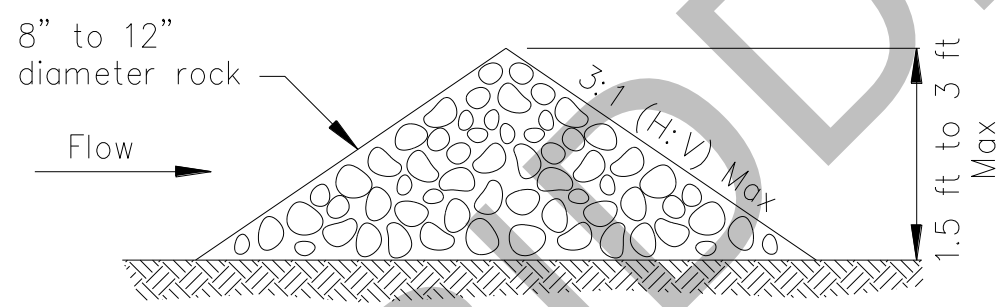
Metzger, M.E. 2004. Managing mosquitoes in stormwater treatment devices. University of California Division of Agriculture and Natural Resources, Publication 8125. On-line: <http://anrcatalog.ucdavis.edu/pdf/8125.pdf>

# Check Dams

# SE-4

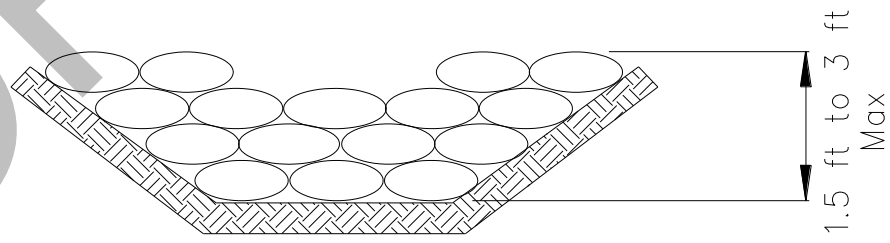


ELEVATION



TYPICAL ROCK CHECK DAM SECTION

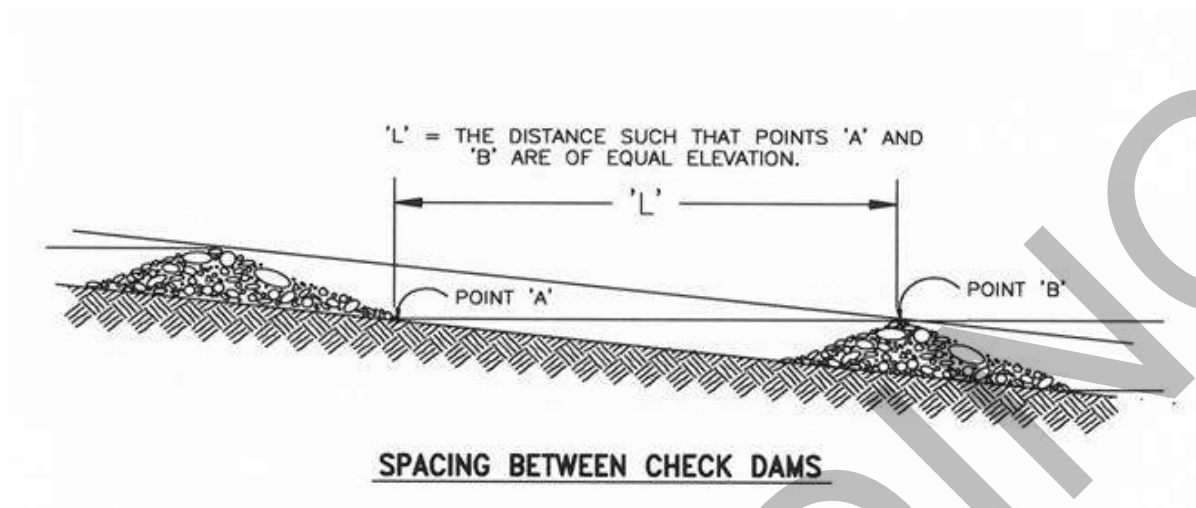
ROCK CHECK DAM  
NOT TO SCALE



GRAVEL BAG CHECK DAM ELEVATION  
NOT TO SCALE

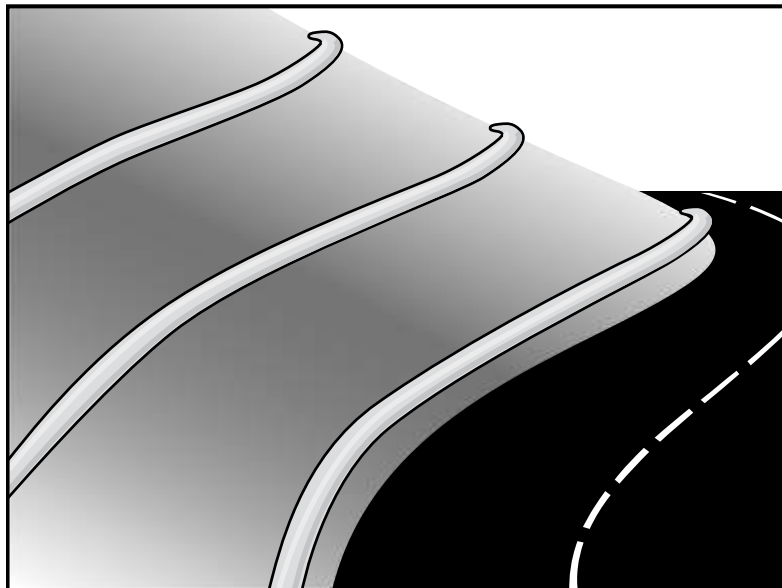
# Check Dams

## SE-4



# Fiber Rolls

## SE-5



### Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ Primary Category
- ☒ Secondary Category

### Description and Purpose

A fiber roll consists of straw, coir, or other biodegradable materials bound into a tight tubular roll wrapped by netting, which can be photodegradable or natural. Additionally, gravel core fiber rolls are available, which contain an imbedded ballast material such as gravel or sand for additional weight when staking the rolls are not feasible (such as use as inlet protection). When fiber rolls are placed at the toe and on the face of slopes along the contours, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff (through sedimentation). By interrupting the length of a slope, fiber rolls can also reduce sheet and rill erosion until vegetation is established.

### Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- At the end of a downward slope where it transitions to a steeper slope.
- Along the perimeter of a project.
- As check dams in unlined ditches with minimal grade.
- Down-slope of exposed soil areas.
- At operational storm drains as a form of inlet protection.

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

- SE-1 Silt Fence
- SE-6 Gravel Bag Berm
- SE-8 Sandbag Barrier
- SE-12 Manufactured Linear Sediment Controls
- SE-14 Biofilter Bags

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# Fiber Rolls

## SE-5

- Around temporary stockpiles.

### Limitations

- Fiber rolls are not effective unless trenched in and staked.
- Not intended for use in high flow situations.
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.
- Rolls typically function for 12-24 months depending upon local conditions.

### Implementation

#### ***Fiber Roll Materials***

- Fiber rolls should be prefabricated.
- Fiber rolls may come manufactured containing polyacrylamide (PAM), a flocculating agent within the roll. Fiber rolls impregnated with PAM provide additional sediment removal capabilities and should be used in areas with fine, clayey or silty soils to provide additional sediment removal capabilities. Monitoring may be required for these installations.
- Fiber rolls are made from weed free rice straw, flax, or a similar agricultural material bound into a tight tubular roll by netting.
- Typical fiber rolls vary in diameter from 9 in. to 20 in. Larger diameter rolls are available as well.

#### ***Installation***

- Locate fiber rolls on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
  - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Prepare the slope before beginning installation.
- Dig small trenches across the slope on the contour. The trench depth should be  $\frac{1}{4}$  to  $\frac{1}{3}$  of the thickness of the roll, and the width should equal the roll diameter, in order to provide area to backfill the trench.

# Fiber Rolls

## SE-5

- It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.
- Start building trenches and installing rolls from the bottom of the slope and work up.
- It is recommended that pilot holes be driven through the fiber roll. Use a straight bar to drive holes through the roll and into the soil for the wooden stakes.
- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.
- Stake fiber rolls into the trench.
  - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.
  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.
- See typical fiber roll installation details at the end of this fact sheet.

### **Removal**

- Fiber rolls can be left in place or removed depending on the type of fiber roll and application (temporary vs. permanent installation). Typically, fiber rolls encased with plastic netting are used for a temporary application because the netting does not biodegrade. Fiber rolls used in a permanent application are typically encased with a biodegradeable material and are left in place. Removal of a fiber roll used in a permanent application can result in greater disturbance.
- Temporary installations should only be removed when up gradient areas are stabilized per General Permit requirements, and/or pollutant sources no longer present a hazard. But, they should also be removed before vegetation becomes too mature so that the removal process does not disturb more soil and vegetation than is necessary.

### **Costs**

Material costs for regular fiber rolls range from \$20 - \$30 per 25 ft roll.

Material costs for PAM impregnated fiber rolls range between 7.00-\$9.00 per linear foot, based upon vendor research.

### **Inspection and Maintenance**

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP should be periodically removed

# Fiber Rolls

## SE-5

in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-third the designated sediment storage depth.

- If fiber rolls are used for erosion control, such as in a check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.
- Repair any rills or gullies promptly.

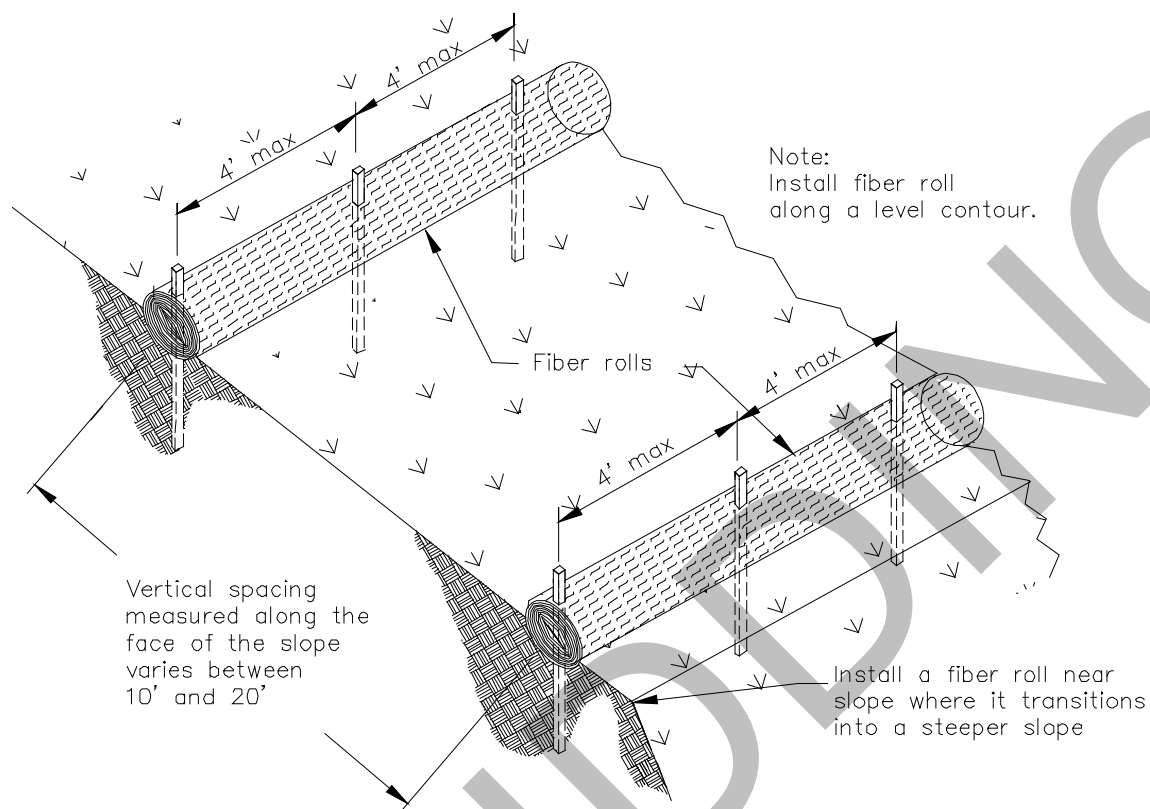
### References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

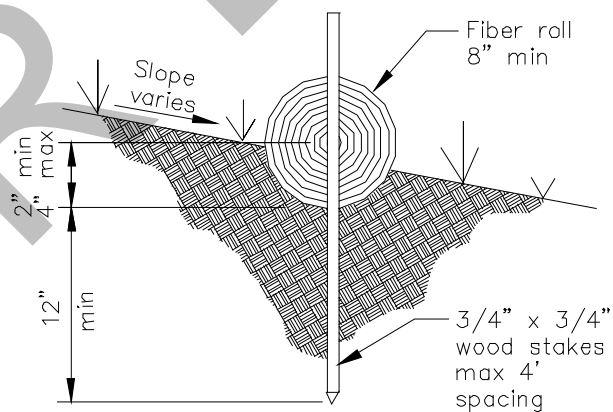
# Fiber Rolls

## SE-5



TYPICAL FIBER ROLL INSTALLATION

N.T.S.

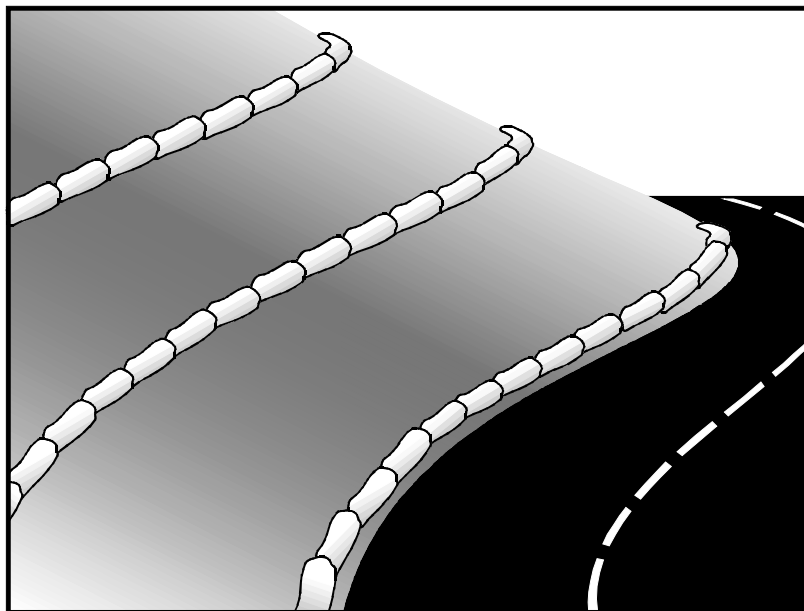


ENTRENCHMENT DETAIL

N.T.S.

# Gravel Bag Berm

# SE-6



## Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

## Legend:

- ☒ **Primary Category**  
☒ **Secondary Category**

## Description and Purpose

A gravel bag berm is a series of gravel-filled bags placed on a level contour to intercept sheet flows. Gravel bags pond sheet flow runoff, allowing sediment to settle out, and release runoff slowly as sheet flow, preventing erosion.

## Suitable Applications

Gravel bag berms may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As a linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

## Potential Alternatives

- SE-1 Silt Fence
- SE-5 Fiber Roll
- SE-8 Sandbag Barrier
- SE-12 Temporary Silt Dike
- SE-14 Biofilter Bags

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# Gravel Bag Berm

## SE-6

- At the top of slopes to divert runoff away from disturbed slopes.
- As chevrons (small check dams) across mildly sloped construction roads. For use check dam use in channels, see SE-4, Check Dams.

### Limitations

- Gravel berms may be difficult to remove.
- Removal problems limit their usefulness in landscaped areas.
- Gravel bag berm may not be appropriate for drainage areas greater than 5 acres.
- Runoff will pond upstream of the berm, possibly causing flooding if sufficient space does not exist.
- Degraded gravel bags may rupture when removed, spilling contents.
- Installation can be labor intensive.
- Durability of gravel bags is somewhat limited and bags may need to be replaced when installation is required for longer than 6 months.
- Easily damaged by construction equipment.
- When used to detain concentrated flows, maintenance requirements increase.

### Implementation

#### *General*

A gravel bag berm consists of a row of open graded gravel-filled bags placed on a level contour. When appropriately placed, a gravel bag berm intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. The open graded gravel in the bags is porous, which allows the ponded runoff to flow slowly through the bags, releasing the runoff as sheet flows. Gravel bag berms also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils. Gravel bag berms are similar to sand bag barriers, but are more porous. Generally, gravel bag berms should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

#### *Design and Layout*

- Locate gravel bag berms on level contours.
- When used for slope interruption, the following slope/sheet flow length combinations apply:
  - Slope inclination of 4:1 (H:V) or flatter: Gravel bags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slope inclination between 4:1 and 2:1 (H:V): Gravel bags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.

# Gravel Bag Berm

## SE-6

Slope inclination 2:1 (H:V) or greater: Gravel bags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.

- Turn the ends of the gravel bag barriers up slope to prevent runoff from going around the berm.
- Allow sufficient space up slope from the gravel bag berm to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, gravel bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the gravel bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- In Non-Traffic Areas:
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Top width = 12 in. minimum for one or two layer construction
  - Side slopes = 2:1 (H:V) or flatter
- In Construction Traffic Areas:
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Top width = 12 in. minimum for one or two layer construction.
  - Side slopes = 2:1 (H:V) or flatter.
- Butt ends of bags tightly.
- On multiple row, or multiple layer construction, overlap butt joints of adjacent row and row beneath.
- Use a pyramid approach when stacking bags.

### Materials

- **Bag Material:** Bags should be woven polypropylene, polyethylene or polyamide fabric or burlap, minimum unit weight of 4 ounces/yd<sup>2</sup>, Mullen burst strength exceeding 300 lb/in<sup>2</sup> in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.

# Gravel Bag Berm

## SE-6

- **Bag Size:** Each gravel-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.
- **Fill Material:** Fill material should be 0.5 to 1 in. crushed rock, clean and free from clay, organic matter, and other deleterious material, or other suitable open graded, non-cohesive, porous gravel.

### Costs

Material costs for gravel bags are average and are dependent upon material availability. \$2.50-3.00 per filled gravel bag is standard based upon vendor research.

### Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Gravel bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.
- Reshape or replace gravel bags as needed.
- Repair washouts or other damage as needed.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Remove gravel bag berms when no longer needed and recycle gravel fill whenever possible and properly dispose of bag material. Remove sediment accumulation and clean, re-grade, and stabilize the area.

### References

Handbook of Steel Drainage and Highway Construction, American Iron and Steel Institute, 1983.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Pollution Plan Handbook, First Edition, State of California, Department of Transportation Division of New Technology, Materials and Research, October 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

# Street Sweeping and Vacuuming

SE-7



## Categories

EC	Erosion Control	
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	<input checked="" type="checkbox"/>
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

## Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

## Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

## Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

## Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

## Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	<input checked="" type="checkbox"/>
Metals	
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	

## Potential Alternatives

None

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# Street Sweeping and Vacuuming

## SE-7

- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.
- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

### Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from \$58/hour (3 yd<sup>3</sup> hopper) to \$88/hour (9 yd<sup>3</sup> hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

### Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

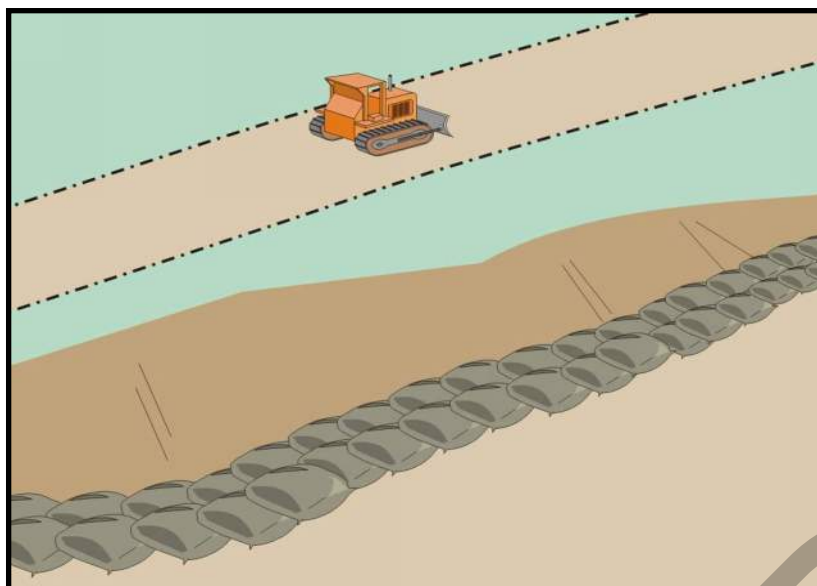
### References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

# Sandbag Barrier

# SE-8



## Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

## Legend:

- ☒ **Primary Category**  
☒ **Secondary Category**

## Description and Purpose

A sandbag barrier is a series of sand-filled bags placed on a level contour to intercept or to divert sheet flows. Sandbag barriers placed on a level contour pond sheet flow runoff, allowing sediment to settle out.

## Suitable Applications

Sandbag barriers may be a suitable control measure for the applications described below. It is important to consider that sand bags are less porous than gravel bags and ponding or flooding can occur behind the barrier. Also, sand is easily transported by runoff if bags are damaged or ruptured. The SWPPP Preparer should select the location of a sandbag barrier with respect to the potential for flooding, damage, and the ability to maintain the BMP.

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes.
  - As sediment traps at culvert/pipe outlets.
  - Below other small cleared areas.
  - Along the perimeter of a site.
  - Down slope of exposed soil areas.
  - Around temporary stockpiles and spoil areas.
  - Parallel to a roadway to keep sediment off paved areas.
  - Along streams and channels.

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

## Potential Alternatives

- SE-1 Silt Fence
- SE-5 Fiber Rolls
- SE-6 Gravel Bag Berm
- SE-12 Manufactured Linear Sediment Controls
- SE-14 Biofilter Bags

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# Sandbag Barrier

## SE-8

- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
  - At the top of slopes to divert runoff away from disturbed slopes.
  - As check dams across mildly sloped construction roads.

### Limitations

- It is necessary to limit the drainage area upstream of the barrier to 5 acres.
- Sandbags are not intended to be used as filtration devices.
- Easily damaged by construction equipment.
- Degraded sandbags may rupture when removed, spilling sand.
- Installation can be labor intensive.
- Durability of sandbags is somewhat limited and bags will need to be replaced when there are signs of damage or wear.
- Burlap should not be used for sandbags.

### Implementation

#### *General*

A sandbag barrier consists of a row of sand-filled bags placed on a level contour. When appropriately placed, a sandbag barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. Sand-filled bags have limited porosity, which is further limited as the fine sand tends to quickly plug with sediment, limiting or completely blocking the rate of flow through the barrier. If a porous barrier is desired, consider SE-1, Silt Fence, SE-5, Fiber Rolls, SE-6, Gravel Bag Berms or SE-14, Biofilter Bags. Sandbag barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets which erode rills, and ultimately gullies, into disturbed, sloped soils. Sandbag barriers are similar to gravel bag berms, but less porous. Generally, sandbag barriers should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

#### *Design and Layout*

- Locate sandbag barriers on a level contour.
- When used for slope interruption, the following slope/sheet flow length combinations apply:
  - Slope inclination of 4:1 (H:V) or flatter: Sandbags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slope inclination between 4:1 and 2:1 (H:V): Sandbags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.

# Sandbag Barrier

## SE-8

- Slope inclination 2:1 (H:V) or greater: Sandbags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.
- Turn the ends of the sandbag barrier up slope to prevent runoff from going around the barrier.
- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, sand bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the sand bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- Butt ends of bags tightly.
- Overlap butt joints of row beneath with each successive row.
- Use a pyramid approach when stacking bags.
- In non-traffic areas
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Side slope = 2:1 (H:V) or flatter
- In construction traffic areas
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Side slopes = 2:1 (H:V) or flatter.
- See typical sandbag barrier installation details at the end of this fact sheet.

### Materials

- **Sandbag Material:** Sandbag should be woven polypropylene, polyethylene or polyamide fabric, minimum unit weight of 4 ounces/yd<sup>2</sup>, Mullen burst strength exceeding 300 lb/in<sup>2</sup> in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355. Use of burlap is not an acceptable substitute, as sand can more easily mobilize out of burlap.
- **Sandbag Size:** Each sand-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.

# Sandbag Barrier

## SE-8

- **Fill Material:** All sandbag fill material should be non-cohesive, Class 3 (Caltrans Standard Specification, Section 25) or similar permeable material free from clay and deleterious material, such as recycled concrete or asphalt.

### Costs

Empty sandbags cost \$0.25 - \$0.75. Average cost of fill material is \$8 per yd<sup>3</sup>. Additional labor is required to fill the bags. Pre-filled sandbags are more expensive at \$1.50 - \$2.00 per bag. These costs are based upon vendor research.

### Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Sandbags exposed to sunlight will need to be replaced every two to three months due to degradation of the bags.
- Reshape or replace sandbags as needed.
- Repair washouts or other damage as needed.
- Sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Remove sandbags when no longer needed and recycle sand fill whenever possible and properly dispose of bag material. Remove sediment accumulation, and clean, re-grade, and stabilize the area.

### References

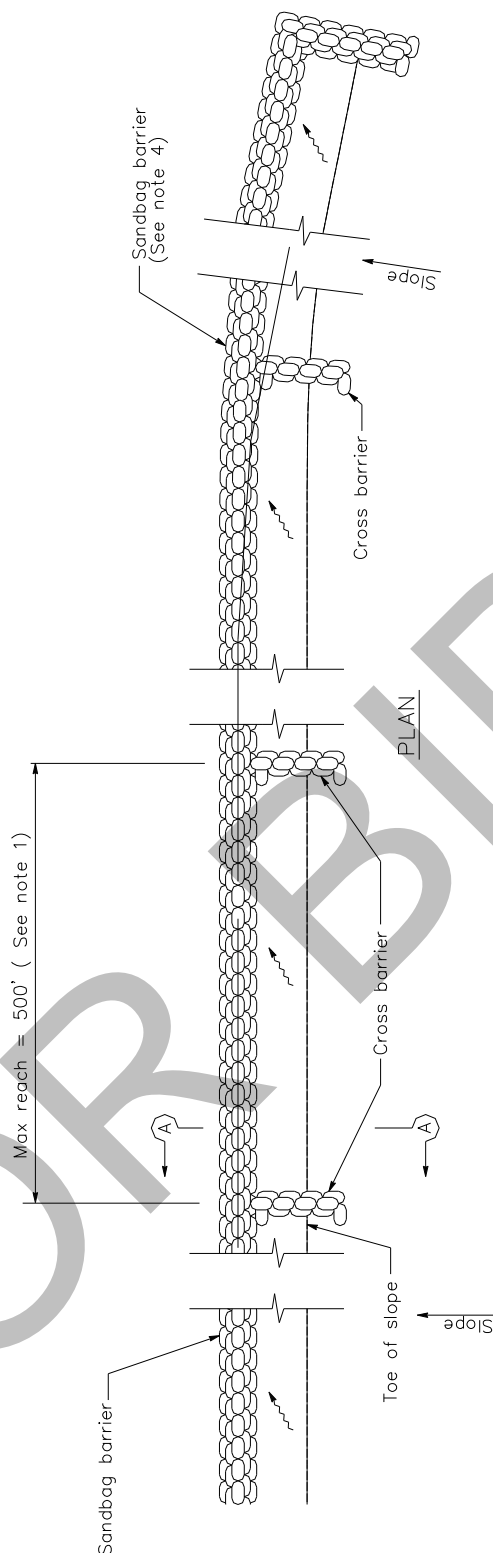
Standard Specifications for Construction of Local Streets and Roads, California Department of Transportation (Caltrans), July 2002.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

# Sandbag Barrier

## SE-8

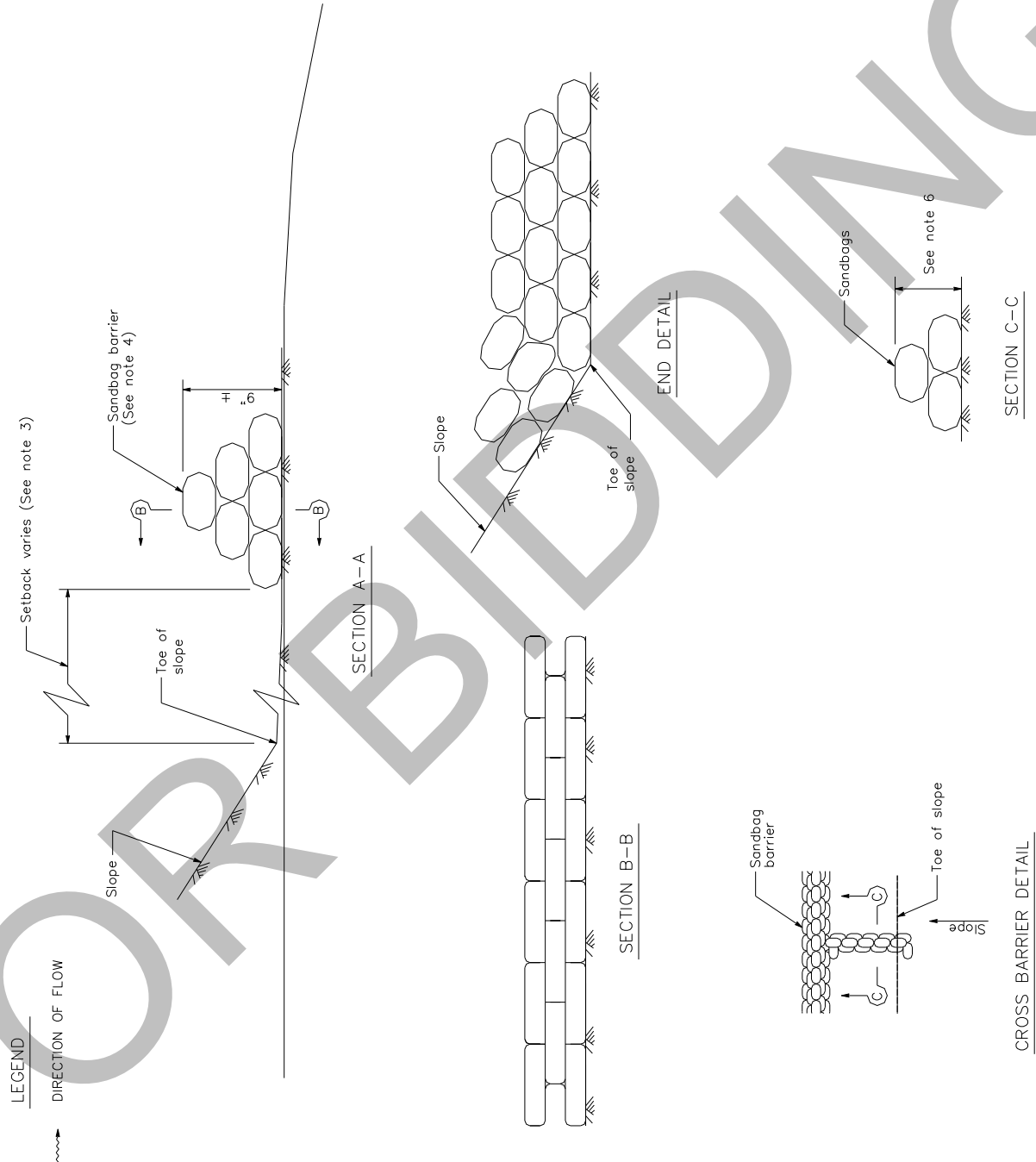


### NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed  $1/2$  the height of the linear barrier. In no case shall the reach length exceed 500'.
2. Place sandbags tightly.
3. Dimension may vary to fit field condition.
4. Sandbag barrier shall be a minimum of 3 bags high.
5. The end of the barrier shall be turned up slope.
6. Cross barriers shall be a min of  $1/2$  and a max of  $2/3$  the height of the linear barrier.
7. Sandbag rows and layers shall be staggered to eliminate gaps.

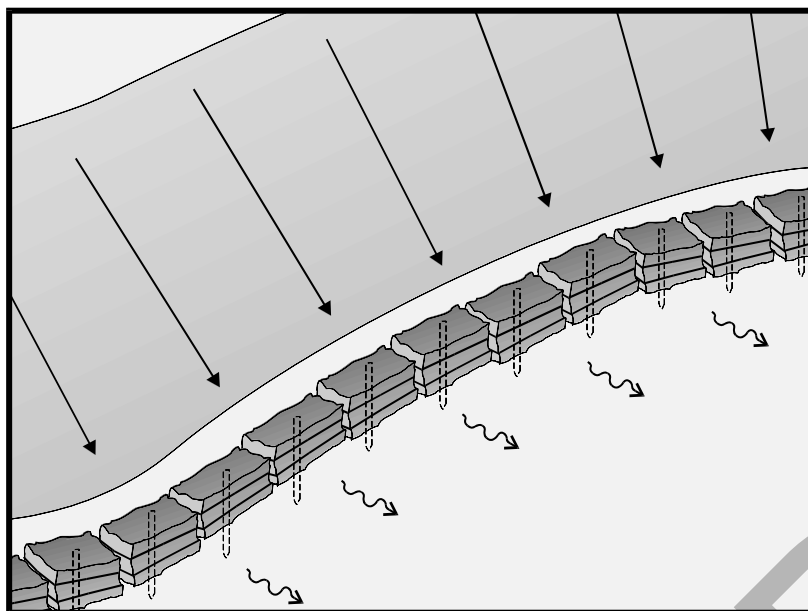
# Sandbag Barrier

# SE-8



# Straw Bale Barrier

# SE-9



## Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

## Legend:

- ☒ **Primary Objective**  
☒ **Secondary Objective**

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

## Potential Alternatives

SE-1 Silt Fence  
 SE-5 Fiber Rolls  
 SE-6 Gravel Bag Berm  
 SE-8 Sandbag Barrier  
 SE-12 Temporary Silt Dike  
 SE-14 Biofilter Bags

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## Description and Purpose

A straw bale barrier is a series of straw bales placed on a level contour to intercept sheet flows. Straw bale barriers pond sheet-flow runoff, allowing sediment to settle out.

## Suitable Applications

Straw bale barriers may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow

# Straw Bale Barrier

## SE-9

- At the top of slopes to divert runoff away from disturbed slopes
- As check dams across mildly sloped construction roads

### Limitations

Straw bale barriers:

- Are not to be used for extended periods of time because they tend to rot and fall apart
- Are suitable only for sheet flow on slopes of 10 % or flatter
- Are not appropriate for large drainage areas, limit to one acre or less
- May require constant maintenance due to rotting
- Are not recommended for concentrated flow, inlet protection, channel flow, and live streams
- Cannot be made of bale bindings of jute or cotton
- Require labor-intensive installation and maintenance
- Cannot be used on paved surfaces
- Should not to be used for drain inlet protection
- Should not be used on lined ditches
- May introduce undesirable non-native plants to the area

### Implementation

#### General

A straw bale barrier consists of a row of straw bales placed on a level contour. When appropriately placed, a straw bale barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. Straw bale barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils.

Straw bale barriers have not been as effective as expected due to improper use. These barriers have been placed in streams and drainage ways where runoff volumes and velocities have caused the barriers to wash out. In addition, failure to stake and entrench the straw bale has allowed undercutting and end flow. Use of straw bale barriers in accordance with this BMP should produce acceptable results.

#### Design and Layout

- Locate straw bale barriers on a level contour.
  - Slopes up to 10:1 (H:V): Straw bales should be placed at a maximum interval of 50 ft (a closer spacing is more effective), with the first row near the toe of slope.
  - Slopes greater than 10:1 (H:V): Not recommended.

# Straw Bale Barrier

## SE-9

- Turn the ends of the straw bale barrier up slope to prevent runoff from going around the barrier.
- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, consider moving the barrier away from the slope toe to facilitate cleaning. To prevent flow behind the barrier, sand bags can be placed perpendicular to the barrier to serve as cross barriers.
- Drainage area should not exceed 1 acre, or 0.25 acre per 100 ft of barrier.
- Maximum flow path to the barrier should be limited to 100 ft.
- Straw bale barriers should consist of two parallel rows.
  - Butt ends of bales tightly
  - Stagger butt joints between front and back row
  - Each row of bales must be trenched in and firmly staked
- Straw bale barriers are limited in height to one bale laid on its side.
- Anchor bales with either two wood stakes or four bars driven through the bale and into the soil. Drive the first stake towards the butt joint with the adjacent bale to force the bales together.
- See attached figure for installation details.

### Materials

- **Straw Bale Size:** Each straw bale should be a minimum of 14 in. wide, 18 in. in height, 36 in. in length and should have a minimum mass of 50 lbs. The straw bale should be composed entirely of vegetative matter, except for the binding material.
- **Bale Bindings:** Bales should be bound by steel wire, nylon or polypropylene string placed horizontally. Jute and cotton binding should not be used. Baling wire should be a minimum diameter of 14 gauge. Nylon or polypropylene string should be approximately 12 gauge in diameter with a breaking strength of 80 lbs force.
- **Stakes:** Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake, or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable. Steel bar reinforcement should be equal to a #4 designation or greater. End protection should be provided for any exposed bar reinforcement.

### Costs

Straw bales cost \$5 - \$7 each. Adequate labor should be budgeted for installation and maintenance.

# Straw Bale Barrier

## SE-9

### Inspection and Maintenance

#### *Maintenance*

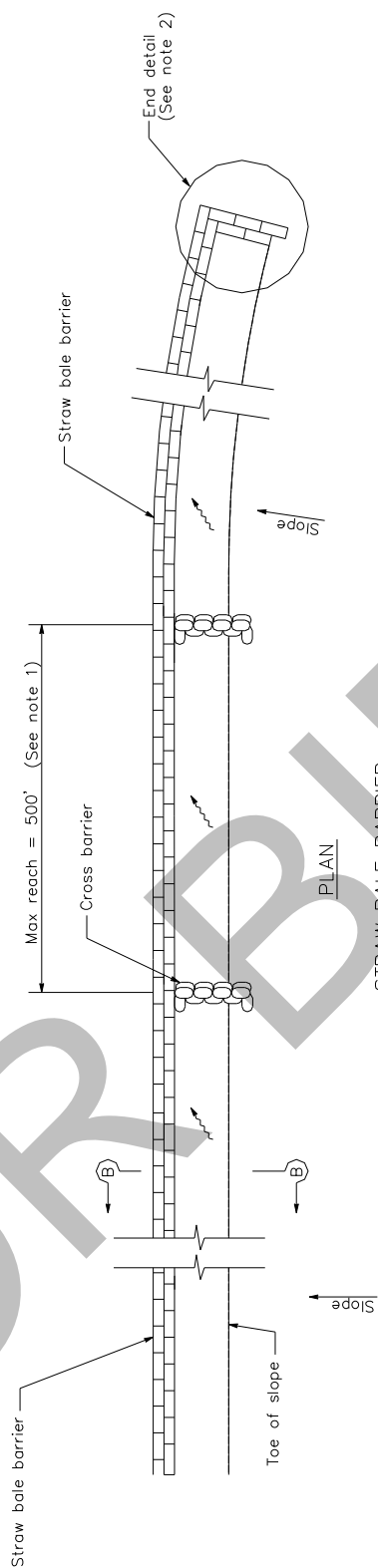
- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Straw bales degrade, especially when exposed to moisture. Rotting bales will need to be replaced on a regular basis.
- Replace or repair damaged bales as needed.
- Repair washouts or other damages as needed.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Remove straw bales when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilize the area. Removed sediment should be incorporated in the project or disposed of.

#### References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

# Straw Bale Barrier

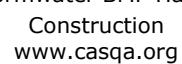
# SE-9



## NOTES

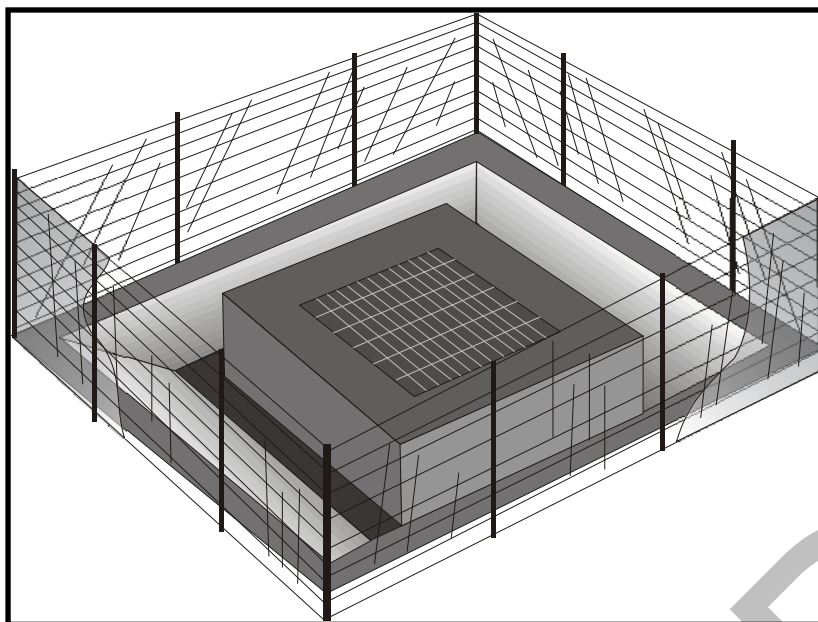
1. Construct the length of each reach so that the change in base elevation along the reach does not exceed  $1/2$  the height of the linear barrier. In no case shall the reach length exceed 500'.
2. The end of barrier shall be turned up slope.
3. Dimension may vary to fit field condition.
4. Stake dimensions are nominal.
5. Place straw bales tightly together.
6. Tamp embedment spoils against sides of installed bales.
7. Drive angled wood stake before vertical stake to ensure tight abutment to adjacent bale.
8. Sandbag cross barriers should be a min of  $1/2$  and a max of  $2/3$  the height of the linear barrier.
9. Sandbag rows and layers should be offset to eliminate gaps.

LEGEND  
DIRECTION OF FLOW



# Storm Drain Inlet Protection

## SE-10



### Categories

EC	Erosion Control	
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ **Primary Category**  
☒ **Secondary Category**

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	<input checked="" type="checkbox"/>
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

- SE-1 Silt Fence
- SE-5 Fiber Rolls
- SE-6 Gravel Bag Berm
- SE-8 Sandbag Barrier
- SE-14 Biofilter Bags
- SE-13 Compost Socks and Berms

### Description and Purpose

Storm drain inlet protection consists of a sediment filter or an impounding area in, around or upstream of a storm drain, drop inlet, or curb inlet. Storm drain inlet protection measures temporarily pond runoff before it enters the storm drain, allowing sediment to settle. Some filter configurations also remove sediment by filtering, but usually the ponding action results in the greatest sediment reduction. Temporary geotextile storm drain inserts attach underneath storm drain grates to capture and filter storm water.

### Suitable Applications

- Every storm drain inlet receiving runoff from unstabilized or otherwise active work areas should be protected. Inlet protection should be used in conjunction with other erosion and sediment controls to prevent sediment-laden stormwater and non-stormwater discharges from entering the storm drain system.

### Limitations

- Drainage area should not exceed 1 acre.
- In general straw bales should not be used as inlet protection.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.
- Sediment removal may be inadequate to prevent sediment discharges in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are expected, use

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# Storm Drain Inlet Protection

## SE-10

other onsite sediment trapping techniques in conjunction with inlet protection.

- Frequent maintenance is required.
- Limit drainage area to 1 acre maximum. For drainage areas larger than 1 acre, runoff should be routed to a sediment-trapping device designed for larger flows. See BMPs SE-2, Sediment Basin, and SE-3, Sediment Traps.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected, and overflow capability is needed.

### Implementation

#### General

Inlet control measures presented in this handbook should not be used for inlets draining more than one acre. Runoff from larger disturbed areas should be first routed through SE-2, Sediment Basin or SE-3, Sediment Trap and/or used in conjunction with other drainage control, erosion control, and sediment control BMPs to protect the site. Different types of inlet protection are appropriate for different applications depending on site conditions and the type of inlet. Alternative methods are available in addition to the methods described/shown herein such as prefabricated inlet insert devices, or gutter protection devices.

#### Design and Layout

Identify existing and planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed and which method to use.

- The key to successful and safe use of storm drain inlet protection devices is to know where runoff that is directed toward the inlet to be protected will pond or be diverted as a result of installing the protection device.
  - Determine the acceptable location and extent of ponding in the vicinity of the drain inlet. The acceptable location and extent of ponding will influence the type and design of the storm drain inlet protection device.
  - Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the device and towards the next downstream inlet. In some cases, this is acceptable; in other cases, serious erosion or downstream property damage can be caused by these diversions. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.
- The location and extent of ponding, and the extent of diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the inlet protection device a short distance upstream of the actual inlet can provide more efficient sediment control, limit ponding to desired areas, and prevent or control diversions.
- Seven types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.

# Storm Drain Inlet Protection

## SE-10

- Silt Fence: Appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.
- Excavated Drop Inlet Sediment Trap: An excavated area around the inlet to trap sediment (SE-3).
- Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cfs, and where overtopping is required to prevent flooding.
- Block and Gravel Filter: Appropriate for flows greater than 0.5 cfs.
- Temporary Geotextile Storm drain Inserts: Different products provide different features. Refer to manufacturer details for targeted pollutants and additional features.
- Biofilter Bag Barrier: Used to create a small retention area upstream of inlets and can be located on pavement or soil. Biofilter bags slowly filter runoff allowing sediment to settle out. Appropriate for flows under 0.5 cfs.
- Compost Socks: Allow filtered run-off to pass through the compost while retaining sediment and potentially other pollutants (SE-13). Appropriate for flows under 1.0 cfs.
- Select the appropriate type of inlet protection and design as referred to or as described in this fact sheet.
- Provide area around the inlet for water to pond without flooding structures and property.
- Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.
- Excavate sediment sumps (where needed) 1 to 2 ft with 2:1 side slopes around the inlet.

### Installation

- **DI Protection Type 1 - Silt Fence** - Similar to constructing a silt fence; see BMP SE-1, Silt Fence. Do not place fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced and water flow through the grate will be blocked resulting in flooding. See typical Type 1 installation details at the end of this fact sheet.
  1. Excavate a trench approximately 6 in. wide and 6 in. deep along the line of the silt fence inlet protection device.
  2. Place 2 in. by 2 in. wooden stakes around the perimeter of the inlet a maximum of 3 ft apart and drive them at least 18 in. into the ground or 12 in. below the bottom of the trench. The stakes should be at least 48 in.
  3. Lay fabric along bottom of trench, up side of trench, and then up stakes. See SE-1, Silt Fence, for details. The maximum silt fence height around the inlet is 24 in.
  4. Staple the filter fabric (for materials and specifications, see SE-1, Silt Fence) to wooden stakes. Use heavy-duty wire staples at least 1 in. in length.

# Storm Drain Inlet Protection

## SE-10

5. Backfill the trench with gravel or compacted earth all the way around.

- **DI Protection Type 2 - Excavated Drop Inlet Sediment Trap** - Install filter fabric fence in accordance with DI Protection Type 1. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 yd<sup>3</sup>/acre of drainage area. See typical Type 2 installation details at the end of this fact sheet.
- **DI Protection Type 3 - Gravel bag** - Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with SE-6, Gravel Bag Berm. Gravel bags should be used due to their high permeability. See typical Type 3 installation details at the end of this fact sheet.
  1. Construct on gently sloping street.
  2. Leave room upstream of barrier for water to pond and sediment to settle.
  3. Place several layers of gravel bags – overlapping the bags and packing them tightly together.
  4. Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.
- **DI Protection Type 4 – Block and Gravel Filter** - Block and gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction. See typical Type 4 installation details at the end of this fact sheet.
  1. Place hardware cloth or comparable wire mesh with 0.5 in. openings over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place woven geotextile over the wire mesh.
  2. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.
  3. Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.
  4. Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.
- **DI Protection Type 5 – Temporary Geotextile Insert (proprietary)** – Many types of temporary inserts are available. Most inserts fit underneath the grate of a drop inlet or inside of a curb inlet and are fastened to the outside of the grate or curb. These inserts are removable and many can be cleaned and reused. Installation of these inserts differs between manufacturers. Please refer to manufacturer instruction for installation of proprietary devices.

# Storm Drain Inlet Protection

## SE-10

- **DI Protection Type 6 - Biofilter bags** – Biofilter bags may be used as a substitute for gravel bags in low-flow situations. Biofilter bags should conform to specifications detailed in SE-14, Biofilter bags.
  1. Construct in a gently sloping area.
  2. Biofilter bags should be placed around inlets to intercept runoff flows.
  3. All bag joints should overlap by 6 in.
  4. Leave room upstream for water to pond and for sediment to settle out.
  5. Stake bags to the ground as described in the following detail. Stakes may be omitted if bags are placed on a paved surface.
- **DI Protection Type 7 – Compost Socks** – A compost sock can be assembled on site by filling a mesh sock (e.g., with a pneumatic blower). Compost socks do not require special trenching compared to other sediment control methods (e.g., silt fence). Compost socks should conform to specification detailed in SE-13, Compost Socks and Berms.

### Costs

- Average annual cost for installation and maintenance of DI Type 1-4 and 6 (one year useful life) is \$200 per inlet.
- Temporary geotextile inserts are proprietary and cost varies by region. These inserts can often be reused and may have greater than 1 year of use if maintained and kept undamaged. Average cost per insert ranges from \$50-75 plus installation, but costs can exceed \$100. This cost does not include maintenance.
- See SE-13 for Compost Sock cost information.

### Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- **Silt Fences.** If the fabric becomes clogged, torn, or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes. At a minimum, remove the sediment behind the fabric fence when accumulation reaches one-third the height of the fence or barrier height.
- **Gravel Filters.** If the gravel becomes clogged with sediment, it should be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.

# Storm Drain Inlet Protection

## SE-10

- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Inspect and maintain temporary geotextile insert devices according to manufacturer's specifications.
- Remove storm drain inlet protection once the drainage area is stabilized.
  - Clean and regrade area around the inlet and clean the inside of the storm drain inlet, as it should be free of sediment and debris at the time of final inspection.

### References

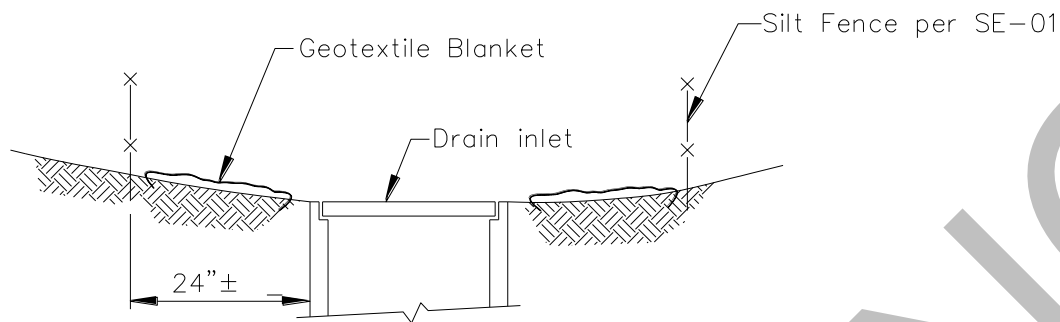
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

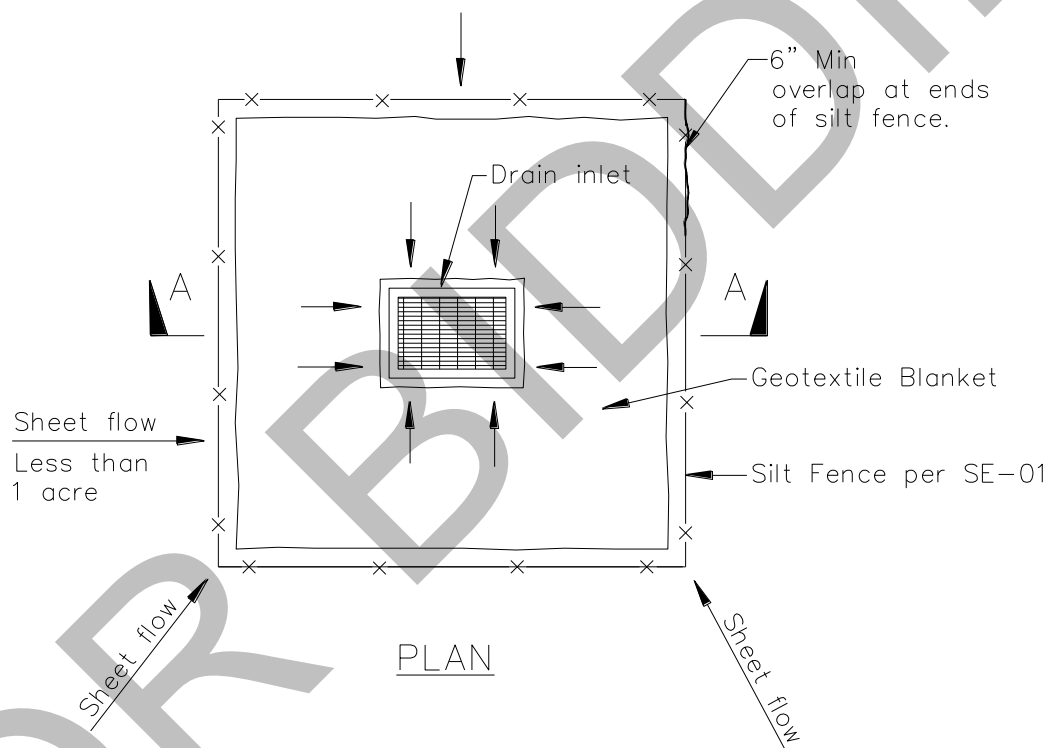
Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

# Storm Drain Inlet Protection

## SE-10



SECTION A-A



PLAN

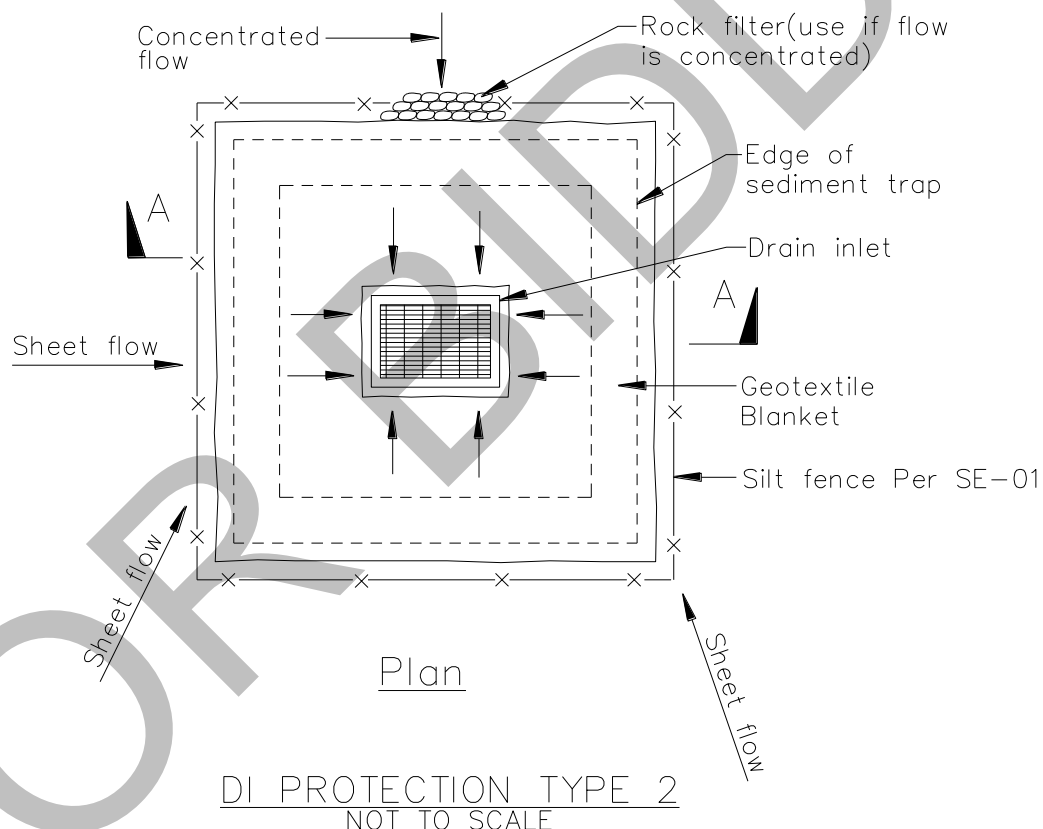
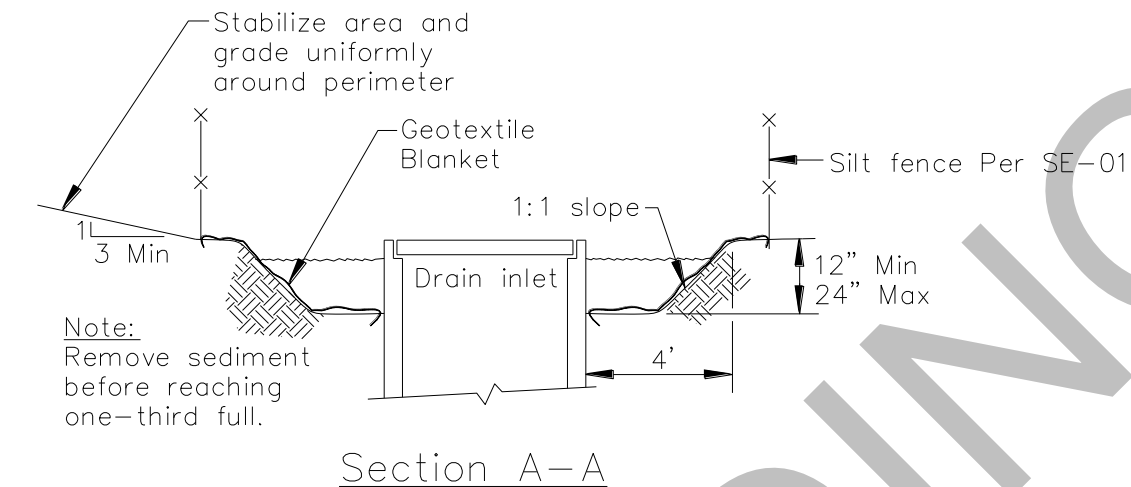
DI PROTECTION TYPE 1  
NOT TO SCALE

NOTES:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.

# Storm Drain Inlet Protection

## SE-10

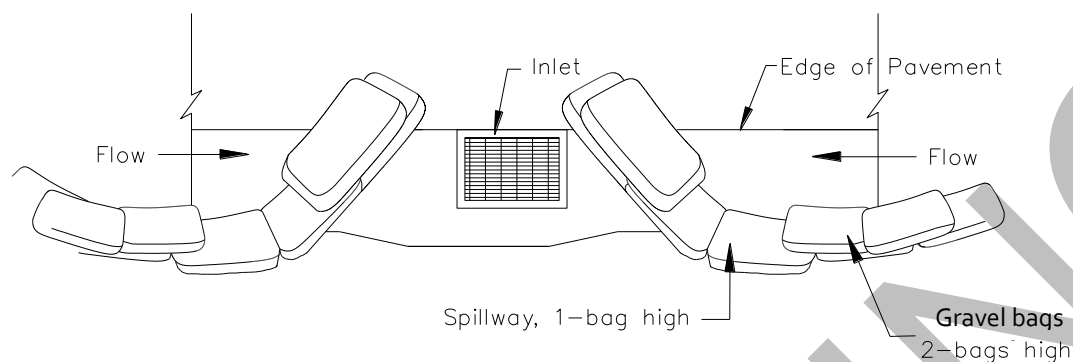


### Notes

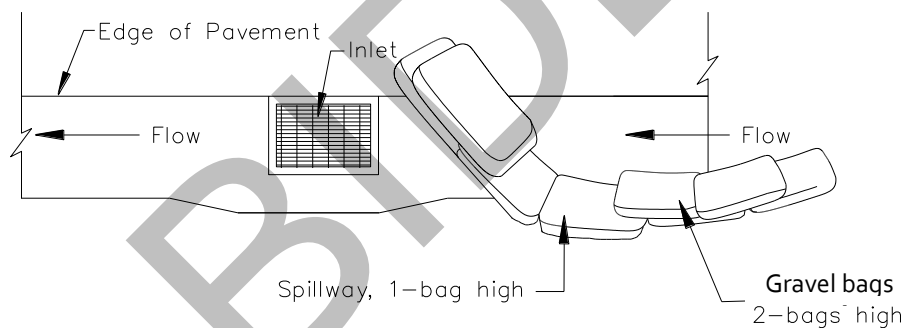
1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.

# Storm Drain Inlet Protection

## SE-10



TYPICAL PROTECTION FOR INLET ON SUMP



TYPICAL PROTECTION FOR INLET ON GRADE

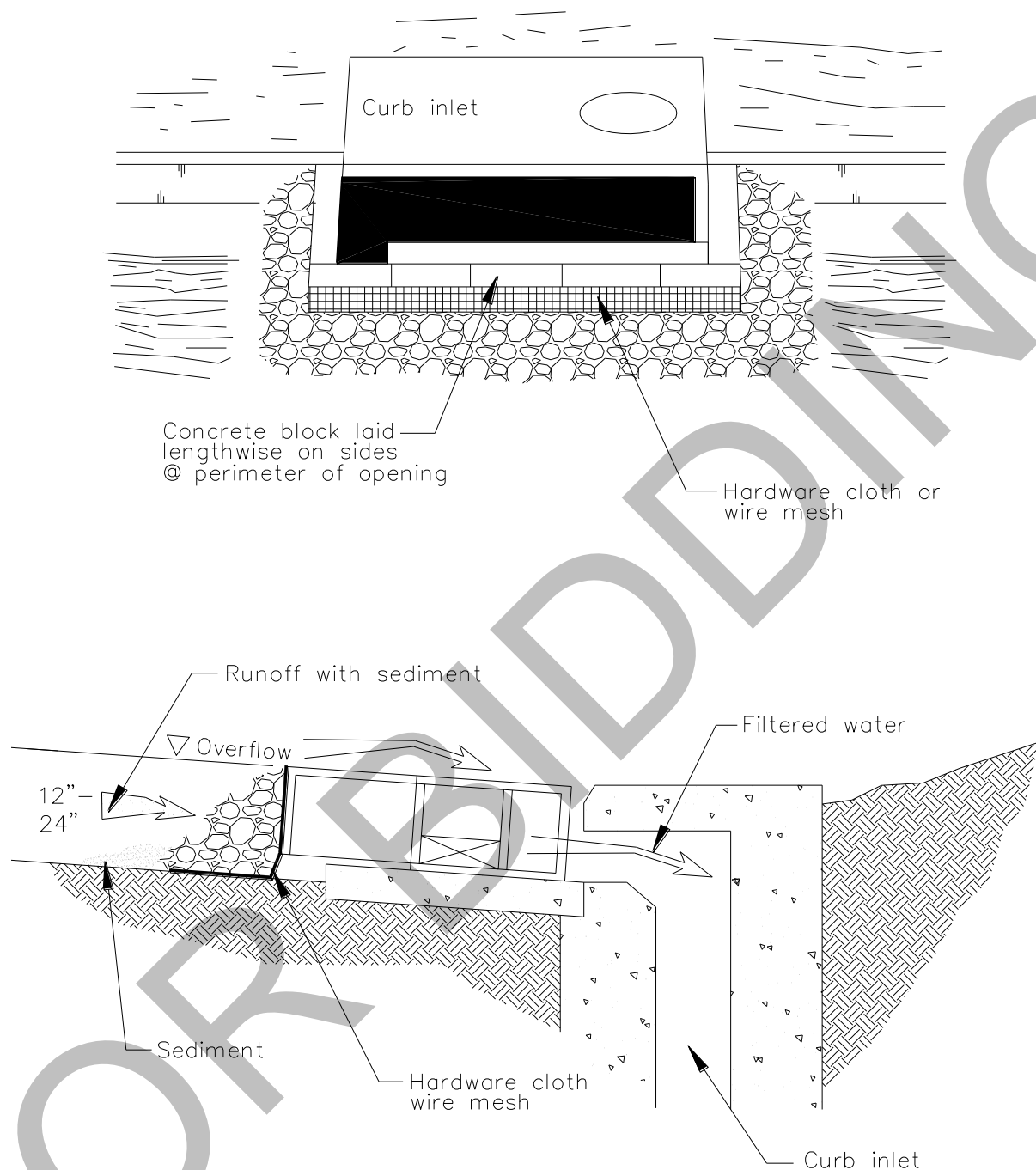
### NOTES:

1. Intended for short-term use.
2. Use to inhibit non-storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed
5. Not applicable in areas with high silts and clays without filter fabric.
6. Protection can be effective even if it is not immediately adjacent to the inlet provided that the inlet is protected from potential sources of pollution.

DI PROTECTION TYPE 3  
NOT TO SCALE

# Storm Drain Inlet Protection

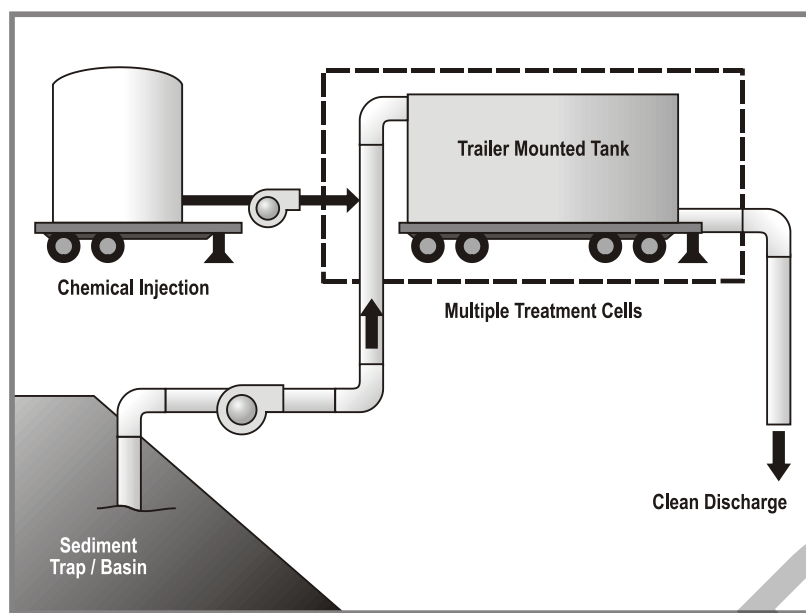
## SE-10



DI PROTECTION — TYPE 4  
NOT TO SCALE

# Active Treatment Systems

## SE-11



### Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ Primary Category
- ☒ Secondary Category

### Description and Purpose

Active Treatment Systems (ATS) reduce turbidity of construction site runoff by introducing chemicals to stormwater through direct dosing or an electrical current to enhance flocculation, coagulation, and settling of the suspended sediment. Coagulants and flocculants are used to enhance settling and removal of suspended sediments and generally include inorganic salts and polymers (USACE, 2001). The increased flocculation aids in sedimentation and ability to remove fine suspended sediments, thus reducing stormwater runoff turbidity and improving water quality.

### Suitable Applications

ATS can reliably provide exceptional reductions of turbidity and associated pollutants and should be considered where turbid discharges to sediment and turbidity sensitive waters cannot be avoided using traditional BMPs. Additionally, it may be appropriate to use an ATS when site constraints inhibit the ability to construct a correctly sized sediment basin, when clay and/or highly erosive soils are present, or when the site has very steep or long slope lengths.

### Limitations

Dischargers choosing to utilize chemical treatment in an ATS must follow all guidelines of the Construction General Permit Attachment F – Active Treatment System Requirements. General limitations are as follows:

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

None

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# Active Treatment Systems

## SE-11

- Numeric Effluent Limit (NEL) for all discharges (10 NTU daily flow-weighted average)
- Limited availability of chemical residual testing procedures that meet permit requirements for flow-through treatment
- Specific field and classroom ATS training required to operate equipment
- Batch treatment requires extensive toxicity testing of effluent
- Batch treatment requires large footprint to accommodate treatment cells
- Requires additional filtration to remove residual floc and treatment chemicals prior to discharge
- Petroleum based polymers should not be used
- Requires site-specific design and equipment
- Limited discharge rates depending on receiving water body
- Labor intensive operation and maintenance
- ATS costs are higher on a unit basis for smaller sites that would be expected to have a lower volume of treated runoff
- ATS costs are seasonably variable due to increases or decreases in rainfall volumes

### Implementation

Turbidity is difficult to control once fine particles are suspended in stormwater runoff from a construction site. Sedimentation ponds are effective at removing larger particulate matter by gravity settling, but are ineffective at removing smaller particulates such as clay and fine silt. Sediment ponds are typically designed to remove sediment no smaller than medium silt (0.02 mm). ATS may be used to reduce the turbidity of stormwater runoff. With an ATS, very high turbidities can be reduced to levels comparable to what is found in streams during dry weather.

### Criteria for ATS Product Use

Chemically treated stormwater discharged from construction sites must be non-toxic to aquatic organisms. The following protocol should be used to evaluate chemicals proposed for stormwater treatment at construction sites. Authorization to use a chemical in the field based on this protocol does not relieve the applicant from responsibility for meeting all discharge and receiving water criteria applicable to a site.

- An ATS Plan, which includes an Operation and Maintenance component, a Monitoring, Sampling and Reporting component, a Health and Safety component, and a Spill Prevention component must be prepared and submitted to the Regional Water Quality Control Board (RWQCB).

# Active Treatment Systems

## SE-11

- Treatment chemicals should be approved by EPA for potable water use or otherwise be demonstrated to be protective of human health and the environment. Chemical residual or whole effluent toxicity testing is required.
- Prior to field use of chemical treatment, jar tests are to be conducted to demonstrate that turbidity reduction necessary to meet the NELs and receiving water criteria can be achieved. Test conditions, including but not limited to raw water quality and jar test procedures, should be indicative of field conditions. Although these small-scale tests cannot be expected to reproduce performance under field conditions, they are indicative of treatment capability. A minimum of six site-specific jar tests must be conducted per chemical.
- The proposed maximum dosage should be at least a factor of five lower than the no observed effects concentration (NOEC).
- Effluent discharge from an ATS to a receiving water is conditional upon the favorable results of full-scale whole effluent bioassay/toxicity testing for batch treatment systems and upon chemical residuals testing for flow-through systems.
- Contact the RWQCB for a list of treatment chemicals that may be pre-approved for use.

### ***Active Treatment System Design Considerations***

The design and operation of an ATS should take into consideration the factors that determine optimum, cost-effective performance. While site characteristics will influence system design, it is important to recognize the following overriding considerations:

- The right chemical must be used at the right dosage. A dosage that is either too low or too high will not produce the lowest turbidity. There is an optimum dosage rate. This is a situation where the adage “adding more is always better” is not the case.
- The coagulant must be mixed rapidly into the water to insure proper dispersion.
- The mixing system for batch treatment must be sized to provide adequate mixing for the design storage volume. Lack of adequate mixing during the flocculation phase results in flocs that are too small and/or insufficiently dense. Too much mixing can rapidly destroy floc as it is formed.
- Care must be taken in the design of the withdrawal system to minimize outflow velocities and to prevent floc discharge. The discharge should be directed through a filtration system such as sand, bag, or cartridge filter that would catch any unintended floc discharge.
- ATS is also regulated for pH of the discharge. A pH-adjusting chemical should be added into the treated water to control pH if the selected coagulant requires alteration of the pH of the discharge outside of the acceptable range.

### ***Active Treatment System Design***

ATS can be designed as batch treatment systems using either ponds or portable trailer-mounted tanks, or as flow-through systems using any number of proprietary designed systems.

# Active Treatment Systems

## SE-11

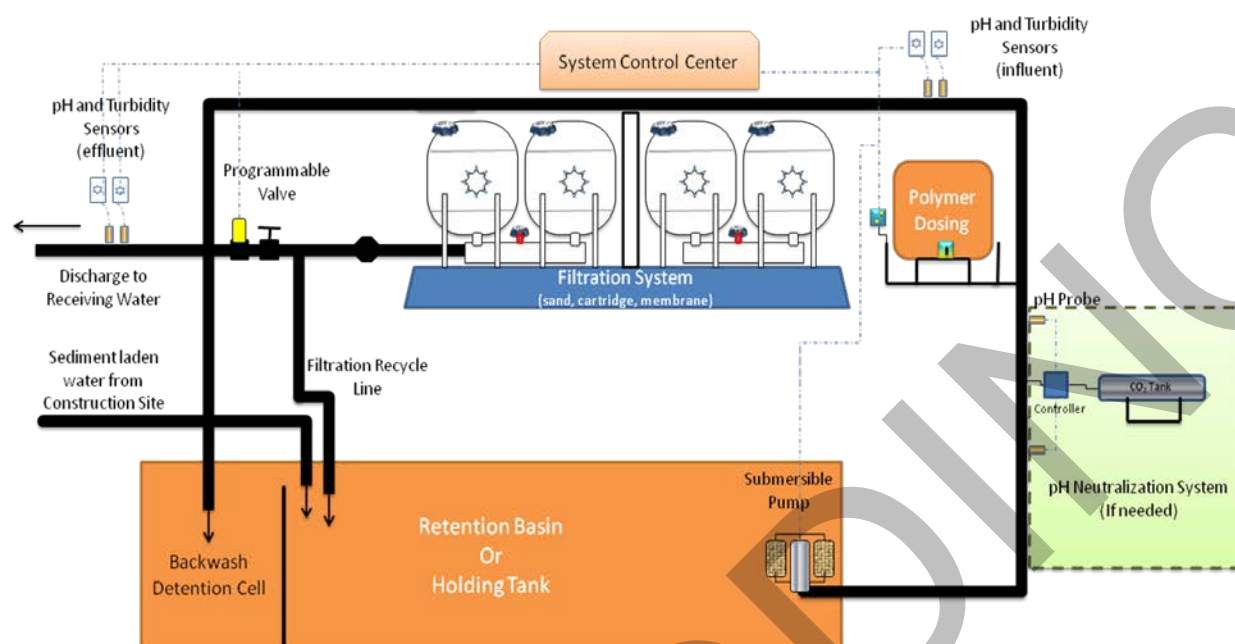


Figure has been adapted from Port of Seattle response to Washington Dept. of Ecology Action Order 2948

### Batch Treatment

Batch Treatment systems consist of the stormwater collection system (either temporary diversion or the permanent site drainage system); a sediment basin, trap or holding tanks; pumps; a chemical feed system; treatment cells; and, interconnecting piping.

Batch treatment systems should use a minimum of two lined treatment cells. Multiple treatment cells allow for clarification of treated water while other cells are being filled or emptied. Treatment cells may be basins, traps, or tanks. Portable tanks may also be suitable for some sites.

The following equipment should be located in a secured, covered location:

- The chemical injector
- Secondary containment for acid, caustic, buffering compound, and treatment chemical
- Emergency shower and eyewash
- Monitoring equipment which consists of a pH meter and a turbidimeter (if not already within the instrumentation panel of the chemical injector)

### Flow-through Treatment

At a minimum, a flow-through ATS system consists of the stormwater collection system (either temporary diversion or the permanent site drainage system), an untreated stormwater storage pond or holding tank, and a chemically enhanced filtration system.

Stormwater is collected at interception point(s) on the site and is diverted by gravity or by pumping to an untreated stormwater storage pond or other untreated stormwater holding area.

# Active Treatment Systems

## SE-11

The stormwater is stored until treatment occurs. It is important that the holding pond be large enough to provide adequate storage.

Stormwater is then pumped from the untreated stormwater storage pond to the chemically enhanced filtration system where polymer is added. Adjustments to pH may be necessary before chemical addition. The filtration system continually monitors the stormwater for turbidity and pH. If the discharge water is out of the acceptable turbidity or pH range, the water is recycled to the untreated stormwater pond (or holding tank) where it can be retreated. Flow through systems must ensure that:

- Cumulative flow volume shall be recorded daily. The data recording system shall have the capacity to record a minimum of seven days of continuous data.
- Instrumentation systems are interfaced with system control to provide auto shutoff or recirculation in the event that effluent measurements exceed turbidity or pH.
- Upon system upset, power failure, or other catastrophic event, the ATS will default to a recirculation mode or safe shut down.
- The instrumentation system provides a method for controlling coagulant dose, to prevent potential overdosing.

### ***Sizing Criteria***

An ATS shall be designed and approved by a Certified Professional in Erosion and Sediment Control (CPESC), a Certified Professional in Storm Water Quality (CPSWQ); a California registered civil engineer; or any other California registered engineer.

ATS must be designed to capture and treat (within 72 hours) runoff from the 10-year 24-hour storm event. The runoff volume of the watershed area to be treated from this size storm event is required to be calculated using the Rational Method with a runoff coefficient of 1.

If sediment basins are used to capture flow-through or batch treatment, see SE-2, Sediment Basin, for design criteria. Bypass should be provided around the ATS to accommodate extreme storm events. Primary settling should be encouraged in the sediment basin/storage pond. A forebay with access for maintenance may be beneficial.

The permissible discharge rate governed by potential downstream effect should be used to calculate the recommended size of the treatment cells. Local requirements related to Phase I or Phase II NPDES permit thresholds should be considered in developing maximum discharge rates the ATS Plan.

### **Costs**

Costs for ATS may be significant due to equipment rental requirements and cost of chemicals. ATS cost is lower on a treated unit-basis for large construction sites with large volumes of runoff.

### **Inspection and Maintenance**

ATS must be operated and maintained by individuals with experience in their use and trained in accordance with training requirements below. ATS should be monitored continuously while in

# Active Treatment Systems

## SE-11

use. A designated responsible person shall be on site daily at all times during treatment operations. Daily on-site visual monitoring of the system for proper performance shall be conducted and recorded in the project data log. The name, phone number, and training documentation of the person responsible for system operation and monitoring shall be included in the project data log.

The following monitoring requirements and results should be recorded in the data log:

### ***Operational and Compliance Monitoring***

- Effluent flow rate and volume shall be continuously monitored and recorded at 15- minute or less intervals.
- Influent and effluent pH must be continuously monitored and recorded at 15-minute or less intervals.
- Influent and effluent turbidity (expressed in NTU) must be continuously monitored and recorded at 15-minute or less intervals.
- The type and amount of chemical used for pH adjustment, if any, shall be monitored and recorded.
- Dose rate of chemical used in the ATS system (expressed in mg/L) shall be monitored and reported 15-minutes after startup and every 8 hours of operation.
- Laboratory duplicates – monthly laboratory duplicates for residual coagulant analysis must be performed and records shall be maintained onsite.
- Effluent shall be monitored and recorded for residual chemical/additive levels.
- If a residual chemical/additive test does not exist and the ATS is operating in a batch treatment mode of operation refer to the toxicity monitoring requirements below.

### ***Toxicity Monitoring***

#### **Batch Treatment**

Toxicity testing for systems operated in batch treatment mode should be made in accordance with the following:

- Acute toxicity testing on effluent samples representing effluent from each batch prior to discharge shall be undertaken. All bioassays shall be sent to a laboratory certified by the Department of Health Services (DHS) Environmental Laboratory Accreditation Program (ELAP). The required field of testing number for Whole Effluent Toxicity (WET) testing is E113.
- Acute toxicity tests shall be conducted with the following species and protocols. The methods to be used in the acute toxicity testing shall be those outlined for a 96-hour acute test in “Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, USEPA-841-R-02-012” for Fathead minnow, *Pimephales promelas*. Rainbow trout, *Oncorhynchus mykiss*, may be used as a substitute for fathead minnow.

# Active Treatment Systems

## SE-11

All toxicity tests shall meet quality assurance criteria and test acceptability criteria in the most recent versions of the EPA test method for WET testing.

### Flow-through Treatment

Toxicity testing for systems operated in flow-through treatment mode should be made in accordance with the following:

- A residual chemical test method shall be used that has a method detection limit (MDL) of 10% or less than the maximum allowable threshold concentration (MATC) for the specific coagulant in use and for the most sensitive species of the chemical used. The MATC is equal to the geometric mean of the No Observed Effect Concentration (NOEC) and Lowest Observed Effect Concentration (LOEC) Acute and Chronic toxicity results for most sensitive species determined for the specific coagulant.
- The residual chemical test method shall produce a result within one hour of sampling.
- A California State certified laboratory shall validate the selected residual chemical test. Specifically the lab will review the test protocol, test parameters, and the detection limit of the coagulant. The discharger shall electronically submit this documentation as part of the ATS Plan.

### ***Numeric Effluent Limit (NEL) Compliance:***

All chemically treated stormwater must be sampled and tested for compliance with pH and turbidity limits. These limits have been established by the Construction General Permit. Sampling and testing for other pollutants may also be necessary at some sites. Turbidity limits have been set as 10 NTU as a daily flow-weighted average or 20 NTU from a single sample. pH must be within the range of 6.0 to 9.0 standard units. It is often possible to discharge treated stormwater that has a lower turbidity than the receiving water and that matches the pH.

Treated stormwater samples and measurements should be taken from the discharge pipe or another location representative of the nature of the treated stormwater discharge. Samples used for determining compliance with the water quality standards in the receiving water should not be taken from the treatment pond prior to decanting. Compliance with the water quality standards is determined in the receiving water.

### ***Operator Training:***

Operators shall have training specific to using an ATS and liquid coagulants for stormwater discharges in California. The training shall be in the form of a formal class with a certificate and requirements for testing and certificate renewal. Training shall include a minimum of eight hours classroom and 32 hours field training.

### ***Standard BMPs:***

Erosion and sediment control BMPs should be implemented throughout the site to prevent erosion and discharge of sediment to the ATS. Some types of chemical coagulation and flocculation are only achievable in water below a certain turbidity; therefore minimizing the amount of sediment reaching the system will increase the likelihood of meeting effluent limits and will potentially lower costs of chemical dosing.

# Active Treatment Systems

## SE-11

### ***Sediment Removal and Disposal***

- Sediment shall be removed from the storage or treatment cells as necessary to ensure that the cells maintain their required water storage (i.e., volume) capability.
- Handling and disposal of all solids generated during ATS operations shall be done in accordance with all local, state, and federal laws and regulations.
- If sediment is determined to be non-toxic, it may be incorporated into the site away from drainages.

### **References**

Engineering and Design – Precipitation/Coagulation/Flocculation. United States Army Corps of Engineers, EM 1110-1-4012, 2001.

Evaluation of Active Treatment Systems (ATS) for Construction Site Runoff. California Building and Industry Association (prepared by Geosyntec Consultants), 2008.

Stormwater Management Manual for Western Washington, Volume II – Construction Stormwater Pollution Prevention, Washington State Department of Ecology, August 2001.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

# Manufactured Linear Sediment Controls (MLSC)

## SE-12



### Description and Purpose

Manufactured linear sediment controls (MLSC) are pre-manufactured devices that are typically specified and installed for drainage and sediment control on the perimeter of disturbed sites or stockpiles and as check dams within channels. Typically, MLSCs can be reused.

This fact sheet is intended to provide guidance on BMP selection and implementation of proprietary or vendor-supplied products, for sediment control. Products should be evaluated for project-specific implementation and used if determined to be appropriate by the SWPPP Preparer.

### Suitable Applications

MLSCs are generally used in areas as a substitute for fiber rolls and silt fences in sediment control applications to slow down runoff water, divert drainage or contain fines and sediment. MLSCs are a linear control and application suitability varies based on the specific product type. They may be suitable:

- On paved surfaces for perimeter protection.
- As check structures in channels.
- Along the perimeter of disturbed sites in lieu of silt fence.

### Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	<input checked="" type="checkbox"/>

### Legend:

- ☒ Primary Category  
☒ Secondary Category

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	<input checked="" type="checkbox"/>
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

SE-1 Silt Fence  
 SE-5 Fiber Roll  
 SE-6 Gravel Bag Berm  
 SE-8 Sandbag Barrier

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# Manufactured Linear Sediment Controls (MLSC) SE-12

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- At operational storm drains as a form of inlet protection.
- Around temporary stockpiles or material/equipment storage areas.
- At the interface between graveled driveways and pavement.
- Along the toe of exposed and erodible slopes.

## Limitations

- Limitations vary by product. Product manufacturer's printed product use instructions should be reviewed by the SWPPP Preparer to determine the project-specific applicability of MLSCs.

## Implementation

### **General**

When appropriately placed, MLSCs intercept and slow sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. The device is porous, which allows the ponded runoff to flow slowly through the device, releasing the runoff as sheet flows. Generally, MLSCs should be used in conjunction with temporary soil stabilization controls up-slope to provide an effective combination of erosion and sediment control.

### **Design and Layout**

- MLSCs used on soil should be trenched or attached to the ground per manufacturer specifications in a manner that precludes runoff or ponded water from flowing around or under the device.
- MLSCs designed for use on asphalt or concrete may be attached using a variety of methods, including nailing the device to the pavement, or using a high strength adhesive.
- Follow manufacturer written specifications when installing MLSCs.
- Allow sufficient space up-slope from the silt dike to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, MLSCs should be set back 3 feet from the slope toe to facilitate cleaning. Where site conditions do not allow set back, the sediment control may be constructed on the toe of the slope. To prevent flows behind the barrier, sand or gravel bags can be placed perpendicular and between the sediment control and slope to serve as a barrier to parallel flow.
- Drainage area should not exceed 5 acres.

### **Materials**

- Several manufactured products are available. The following search terms or combination of terms can be used with an internet search engine to find manufactured linear sediment controls:

# Manufactured Linear Sediment Controls (MLSC) SE-12

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- “silt barrier”
- “reusable silt fence”
- “silt fence alternative” or
- “perimeter sediment control”

## Costs

Manufacturers should be contacted directly for current pricing.

## Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Reshape or replace sections of damaged MLSCs as needed.
- Repair washouts or other damage as needed.
- Sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Remove MLSCs when no longer needed. Remove sediment accumulation and clean, re-grade, and stabilize the area. Removed sediment should be incorporated in the project or disposed of properly.

## References

City of Elko Construction Site Best Management Practices Handbook, December 2005.

Construction Site Best Management Practices Handbook, June 2008 Update, Truckee Meadows Regional Stormwater Quality Management Program, June 2008.

Complying with the Edwards Aquifer Rules Technical Guidance on Best Management Practices, Texas Commission on Environmental Quality, Revised July 2005, Addendum Sheet, January 26, 2011.

Stormwater Management Manual for Western Washington Volume II, Construction Stormwater Pollution Prevention, Washington State Department of Ecology, February 2005.

# Compost Socks and Berms

# SE-13



## Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
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## Legend:

- ☒ Primary Category  
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## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	<input checked="" type="checkbox"/>
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	

## Potential Alternatives

- SE-1 Silt Fence
- SE-5 Fiber Roll
- SE-6 Gravel Bag Berm
- SE-8 Sandbag Barrier
- SE-14 Biofilter Bags

## Description and Purpose

Compost socks and berms act as three-dimensional biodegradable filtering structures to intercept runoff where sheet flow occurs and are generally placed at the site perimeter or at intervals on sloped areas. Compost socks are generally a mesh sock containing compost and a compost berm is a dike of compost, trapezoidal in cross section. When employed to intercept sheet flow, both BMPs are placed perpendicular to the flow of runoff, allowing filtered runoff to pass through the compost and retaining sediment (and potentially other pollutants). A compost sock can be assembled on site by filling a mesh sock (e.g. with a pneumatic blower). The compost berm should be constructed using a backhoe or equivalent and/or a pneumatic delivery (blower) system and should be properly compacted. Compost socks and berms act as filters, reduce runoff velocities, and in some cases, aid in establishing vegetation.

Compost is organic, biodegradable, and renewable. Compost provides soil structure that allows water to infiltrate the compost medium which helps prevent rill erosion and the retained moisture promotes seed germination and vegetation growth, in addition to providing organic matter and nutrients important for fostering vegetation. Compost improves soil quality and productivity, as well as erosion and sediment control.

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# Compost Socks and Berms

## SE-13

The compost of the compost sock or berm can be selected that targets site specific objectives in capturing sediment and other pollutants, supporting vegetation, or additional erosion control.

Compost is typically derived from combinations of feedstocks, biosolids, leaf and yard trimmings, manure, wood, or mixed solid waste. Many types of compost are products of municipal recycle or "Greenwaste" programs. Compost is organic and biodegradable and can be left onsite. There are many types of compost with a variety of properties with specific functions, and accordingly compost selection is an important design consideration in the application of this type of erosion and sediment control.

### Suitable Applications

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow (compost berms should only be used at the top of slopes or on slopes 4:1 (H:V) or flatter, all other slope applications should use compost socks)
- Along the perimeter of a project
- As check dams in unlined ditches (compost socks only)
- Down-slope of exposed soil areas
- At operational storm drains as a form of inlet protection (compost socks only)
- Around temporary stockpiles

Compost socks and berms do not require special trenching or BMP removal compared to other sediment control methods (e.g. silt fence or fiber rolls). Compost socks and berms can remain in place after earth disturbing activities are completed or the compost components can be spread over the site providing nutrients for plant growth and augmenting soil structure. BMPs that remain in place are particularly advantageous below embankments, especially adjacent streams, by limiting re-entry and the disturbance to sensitive areas.

Compost can be pre-seeded prior to application (recommended by the EPA for construction site stormwater runoff control and required for compost socks) or seeded after installation (for compost berms only). The compost medium can also remove pollutants in stormwater including heavy metals; oil and grease; and hydrocarbons.

### Limitations

- Compost can potentially leach nutrients (dissolved phosphorus and nitrogen) into runoff and potentially impact water quality. Compost should not be used directly upstream from nutrient impaired waterbodies (Adams et. al, 2008).
- Compost may also contain other undesirable constituents that are detrimental to water quality. Compost should be obtained from a supplier certified by the California Integrated Waste Management Board or compost should otherwise meet the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7. Carefully consider the qualifications and experience of any compost producer/supplier.

# Compost Socks and Berms

## SE-13

- Application by hand is more time intensive and potentially costly. Using a pneumatic blower truck is the recommended cost effective method of assembly.
- Compost socks and berms should not be employed at the base of slopes greater than 2:1 (H:V). They can be employed with other erosion control methods for steeper slopes.
- Difficult to move once saturated.
- Compost berms should not be applied in areas of concentrated flows.
- Compost socks and berms are easy to fix; however, they are susceptible to damage by frequent traffic. Compost socks can be used around heavy machinery, but regular disturbance decreases sock performance.

### Implementation

#### ***Compost Materials***

- California Compost Regulations (Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3) define and require a quality of compost for application. Compost should comply with all physical and chemical requirements. Specific requirements are provided in **Table 1**, taken from Caltrans Standard Special Provision 10-1 (SSP 10-1), Erosion Control (Compost Blanket).
- The compost producer should be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies and any other State and Local Agencies that regulate Solid Waste Facilities. If exempt from State permitting requirements, the composting facility should certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.
- The compost producer should be a participant in United States Composting Council's Seal of Testing Assurance program.
- Compost medium parameter specifications for compost socks and berms have been developed to assist in compost selection, such as those provided by the American Association of State Highway Transportation Officials (AASHTO).
- Particle size is important parameter for selecting compost. Well consolidated coarser grades of compost (e.g. small and large pieces) perform better for filtration objectives, while finer grades better support vegetation. Particle size of the compost should be selected based on site conditions, such as expected precipitation, and filtration goals and / or long term plant nutrients.
- Compost moisture should be considered for composition quality and application purposes. A range of 30-50% is typical. Compost that is too dry is hard to apply and compost that is too wet is more difficult (and more expensive) to transport. For arid or semi-arid areas, or for application during the dry season, use compost with greater moisture content than areas with wetter climates. For wetter or more humid climates or for application during the wet season, drier composts can be used as the compost will absorb moisture from the ambient air.

# Compost Socks and Berms

## SE-13

- If vegetation establishment is a desired function of the compost, a compost sample should be inspected by a qualified individual. Vegetation has different nutrient and moisture needs.
- Organic content of the compost is also important and should range from 30 to 65% depending on site conditions.
- Compost should not be derived from mixed municipal solid waste and should be reasonably free of visible contaminants.
- Compost should not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Metal concentrations in compost should not exceed the maximum metal concentrations listed under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.
- Compost should not possess objectionable odors.
- Compost should be weed free.

# Compost Socks and Berms

## SE-13

Table 1. Physical/Chemical Requirements of Compost  
Reference - Caltrans SSP-10 Erosion Control Blanket (Compost)

Property	Test Method	Requirement
pH	*TMECC 04.11-A Elastometric pH 1:5 Slurry Method pH Units	6.0–8.0
Soluble Salts	TMECC 04.10-A Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm)	0-10.0
Moisture Content	TMECC 03.09-A Total Solids & Moisture at 70+/- 5 deg C % Wet Weight Basis	30-60
Organic Matter Content	TMECC 05.07-A Loss-On-Ignition Organic Matter Method (LOI) % Dry Weight Basis	30–65
Maturity	TMECC 05.05-A Germination and Vigor Seed Emergence Seedling Vigor % Relative to Positive Control	80 or Above 80 or Above
Stability	TMECC 05.08-B Carbon Dioxide Evolution Rate mg CO <sub>2</sub> -C/g OM per day	8 or below
Particle Size	TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis	100% Passing, 3 inch 90-100% Passing, 1 inch 65-100% Passing, 3/4 inch 0 - 75% Passing, 1/4 inch Maximum length 6 inches
Pathogen	TMECC 07.01-B Fecal Coliform Bacteria < 1000 MPN/gram dry wt.	Pass
Pathogen	TMECC 07.01-B Salmonella < 3 MPN/4 grams dry wt.	Pass
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Plastic, Glass and Metal % > 4mm fraction	Combined Total: < 1.0
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Sharps (Sewing needles, straight pins and hypodermic needles) % > 4mm fraction	None Detected

\*TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

### Installation

- Prior to application, prepare locations for socks and berms by removing brush and thick vegetation. The compost of the sock and/or berm should be allowed to come in full contact with the ground surface.
- Select method to apply the compost sock or berm. A pneumatic blower is most cost effective and most adaptive in applying compost to steep, rough terrain, and hard to reach locations.
- The compost of the berm should be distributed evenly to the surface, compacted, and shaped trapezoidal in cross section. Berm design is generally consists of a base two times the height. AASHTO specification MP 9-03 provides compost berm dimensions based on anticipated

# Compost Socks and Berms

## SE-13

site precipitation (AASHTO, 2003 and USEPA, 2009). State agencies, such as Oregon Department of Environmental Quality (ODEQ) have developed berm dimension based on slope steepness and length (ODEQ, 2004).

- Compost socks can be assembled on site by filling mesh socks with the selected compost. Mesh socks can be tied at one end, filled, and then tied at the other end. The ends of socks can be interlocked until the desired length is achieved. The sock diameter is a function of slope steepness and length. Again, ASSHTO provides specifications for various parameters. Compost socks range from 8" to 18", but are typically 12" to 18" in diameter.
- Compost socks are typically placed in contours perpendicular to sheet flow. They can also be placed in V formation on a slope. Compost socks need to be anchored, typically stakes, through the center of the sock. To prevent water flowing around them, the ends of compost socks should be placed upslope.
- Locate compost socks and berms on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Socks and/or berms should be placed at a maximum interval of 20 ft.
  - Slope inclination between 4:1 and 2:1 (H:V): Socks should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - Slope inclination 2:1 (H:V) or greater: Socks should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Place perimeter socks and berms using a j-hook installation. Use of vegetation will also provide additional anchoring.
- Compost socks and berms can be placed around the perimeter of an affected area, like a silt fence, if the area is flat or on a contour. Do not place these socks and berms where ponded water could become an issue.
- If used at the toe of slopes, the compost sock or berm should at a minimum of 5 to 10 feet away.
- Use additional anchoring and erosion control BMPs in conjunction of the compost socks and berms as needed.
- Consider using compost berms or socks as necessary at the top and/or bottom of the slope for additional erosion control performance.
- Compost socks and berms can also be effective over rocky and frozen ground if installed properly.
- It is recommended that the drainage areas of these compost BMPs do not exceed 0.25 acre per 100 feet placement interval and runoff does not exceed 1 cubic foot per second.

# Compost Socks and Berms

## SE-13

### Costs

Recently obtained vendor costs indicated \$3.50 per linear foot for compost berm application and \$2.00 per linear foot for 8" socks and \$2.50 per linear foot for 12" socks. Costs do not include final compost sock or berm functions at the end of construction activities, including spreading or removal, if required. ODEQ estimates that compost berms cost 30 percent less than silt fences to install.

### Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Once damage is identified, mend or reapply the sock or berm as needed. Washed out areas should be replaced. If the sock or berm height is breached during a storm, an additional sock can be stacked to increase the sock height and similarly the berm dimensions can be increased, as applicable. An additional sock or berm may be installed upslope, as needed. It may be necessary to apply an additional type of stormwater BMP, such as a compost blanket.
- Sediment contained by the sock or berm should be removed prior reaching 1/3 of the exposed height of the BMP. The sediment can be stabilized with the compost sock or berm with vegetation at the end of construction activities.
- Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.
- Limit traffic to minimize damage to BMPs or impede vegetation establishment.

### References

An analysis of Composting as an Environmental Remediation Technology, U.S. Environmental Protection Agency (USEPA), Solid Waste and Emergency Response (5305W), EPA530-R-8-008, 1998.

Characteristics of Compost: Moisture Holding and Water Quality Improvement, Center for Research in Water Resources, Kirchoff, C., Malina, J., and Barrett, M., 2003.

Compost Utilization for Erosion Control, The University of Georgia College of Agricultural and Environmental Sciences, [pubs.caes.uga.edu/caespubs/pubcd/B1200.htm](http://pubs.caes.uga.edu/caespubs/pubcd/B1200.htm), Faucette, B. and Risse, M., 2001.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Standard Special Provision 10-1, Erosion Control (Compost Blanket), State of California Department of Transportation (Caltrans). 2007 Update.

Evaluation of Environmental Benefits and Impacts of Compost and Industry Standard Erosion and Sediment Controls Measures Used in Construction Activities, Dissertation, Institute of Ecology, University of Georgia, Faucette, B., 2004.

# Compost Socks and Berms

## SE-13

National Pollutant Discharge Elimination System (NPDES), Compost Blankets, U.S. Environmental Protection Agency (USEPA).

[http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet\\_results&view=specific&bmp=118](http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=118), 2009.

Standard Specifications for Transportation Materials and Methods of Sampling and Testing, Designation MP-9, Compost for Erosion/Sediment Control (Filter Berms), Provisional, American Association of State Highway Transportation Officials (AASHTO), 2003.

Stormwater Best Management Practices (BMPs) Field Trials of Erosion Control Compost in Reclamation of Rock Quarry Operations, Nonpoint Source Protection Program CWA §319(h), Texas Commission on Environmental Quality, Adams, T., McFarland, A., Hauck, L., Barrett, M., and Eck, B., 2008.

# Biofilter Bags

## SE-14



### Categories

EC	Erosion Control	
SE	Sediment Control	<input checked="" type="checkbox"/>
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ **Primary Category**  
☒ **Secondary Category**

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

- SE-1 Silt Fence
- SE-4 Check Dams
- SE-5 Fiber Roll
- SE-6 Gravel Bag Berm
- SE-8 Sandbag Barrier
- SE-10 Storm Drain Inlet Protection

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### Description and Purpose

Biofilter bags, or bio-bags, are a multi-purpose sediment control BMP consisting of a plastic mesh bag filled with 100% recycled wood product waste. Biofilter bags come in a variety of sizes (30" x 18" and 30" x 9" being common) and generally have between 1-2 cubic yards of recycled wood waste (or wood chips). Biofilter bags work by detaining flow and allowing a slow rate of discharge through the wood media. This action removes suspended sediment through gravity settling of the detained water and filtration within the bag.

### Suitable Applications

Biofilter bags are a short-term BMP that can be rapidly deployed, maintained, and replaced. Biofilter bags can be an effective short-term solution to place in developed rills to prevent further erosion until permanent measures can be established. Suitable short-term applications include:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - Below other small cleared areas
  - Along the perimeter of a site (with low-expected flow)
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas

# Biofilter Bags

## SE-14

- Along streams and channels
- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow
  - At the top of slopes to divert runoff away from disturbed slopes
  - As check dams across mildly sloped construction roads
- Inlet Protection (See SE-10)
- Supplement to silt fences or other sediment control devices

### Limitations

- Short life-span (maximum usefulness of 2-3 months and should be replaced more frequently if needed); regular maintenance and replacement required to ensure effectiveness. Bags will rapidly fill with sediment and reduce permeability.
- Easily damaged by construction vehicles.
- If not properly staked, will fail on slope applications.
- If improperly installed can allow undercutting or side-cutting flow.
- Not effective where water velocities or volumes are high.
- Potentially buoyant and easily displaced if not properly installed.

### Implementation

#### **General**

Biofilter bags are a relatively low cost temporary BMP that are easily deployed and have a simple installation that can be performed by hand. Without proper installation, however, biofilter bags can fail due to their light weight, potential displacement, and multiple joint locations. One of the benefits of utilizing biofilter bags is that the media (wood-product) can be recycled or used onsite when no longer needed (where acceptable).

#### **Design and Layout – Linear control**

- Locate biofilter bags on level contours.
  - Slopes between 20:1 and 4:1 (H:V): Biofilter bags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slopes between 4:1 and 2:1 (H:V): Biofilter bags should be placed at a maximum interval of 15 ft, with the first row near the slope toe.
  - Slopes 2:1 (H:V) or steeper: Biofilter bags should be placed at a maximum interval of 10 ft., with the first row placed the slope toe.

# Biofilter Bags

## SE-14

- Turn the ends of the biofilter bag barriers up slope to prevent runoff from going around the berm.
- Allow sufficient space up slope from the biofilter bag berm to allow ponding, and to provide room for sediment storage.
- Stake biofilter bags into a 1 to 2 in. deep trench with a width equal to the bag.
  - Drive one stake at each end of the bag.
  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- Biofilter bags should be overlapped (6 in.), not abutted.

### Costs

Pre-filled biofilter bags cost approximately \$2.50-\$3.50 per bag, dependent upon size.

### Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Biofilter bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.
- Reshape or replace biofilter bags as needed.
- Repair washouts or other damage as needed.
- Sediment that is retained by the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Remove biofilter bag berms when no longer needed. Remove sediment accumulation and clean, re-grade, and stabilize the area. Biofilter media may be used on-site, if allowed.

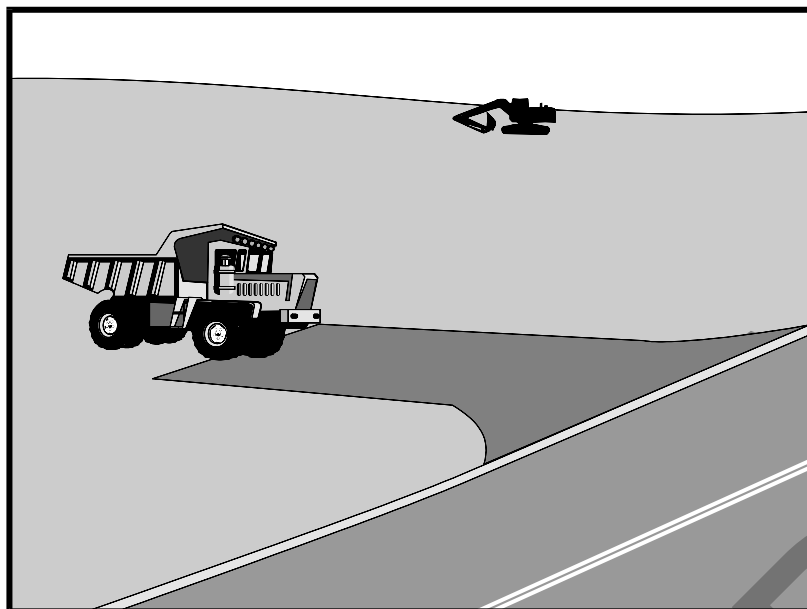
### References

Catalog of Stormwater Best Management Practices for Idaho Cities and Counties. Volume 2, Section 7, BMP 34 – Biofilter Bags, Idaho Department of Environmental Quality, 2005.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

# Stabilized Construction Entrance/Exit TC-1



## Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	<input checked="" type="checkbox"/>
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

## Legend:

- ☒ **Primary Objective**  
☒ **Secondary Objective**

## Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

## Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

## Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water runoff.

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

## Potential Alternatives

None

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# Stabilized Construction Entrance/Exit TC-1

## Implementation

### **General**

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

### **Design and Layout**

- Construct on level ground where possible.
- Select 3 to 6 in. diameter stones.
- Use minimum depth of stones of 12 in. or as recommended by soils engineer.
- Construct length of 50 ft or maximum site will allow, and 10 ft minimum width or to accommodate traffic.
- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
- Provide ample turning radii as part of the entrance.
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.

# Stabilized Construction Entrance/Exit TC-1

- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use asphalt concrete (AC) grindings for stabilized construction access/roadway.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.
- Implement SE-7, Street Sweeping and Vacuuming, as needed.
- All exit locations intended to be used for more than a two-week period should have stabilized construction entrance/exit BMPs.

## Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMPs are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.
- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.
- Keep all temporary roadway ditches clear.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.
- Remove all sediment deposited on paved roadways within 24 hours.
- Remove gravel and filter fabric at completion of construction

## Costs

Average annual cost for installation and maintenance may vary from \$1,200 to \$4,800 each, averaging \$2,400 per entrance. Costs will increase with addition of washing rack, and sediment trap. With wash rack, costs range from \$1,200 - \$6,000 each, averaging \$3,600 per entrance.

## References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

# **Stabilized Construction Entrance/Exit TC-1**

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

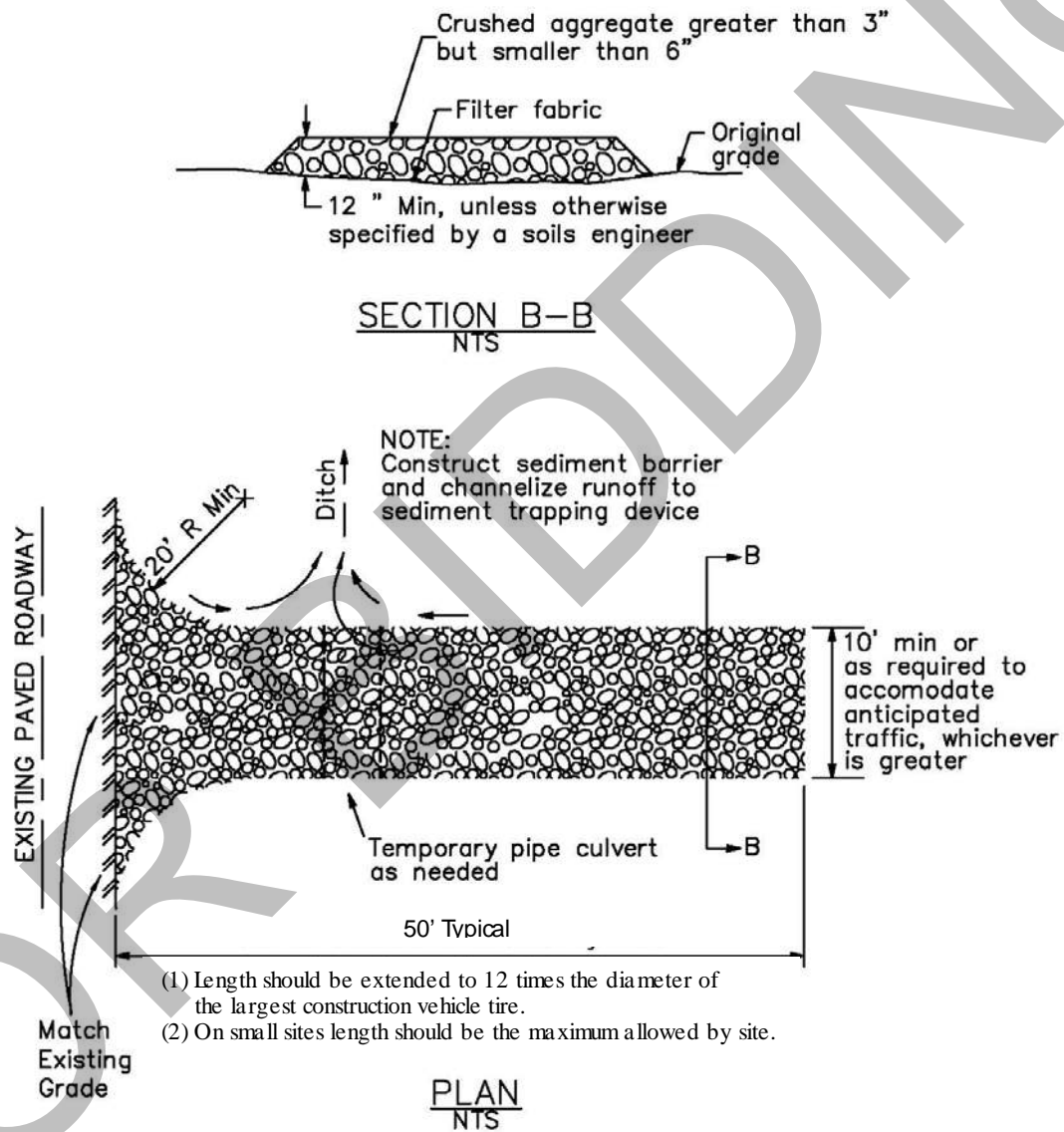
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

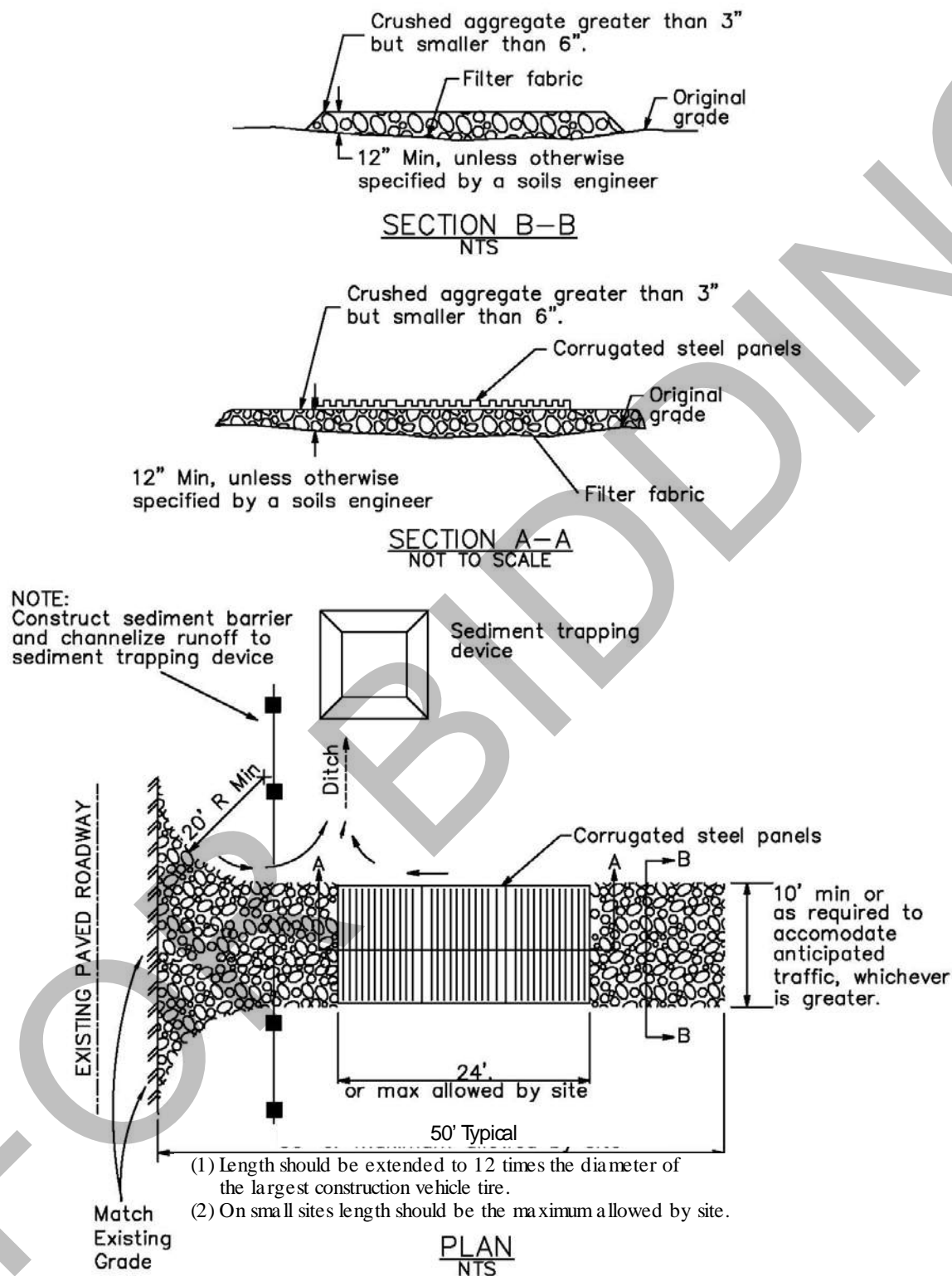
Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

# Stabilized Construction Entrance/Exit TC-1

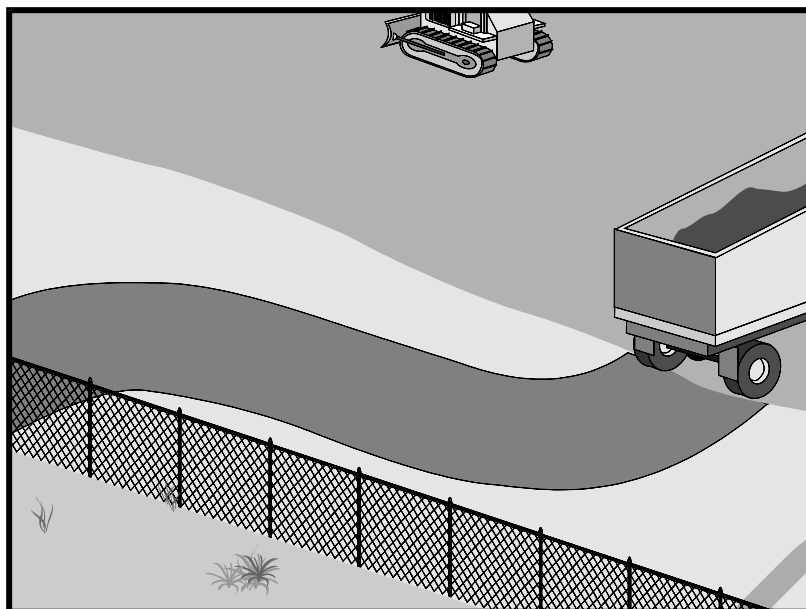


# Stabilized Construction Entrance/Exit TC-1



# Stabilized Construction Roadway

# TC-2



## Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	<input checked="" type="checkbox"/>
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

## Legend:

- ☒ **Primary Objective**  
☒ **Secondary Objective**

## Description and Purpose

Access roads, subdivision roads, parking areas, and other onsite vehicle transportation routes should be stabilized immediately after grading, and frequently maintained to prevent erosion and control dust.

## Suitable Applications

This BMP should be applied for the following conditions:

- **Temporary Construction Traffic:**
  - Phased construction projects and offsite road access
  - Construction during wet weather
- **Construction roadways and detour roads:**
  - Where mud tracking is a problem during wet weather
  - Where dust is a problem during dry weather
  - Adjacent to water bodies
  - Where poor soils are encountered

## Limitations

- The roadway must be removed or paved when construction is complete.

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

## Potential Alternatives

None

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# Stabilized Construction Roadway TC-2

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- Certain chemical stabilization methods may cause stormwater or soil pollution and should not be used. See WE-1, Wind Erosion Control.
- Management of construction traffic is subject to air quality control measures. Contact the local air quality management agency.
- Materials will likely need to be removed prior to final project grading and stabilization.
- Use of this BMP may not be applicable to very short duration projects.

## Implementation

### **General**

Areas that are graded for construction vehicle transport and parking purposes are especially susceptible to erosion and dust. The exposed soil surface is continually disturbed, leaving no opportunity for vegetative stabilization. Such areas also tend to collect and transport runoff waters along their surfaces. During wet weather, they often become muddy quagmires that generate significant quantities of sediment that may pollute nearby streams or be transported offsite on the wheels of construction vehicles. Dirt roads can become so unstable during wet weather that they are virtually unusable.

Efficient construction road stabilization not only reduces onsite erosion but also can significantly speed onsite work, avoid instances of immobilized machinery and delivery vehicles, and generally improve site efficiency and working conditions during adverse weather

### **Installation/Application Criteria**

Permanent roads and parking areas should be paved as soon as possible after grading. As an alternative where construction will be phased, the early application of gravel or chemical stabilization may solve potential erosion and stability problems. Temporary gravel roadway should be considered during the rainy season and on slopes greater than 5%.

Temporary roads should follow the contour of the natural terrain to the maximum extent possible. Slope should not exceed 15%. Roadways should be carefully graded to drain transversely. Provide drainage swales on each side of the roadway in the case of a crowned section or one side in the case of a super elevated section. Simple gravel berms without a trench can also be used.

Installed inlets should be protected to prevent sediment laden water from entering the storm sewer system (SE-10, Storm Drain Inlet Protection). In addition, the following criteria should be considered.

- Road should follow topographic contours to reduce erosion of the roadway.
- The roadway slope should not exceed 15%.
- Chemical stabilizers or water are usually required on gravel or dirt roads to prevent dust (WE-1, Wind Erosion Control).
- Properly grade roadway to prevent runoff from leaving the construction site.
- Design stabilized access to support heaviest vehicles and equipment that will use it.

# Stabilized Construction Roadway

## TC-2

- Stabilize roadway using aggregate, asphalt concrete, or concrete based on longevity, required performance, and site conditions. The use of cold mix asphalt or asphalt concrete (AC) grindings for stabilized construction roadway is not allowed.
- Coordinate materials with those used for stabilized construction entrance/exit points.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.

### Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Keep all temporary roadway ditches clear.
- When no longer required, remove stabilized construction roadway and re-grade and repair slopes.
- Periodically apply additional aggregate on gravel roads.
- Active dirt construction roads are commonly watered three or more times per day during the dry season.

### Costs

Gravel construction roads are moderately expensive, but cost is often balanced by reductions in construction delay. No additional costs for dust control on construction roads should be required above that needed to meet local air quality requirements.

### References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

# Stabilized Construction Roadway

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## TC-2

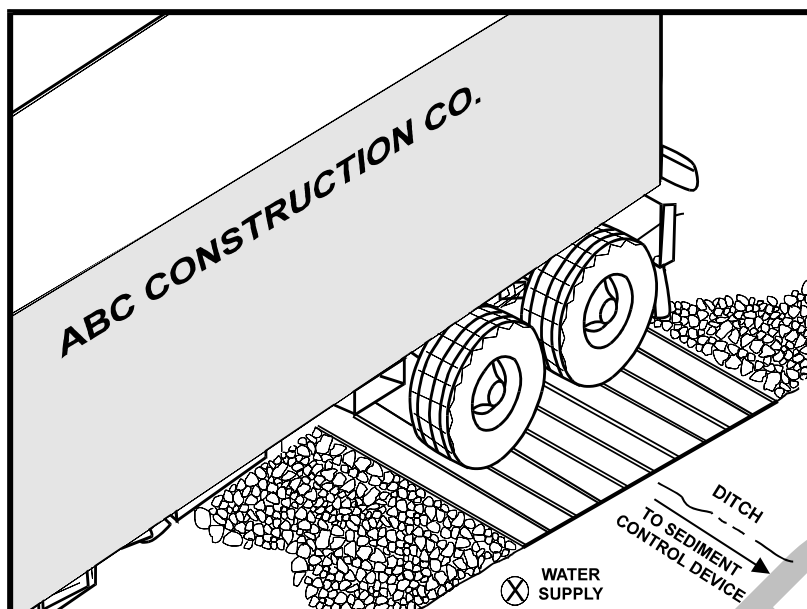
Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

FOR BIDDING

# Entrance/Outlet Tire Wash

## TC-3



### Categories

EC	Erosion Control	
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	<input checked="" type="checkbox"/>
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ **Primary Objective**
- ☒ **Secondary Objective**

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

TC-1 Stabilized Construction Entrance/Exit

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### Description and Purpose

A tire wash is an area located at stabilized construction access points to remove sediment from tires and undercarriages and to prevent sediment from being transported onto public roadways.

### Suitable Applications

Tire washes may be used on construction sites where dirt and mud tracking onto public roads by construction vehicles may occur.

### Limitations

- The tire wash requires a supply of wash water.
- A turnout or doublewide exit is required to avoid having entering vehicles drive through the wash area.
- Do not use where wet tire trucks leaving the site leave the road dangerously slick.

### Implementation

- Incorporate with a stabilized construction entrance/exit. See TC-1, Stabilized Construction Entrance/Exit.
- Construct on level ground when possible, on a pad of coarse aggregate greater than 3 in. but smaller than 6 in. A geotextile fabric should be placed below the aggregate.
- Wash rack should be designed and constructed/manufactured for anticipated traffic loads.



# Entrance/Outlet Tire Wash

## TC-3

- Provide a drainage ditch that will convey the runoff from the wash area to a sediment trapping device. The drainage ditch should be of sufficient grade, width, and depth to carry the wash runoff.
- Use hoses with automatic shutoff nozzles to prevent hoses from being left on.
- Require that all employees, subcontractors, and others that leave the site with mud caked tires and undercarriages to use the wash facility.
- Implement SC-7, Street Sweeping and Vacuuming, as needed.

### Costs

Costs are low for installation of wash rack.

### Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Remove accumulated sediment in wash rack and/or sediment trap to maintain system performance.
- Inspect routinely for damage and repair as needed.

### References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

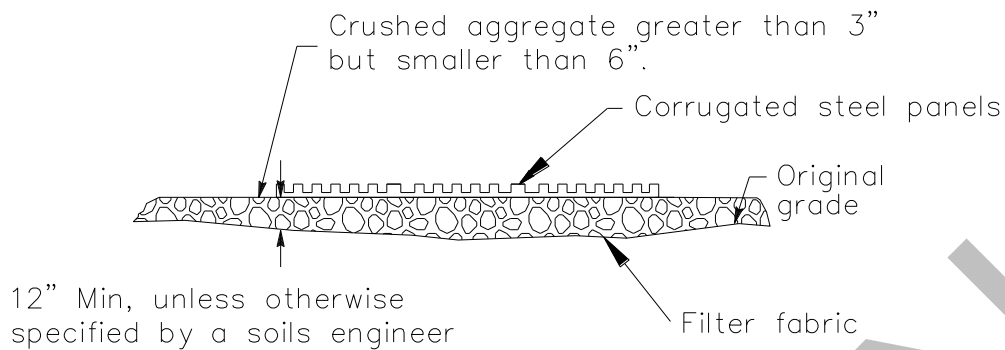
Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

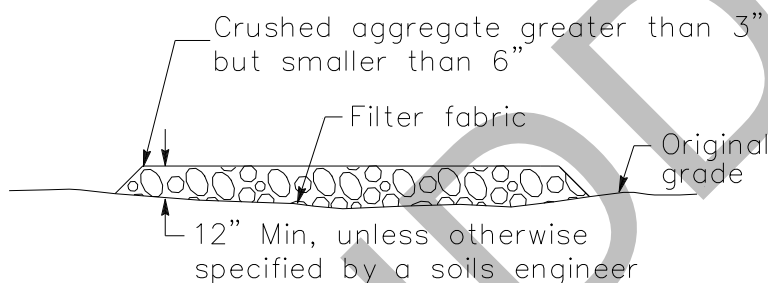
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

# Entrance/Outlet Tire Wash

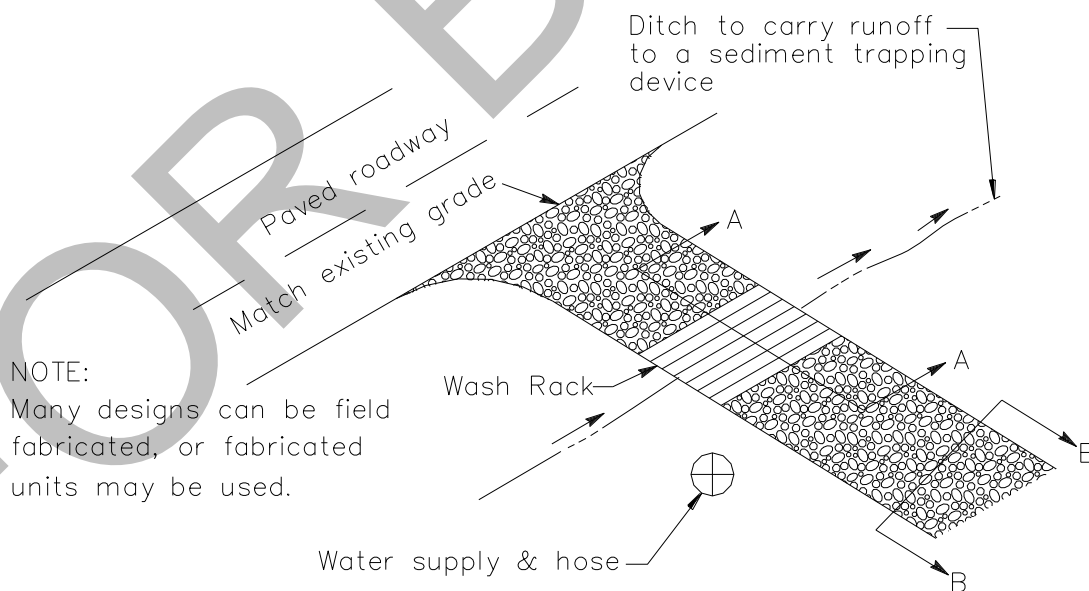
## TC-3



SECTION A-A  
NOT TO SCALE



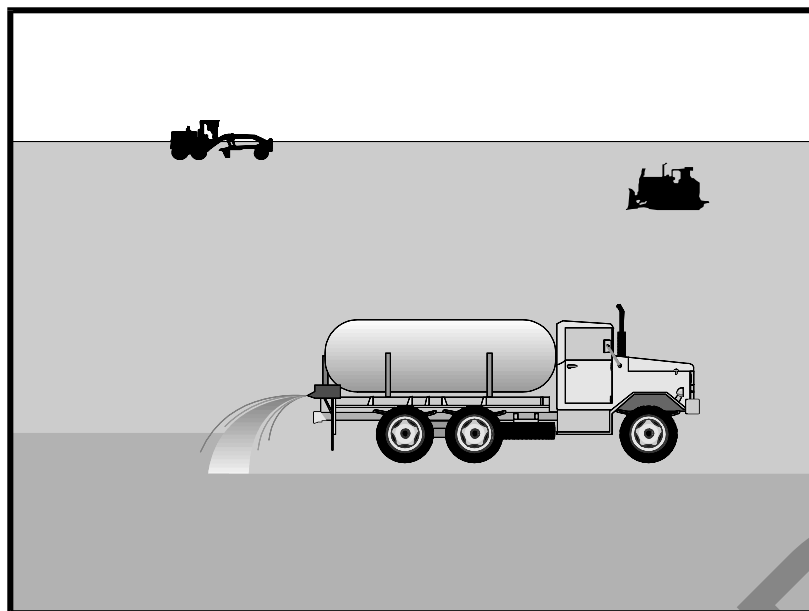
SECTION B-B  
NTS



TYPICAL TIRE WASH  
NOT TO SCALE

# Wind Erosion Control

## WE-1



### Categories

EC	Erosion Control	
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	
WE	Wind Erosion Control	<input checked="" type="checkbox"/>
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

### Legend:

- ☒ Primary Category
- ☒ Secondary Category

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

EC-5 Soil Binders

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### Description and Purpose

Wind erosion or dust control consists of applying water or other chemical dust suppressants as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

California's Mediterranean climate, with a short "wet" season and a typically long, hot "dry" season, allows the soils to thoroughly dry out. During the dry season, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment. Site conditions and climate can make dust control more of an erosion problem than water based erosion. Additionally, many local agencies, including Air Quality Management Districts, require dust control and/or dust control permits in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. Wind erosion control is required to be implemented at all construction sites greater than 1 acre by the General Permit.

### Suitable Applications

Most BMPs that provide protection against water-based erosion will also protect against wind-based erosion and dust control requirements required by other agencies will generally meet wind erosion control requirements for water quality protection. Wind erosion control BMPs are suitable during the following construction activities:



# Wind Erosion Control

# WE-1

- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

## Limitations

- Watering prevents dust only for a short period (generally less than a few hours) and should be applied daily (or more often) to be effective.
- Over watering may cause erosion and track-out.
- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Chemical dust suppression agents may have potential environmental impacts. Selected chemical dust control agents should be environmentally benign.
- Effectiveness of controls depends on soil, temperature, humidity, wind velocity and traffic.
- Chemical dust suppression agents should not be used within 100 feet of wetlands or water bodies.
- Chemically treated subgrades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.
- If the soil surface has minimal natural moisture, the affected area may need to be pre-wetted so that chemical dust control agents can uniformly penetrate the soil surface.

## Implementation

### ***Dust Control Practices***

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table presents dust control practices that can be applied to varying site conditions that could potentially cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph or less, and controlling the number and activity of vehicles on a site at any given time.

# Wind Erosion Control

## WE-1

Chemical dust suppressants include: mulch and fiber based dust palliatives (e.g. paper mulch with gypsum binder), salts and brines (e.g. calcium chloride, magnesium chloride), non-petroleum based organics (e.g. vegetable oil, lignosulfonate), petroleum based organics (e.g. asphalt emulsion, dust oils, petroleum resins), synthetic polymers (e.g. polyvinyl acetate, vinyls, acrylic), clay additives (e.g. bentonite, montmorillonite) and electrochemical products (e.g. enzymes, ionic products).

Site Condition	Dust Control Practices							
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Temporary Gravel Construction Entrances/Equipment Wash Down	Synthetic Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	X	X	X	X	X			X
Disturbed Areas Subject to Traffic			X	X	X	X		X
Material Stockpiles		X	X	X			X	X
Demolition			X			X	X	
Clearing/Excavation			X	X				X
Truck Traffic on Unpaved Roads			X	X	X	X	X	
Tracking					X	X		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (see EC-1, Scheduling).
- Quickly treat exposed soils using water, mulching, chemical dust suppressants, or stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Restrict construction traffic to stabilized roadways within the project site, as practicable.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.
- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality

# Wind Erosion Control

## WE-1

Control Board (RWQCB) requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."

- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and wheel wash areas.
- Stabilize inactive areas of construction sites using temporary vegetation or chemical stabilization methods.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater and should meet all applicable regulatory requirements.

### Costs

Installation costs for water and chemical dust suppression vary based on the method used and the length of effectiveness. Annual costs may be high since some of these measures are effective for only a few hours to a few days.

### Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check areas protected to ensure coverage.
- Most water-based dust control measures require frequent application, often daily or even multiple times per day. Obtain vendor or independent information on longevity of chemical dust suppressants.

### References

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

California Air Pollution Control Laws, California Air Resources Board, updated annually.

Construction Manual, Chapter 4, Section 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative", California Department of Transportation (Caltrans), July 2001.

# Wind Erosion Control

## WE-1

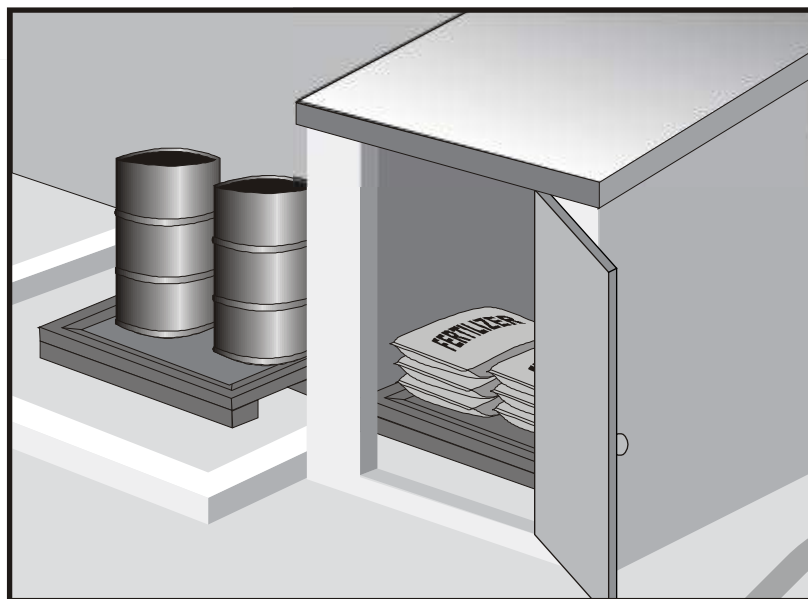
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Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

# Material Delivery and Storage

## WM-1



### Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	<input checked="" type="checkbox"/>

### Legend:

- ☒ **Primary Category**  
☒ **Secondary Category**

### Description and Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in watertight containers and/or a completely enclosed designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see WM-2, Material Use, or WM-4, Spill Prevention and Control. For information on wastes, see the waste management BMPs in this section.

### Suitable Applications

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Soil stabilizers and binders
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

### Potential Alternatives

None

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# Material Delivery and Storage

## WM-1

- Asphalt and concrete components
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

### Limitations

- Space limitation may preclude indoor storage.
- Storage sheds often must meet building and fire code requirements.

### Implementation

The following steps should be taken to minimize risk:

- Chemicals must be stored in water tight containers with appropriate secondary containment or in a storage shed.
- When a material storage area is located on bare soil, the area should be lined and bermed.
- Use containment pallets or other practical and available solutions, such as storing materials within newly constructed buildings or garages, to meet material storage requirements.
- Stack erodible landscape material on pallets and cover when not in use.
- Contain all fertilizers and other landscape materials when not in use.
- Temporary storage areas should be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) should be available on-site for all materials stored that have the potential to effect water quality.
- Construction site areas should be designated for material delivery and storage.
- Material delivery and storage areas should be located away from waterways, if possible.
  - Avoid transport near drainage paths or waterways.
  - Surround with earth berms or other appropriate containment BMP. See EC-9, Earth Dikes and Drainage Swales.
  - Place in an area that will be paved.
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.
- An up to date inventory of materials delivered and stored onsite should be kept.

# Material Delivery and Storage

## WM-1

- Hazardous materials storage onsite should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- Keep ample spill cleanup supplies appropriate for the materials being stored. Ensure that cleanup supplies are in a conspicuous, labeled area.
- Employees and subcontractors should be trained on the proper material delivery and storage practices.
- Employees trained in emergency spill cleanup procedures must be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose of materials and any contaminated soil. See WM-7, Contaminated Soil Management. If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

### ***Material Storage Areas and Practices***

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 should be stored in approved containers and drums and should not be overfilled. Containers and drums should be placed in temporary containment facilities for storage.
- A temporary containment facility should provide for a spill containment volume able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility should be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be collected and placed into drums. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids should be sent to an approved disposal site.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Materials should be covered prior to, and during rain events.
- Materials should be stored in their original containers and the original product labels should be maintained in place in a legible condition. Damaged or otherwise illegible labels should be replaced immediately.

# Material Delivery and Storage

## WM-1

- Bagged and boxed materials should be stored on pallets and should not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials should be covered during non-working days and prior to and during rain events.
- Stockpiles should be protected in accordance with WM-3, Stockpile Management.
- Materials should be stored indoors within existing structures or completely enclosed storage sheds when available.
- Proper storage instructions should be posted at all times in an open and conspicuous location.
- An ample supply of appropriate spill clean up material should be kept near storage areas.
- Also see WM-6, Hazardous Waste Management, for storing of hazardous wastes.

### ***Material Delivery Practices***

- Keep an accurate, up-to-date inventory of material delivered and stored onsite.
- Arrange for employees trained in emergency spill cleanup procedures to be present when dangerous materials or liquid chemicals are unloaded.

### ***Spill Cleanup***

- Contain and clean up any spill immediately.
- Properly remove and dispose of any hazardous materials or contaminated soil if significant residual materials remain on the ground after construction is complete. See WM-7, Contaminated Soil Management.
- See WM-4, Spill Prevention and Control, for spills of chemicals and/or hazardous materials.
- If spills or leaks of materials occur that are not contained and could discharge to surface waters, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

### ***Cost***

- The largest cost of implementation may be in the construction of a materials storage area that is covered and provides secondary containment.

### ***Inspection and Maintenance***

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Keep storage areas clean and well organized, including a current list of all materials onsite.
- Inspect labels on containers for legibility and accuracy.

# Material Delivery and Storage

## WM-1

- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

### References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

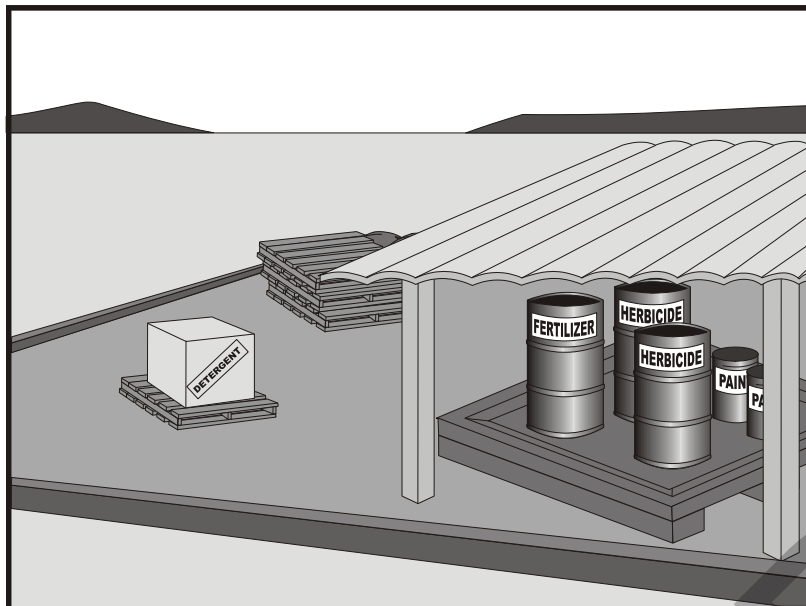
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

# Material Use

## WM-2



### Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	<input checked="" type="checkbox"/>

### Legend:

- ☒ Primary Category  
☒ Secondary Category

### Description and Purpose

Prevent or reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use onsite, and training employees and subcontractors.

### Suitable Applications

This BMP is suitable for use at all construction projects. These procedures apply when the following materials are used or prepared onsite:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Other hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Other materials that may be detrimental if released to the environment

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

### Potential Alternatives

None

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# Material Use

# WM-2

## Limitations

Safer alternative building and construction products may not be available or suitable in every instance.

## Implementation

The following steps should be taken to minimize risk:

- Minimize use of hazardous materials onsite.
- Follow manufacturer instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.
- Train personnel who use pesticides. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct onsite inspections.
- The preferred method of termiticide application is soil injection near the existing or proposed structure foundation/slab; however, if not feasible, soil drench application of termiticides should follow EPA label guidelines and the following recommendations (most of which are applicable to most pesticide applications):
  - Do not treat soil that is water-saturated or frozen.
  - Application shall not commence within 24-hours of a predicted precipitation event with a 40% or greater probability. Weather tracking must be performed on a daily basis prior to termiticide application and during the period of termiticide application.
  - Do not allow treatment chemicals to runoff from the target area. Apply proper quantity to prevent excess runoff. Provide containment for and divert stormwater from application areas using berms or diversion ditches during application.
  - Dry season: Do not apply within 10 feet of storm drains. Do not apply within 25 feet of aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds).
  - Wet season: Do not apply within 50 feet of storm drains or aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds) unless a vegetative buffer is present (if so, refer to dry season requirements).
  - Do not make on-grade applications when sustained wind speeds are above 10 mph (at application site) at nozzle end height.
  - Cover treatment site prior to a rain event in order to prevent run-off of the pesticide into non-target areas. The treated area should be limited to a size that can be backfilled and/or covered by the end of the work shift. Backfilling or covering of the treated area shall be done by the end of the same work shift in which the application is made.
  - The applicator must either cover the soil him/herself or provide written notification of the above requirement to the contractor on site and to the person commissioning the

# Material Use

# WM-2

application (if different than the contractor). If notice is provided to the contractor or the person commissioning the application, then they are responsible under the Federal Insecticide Fungicide, and Rodenticide Act (FIFRA) to ensure that: 1) if the concrete slab cannot be poured over the treated soil within 24 hours of application, the treated soil is covered with a waterproof covering (such as polyethylene sheeting), and 2) the treated soil is covered if precipitation is predicted to occur before the concrete slab is scheduled to be poured.

- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydraulic application. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried offsite by runoff. Do not apply these chemicals before predicted rainfall.
- Train employees and subcontractors in proper material use.
- Supply Material Safety Data Sheets (MSDS) for all materials.
- Dispose of latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, with other construction debris.
- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.
- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled, as hazardous waste.
- For water-based paint, clean brushes to the extent practicable, and rinse to a drain leading to a sanitary sewer where permitted, or contain for proper disposal off site. For oil-based paints, clean brushes to the extent practicable, and filter and reuse thinners and solvents.
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.
- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials onsite when practical.
- Document the location, time, chemicals applied, and applicator's name and qualifications.
- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.
- Discontinue use of erodible landscape material within 2 days prior to a forecasted rain event and materials should be covered and/or bermed.

# Material Use

# WM-2

- Provide containment for material use areas such as masons' areas or paint mixing/preparation areas to prevent materials/pollutants from entering stormwater.

## Costs

All of the above are low cost measures.

## Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Ensure employees and subcontractors throughout the job are using appropriate practices.

## References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

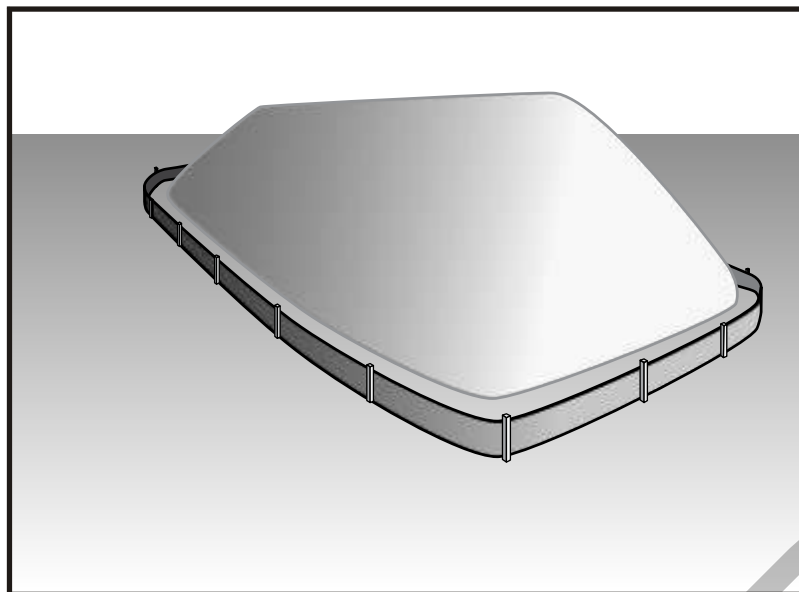
Comments on Risk Assessments Risk Reduction Options for Cypermethrin: Docket No. OPP–2005–0293; California Stormwater Quality Association (CASQA) letter to USEPA, 2006.Environmental Hazard and General Labeling for Pyrethroid Non-Agricultural Outdoor Products, EPA-HQ-OPP-2008-0331-0021; USEPA, 2008.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

# Stockpile Management

## WM-3



### Categories

EC	Erosion Control	
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	<input checked="" type="checkbox"/>

### Legend:

- ☒ Primary Category  
☒ Secondary Category

### Description and Purpose

Stockpile management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, soil amendments, sand, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called “cold mix” asphalt), and pressure treated wood.

### Suitable Applications

Implement in all projects that stockpile soil and other loose materials.

### Limitations

- Plastic sheeting as a stockpile protection is temporary and hard to manage in windy conditions. Where plastic is used, consider use of plastic tarps with nylon reinforcement which may be more durable than standard sheeting.
- Plastic sheeting can increase runoff volume due to lack of infiltration and potentially cause perimeter control failure.
- Plastic sheeting breaks down faster in sunlight.
- The use of Plastic materials and photodegradable plastics should be avoided.

### Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

### Potential Alternatives

None

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# Stockpile Management

## WM-3

- On larger sites, a minimum of 50 ft separation from concentrated flows of stormwater, drainage courses, and inlets is recommended.
- After 14 days of inactivity, a stockpile is non-active and requires further protection described below. All stockpiles are required to be protected as non-active stockpiles immediately if they are not scheduled to be used within 14 days.
- Protect all stockpiles from stormwater runoff using temporary perimeter sediment barriers such as compost berms (SE-13), temporary silt dikes (SE-12), fiber rolls (SE-5), silt fences (SE-1), sandbags (SE-8), gravel bags (SE-6), or biofilter bags (SE-14). Refer to the individual fact sheet for each of these controls for installation information.
- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1, Wind Erosion Control.
- Manage stockpiles of contaminated soil in accordance with WM-7, Contaminated Soil Management.
- Place bagged materials on pallets and under cover.
- Ensure that stockpile coverings are installed securely to protect from wind and rain.
- Some plastic covers withstand weather and sunlight better than others. Select cover materials or methods based on anticipated duration of use.

### ***Protection of Non-Active Stockpiles***

A stockpile is considered non-active if it either is not used for 14 days or if it is scheduled not to be used for 14 days or more. Stockpiles need to be protected immediately if they are not scheduled to be used within 14 days. Non-active stockpiles of the identified materials should be protected as follows:

#### *Soil stockpiles*

- Soil stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- Temporary vegetation should be considered for topsoil piles that will be stockpiled for extended periods.

*Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub base*

- Stockpiles should be covered and protected with a temporary perimeter sediment barrier at all times.

#### *Stockpiles of "cold mix"*

- Cold mix stockpiles should be placed on and covered with plastic sheeting or comparable material at all times and surrounded by a berm.

*Stockpiles of fly ash, stucco, hydrated lime*

# Stockpile Management

## WM-3

- Stockpiles of materials that may raise the pH of runoff (i.e., basic materials) should be covered with plastic and surrounded by a berm.

*Stockpiles/Storage of wood (Pressure treated with chromated copper arsenate or ammoniacal copper zinc arsenate)*

- Treated wood should be covered with plastic sheeting or comparable material at all times and surrounded by a berm.

### **Protection of Active Stockpiles**

A stockpile is active when it is being used or is scheduled to be used within 14 days of the previous use. Active stockpiles of the identified materials should be protected as follows:

- All stockpiles should be covered and protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of “cold mix” and treated wood, and basic materials should be placed on and covered with plastic sheeting or comparable material and surrounded by a berm prior to the onset of precipitation.
- The downstream perimeter of an active stockpile should be protected with a linear sediment barrier or berm and runoff should be diverted around or away from the stockpile on the upstream perimeter.

### **Costs**

For cost information associated with stockpile protection refer to the individual erosion or sediment control BMP fact sheet considered for implementation (For example, refer to SE-1 Silt Fence for installation of silt fence around the perimeter of a stockpile.)

### **Inspection and Maintenance**

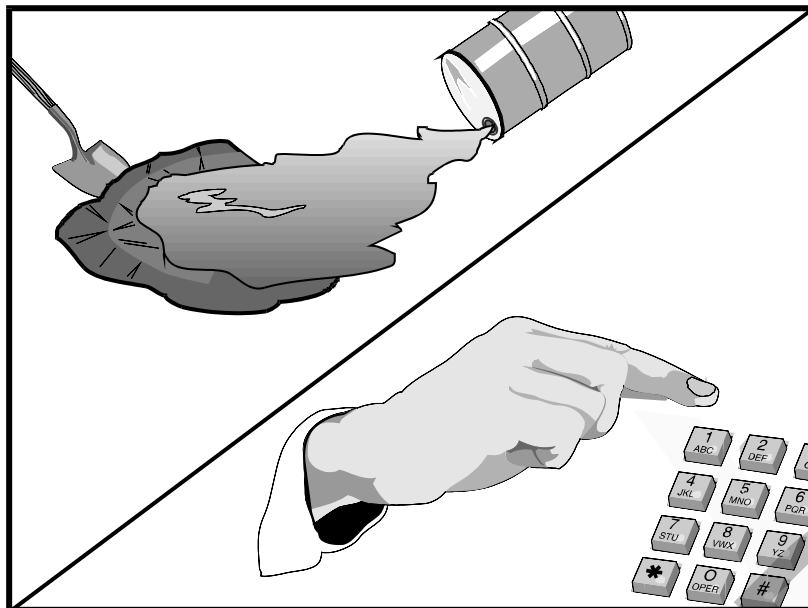
- Stockpiles must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- It may be necessary to inspect stockpiles covered with plastic sheeting more frequently during certain conditions (for example, high winds or extreme heat).
- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.
- Sediment shall be removed when it reaches one-third of the barrier height.

### **References**

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

# Spill Prevention and Control

## WM-4



### Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	<input checked="" type="checkbox"/>

### Legend:

- ☒ **Primary Objective**  
☒ **Secondary Objective**

### Description and Purpose

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1, Materials Delivery and Storage, and WM-2, Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

### Suitable Applications

This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

### Potential Alternatives

None

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# Spill Prevention and Control

## WM-4

- Fuels
- Lubricants
- Other petroleum distillates

### Limitations

- In some cases it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite

### Implementation

The following steps will help reduce the stormwater impacts of leaks and spills:

#### **Education**

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a “significant spill” is for each material they use, and what is the appropriate response for “significant” and “insignificant” spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- Have contractor’s superintendent or representative oversee and enforce proper spill prevention and control measures.

#### **General Measures**

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runoff during rainfall to the extent that it doesn’t compromise clean up activities.
- Do not bury or wash spills with water.

# Spill Prevention and Control

## WM-4

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

### ***Cleanup***

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

### ***Minor Spills***

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
  - Contain the spread of the spill.
  - Recover spilled materials.
  - Clean the contaminated area and properly dispose of contaminated materials.

### ***Semi-Significant Spills***

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

# Spill Prevention and Control

## WM-4

- Spills should be cleaned up immediately:
  - Contain spread of the spill.
  - Notify the project foreman immediately.
  - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
  - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
  - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

### ***Significant/Hazardous Spills***

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
  - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
  - Notify the Governor's Office of Emergency Services Warning Center, (916) 845-8911.
  - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110, 119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
  - Notification should first be made by telephone and followed up with a written report.
  - The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
  - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

### ***Reporting***

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Use the following measures related to specific activities:

# Spill Prevention and Control

## WM-4

### ***Vehicle and Equipment Maintenance***

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runoff of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

### ***Vehicle and Equipment Fueling***

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runoff of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

### **Costs**

Prevention of leaks and spills is inexpensive. Treatment and/ or disposal of contaminated soil or water can be quite expensive.

### **Inspection and Maintenance**

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

# Spill Prevention and Control

## WM-4

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

### References

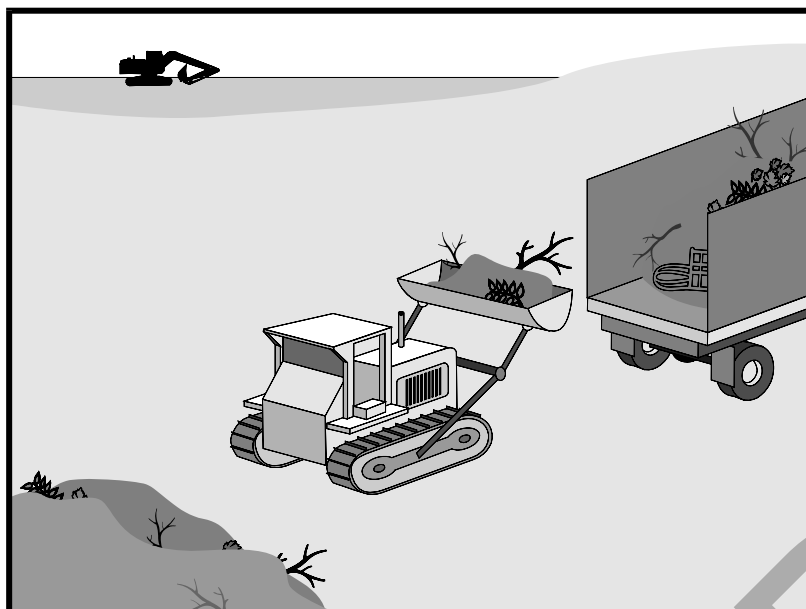
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Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

# Solid Waste Management

## WM-5



### Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	<input checked="" type="checkbox"/>

### Legend:

- ☒ **Primary Objective**  
☒ **Secondary Objective**

### Description and Purpose

Solid waste management procedures and practices are designed to prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

### Suitable Applications

This BMP is suitable for construction sites where the following wastes are generated or stored:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
- Packaging materials including wood, paper, and plastic
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces, and masonry products
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

### Potential Alternatives

None

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# Solid Waste Management

## WM-5

- Highway planting wastes, including vegetative material, plant containers, and packaging materials

### Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

### Implementation

The following steps will help keep a clean site and reduce stormwater pollution:

- Select designated waste collection areas onsite.
- Inform trash-hauling contractors that you will accept only watertight dumpsters for onsite use. Inspect dumpsters for leaks and repair any dumpster that is not watertight.
- Locate containers in a covered area or in a secondary containment.
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy.
- Cover waste containers at the end of each work day and when it is raining.
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Collect site trash daily, especially during rainy and windy conditions.
- Remove this solid waste promptly since erosion and sediment control devices tend to collect litter.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling contractor.
- Arrange for regular waste collection before containers overflow.
- Clean up immediately if a container does spill.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.

### Education

- Have the contractor's superintendent or representative oversee and enforce proper solid waste management procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.

# Solid Waste Management

## WM-5

- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Minimize production of solid waste materials wherever possible.

### ***Collection, Storage, and Disposal***

- Littering on the project site should be prohibited.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.
- Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters at least weekly, regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.
- Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project.
- Full dumpsters should be removed from the project site and the contents should be disposed of by the trash hauling contractor.
- Construction debris and waste should be removed from the site biweekly or more frequently as needed.
- Construction material visible to the public should be stored or stacked in an orderly manner.
- Stormwater runoff should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas should be located at least 50 ft from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters should be securely covered from wind and rain by covering the waste with tarps or plastic.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.

# Solid Waste Management

## WM-5

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.
- Salvage or recycle useful vegetation debris, packaging and surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

### Costs

All of the above are low cost measures.

### Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Inspect construction waste area regularly.
- Arrange for regular waste collection.

### References

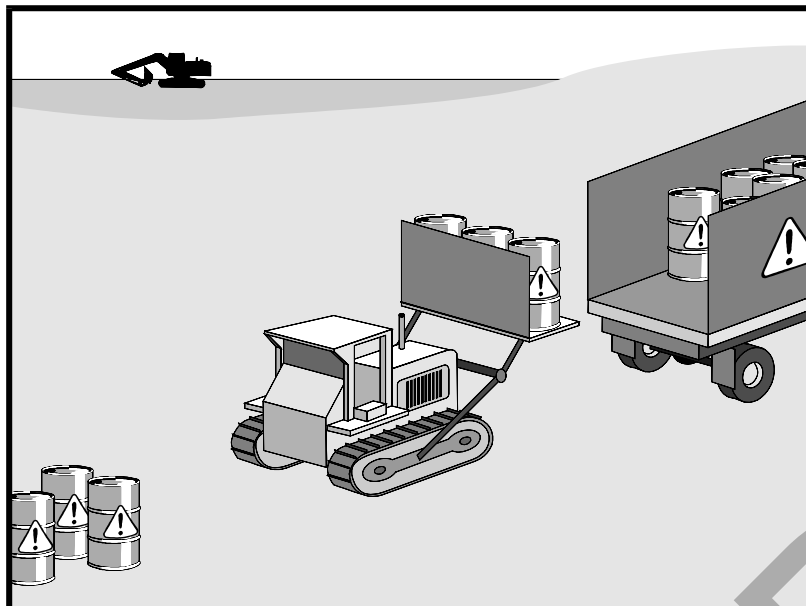
Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

# Hazardous Waste Management

## WM-6



### Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	<input checked="" type="checkbox"/>

### Legend:

- ☒ **Primary Objective**  
☒ **Secondary Objective**

### Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.

### Suitable Applications

This best management practice (BMP) applies to all construction projects. Hazardous waste management practices are implemented on construction projects that generate waste from the use of:

- Petroleum Products
- Concrete Curing Compounds
- Palliatives
- Septic Wastes
- Stains
- Wood Preservatives
- Asphalt Products
- Pesticides
- Acids
- Paints
- Solvents
- Roofing Tar
- Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302

### Targeted Constituents

Sediment	
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

### Potential Alternatives

None

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# Hazardous Waste Management

## WM-6

In addition, sites with existing structures may contain wastes, which must be disposed of in accordance with federal, state, and local regulations. These wastes include:

- Sandblasting grit mixed with lead-, cadmium-, or chromium-based paints
- Asbestos
- PCBs (particularly in older transformers)

### Limitations

- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Nothing in this BMP relieves the contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.
- This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to WM-7, Contaminated Soil Management.

### Implementation

The following steps will help reduce stormwater pollution from hazardous wastes:

#### **Material Use**

- Wastes should be stored in sealed containers constructed of a suitable material and should be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 172, 173, 178, and 179.
- All hazardous waste should be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.
- Waste containers should be stored in temporary containment facilities that should comply with the following requirements:
  - Temporary containment facility should provide for a spill containment volume equal to 1.5 times the volume of all containers able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest tank within its boundary, whichever is greater.
  - Temporary containment facility should be impervious to the materials stored there for a minimum contact time of 72 hours.
  - Temporary containment facilities should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be placed into drums after each rainfall. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids should be sent to an approved disposal site.
  - Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.

# Hazardous Waste Management

## WM-6

- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Throughout the rainy season, temporary containment facilities should be covered during non-working days, and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs.
- Drums should not be overfilled and wastes should not be mixed.
- Unless watertight, containers of dry waste should be stored on pallets.
- Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to one large application. Allow time for infiltration and avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains. People applying pesticides must be certified in accordance with federal and state regulations.
- Paint brushes and equipment for water and oil based paints should be cleaned within a contained area and should not be allowed to contaminate site soils, watercourses, or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused should be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths should be disposed of as solid waste.
- Do not clean out brushes or rinse paint containers into the dirt, street, gutter, storm drain, or stream. "Paint out" brushes as much as possible. Rinse water-based paints to the sanitary sewer. Filter and reuse thinners and solvents. Dispose of excess oil-based paints and sludge as hazardous waste.
- The following actions should be taken with respect to temporary contaminant:
  - Ensure that adequate hazardous waste storage volume is available.
  - Ensure that hazardous waste collection containers are conveniently located.
  - Designate hazardous waste storage areas onsite away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.
  - Minimize production or generation of hazardous materials and hazardous waste on the job site.
  - Use containment berms in fueling and maintenance areas and where the potential for spills is high.
  - Segregate potentially hazardous waste from non-hazardous construction site debris.
  - Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.

# Hazardous Waste Management

## WM-6

- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.
- Place hazardous waste containers in secondary containment.
- Do not allow potentially hazardous waste materials to accumulate on the ground.
- Do not mix wastes.
- Use all of the product before disposing of the container.
- Do not remove the original product label; it contains important safety and disposal information.

### ***Waste Recycling Disposal***

- Select designated hazardous waste collection areas onsite.
- Hazardous materials and wastes should be stored in covered containers and protected from vandalism.
- Place hazardous waste containers in secondary containment.
- Do not mix wastes, this can cause chemical reactions, making recycling impossible and complicating disposal.
- Recycle any useful materials such as used oil or water-based paint.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Arrange for regular waste collection before containers overflow.
- Make sure that hazardous waste (e.g., excess oil-based paint and sludge) is collected, removed, and disposed of only at authorized disposal areas.

### ***Disposal Procedures***

- Waste should be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Hazardous Waste Manifest forms.
- A Department of Health Services certified laboratory should sample waste to determine the appropriate disposal facility.
- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.
- Attention is directed to "Hazardous Material", "Contaminated Material", and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.

# Hazardous Waste Management

## WM-6

### ***Education***

- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The contractor's superintendent or representative should oversee and enforce proper hazardous waste management procedures and practices.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Warning signs should be placed in areas recently treated with chemicals.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- If a container does spill, clean up immediately.

### **Costs**

All of the above are low cost measures.

### ***Inspection and Maintenance***

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events..
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Hazardous waste should be regularly collected.
- A foreman or construction supervisor should monitor onsite hazardous waste storage and disposal procedures.
- Waste storage areas should be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.
- Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

# Hazardous Waste Management

## WM-6

- Hazardous spills should be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.
- The National Response Center, at (800) 424-8802, should be notified of spills of federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302. Also notify the Governors Office of Emergency Services Warning Center at (916) 845-8911.
- A copy of the hazardous waste manifests should be provided.

### References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

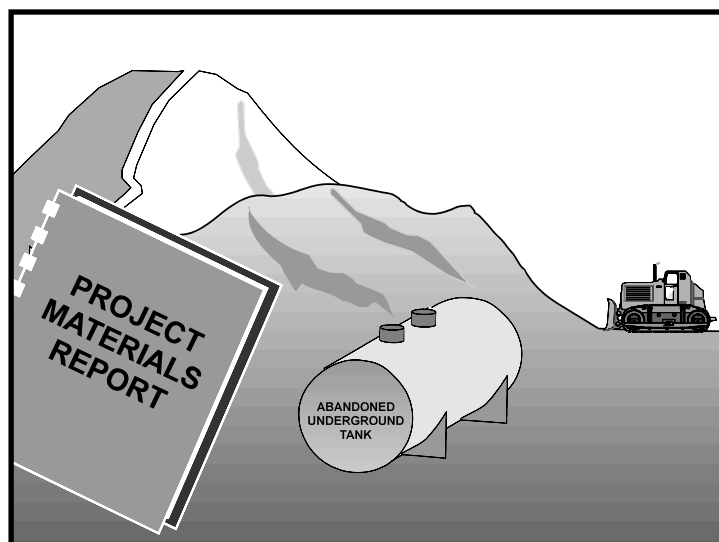
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Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

# Contaminated Soil Management

# WM-7



## Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	<input checked="" type="checkbox"/>

## Legend:

- ☒ **Primary Objective**  
☒ **Secondary Objective**

## Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from contaminated soil and highly acidic or alkaline soils by conducting pre-construction surveys, inspecting excavations regularly, and remediating contaminated soil promptly.

## Suitable Applications

Contaminated soil management is implemented on construction projects in highly urbanized or industrial areas where soil contamination may have occurred due to spills, illicit discharges, aerial deposition, past use and leaks from underground storage tanks.

## Limitations

Contaminated soils that cannot be treated onsite must be disposed of offsite by a licensed hazardous waste hauler. The presence of contaminated soil may indicate contaminated water as well. See NS-2, Dewatering Operations, for more information.

The procedures and practices presented in this BMP are general. The contractor should identify appropriate practices and procedures for the specific contaminants known to exist or discovered onsite.

## Implementation

Most owners and developers conduct pre-construction environmental assessments as a matter of routine. Contaminated soils are often identified during project planning and development with known locations identified in the plans, specifications and in the SWPPP. The contractor should review applicable reports and investigate appropriate call-outs in the

## Targeted Constituents

Sediment	
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

## Potential Alternatives

None

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# Contaminated Soil Management

## WM-7

plans, specifications, and SWPPP. Recent court rulings holding contractors liable for cleanup costs when they unknowingly move contaminated soil highlight the need for contractors to confirm a site assessment is completed before earth moving begins.

The following steps will help reduce stormwater pollution from contaminated soil:

- Conduct thorough, pre-construction inspections of the site and review documents related to the site. If inspection or reviews indicated presence of contaminated soils, develop a plan before starting work.
- Look for contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
- Prevent leaks and spills. Contaminated soil can be expensive to treat and dispose of properly. However, addressing the problem before construction is much less expensive than after the structures are in place.
- The contractor may further identify contaminated soils by investigating:
  - Past site uses and activities
  - Detected or undetected spills and leaks
  - Acid or alkaline solutions from exposed soil or rock formations high in acid or alkaline forming elements
  - Contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
  - Suspected soils should be tested at a certified laboratory.

### ***Education***

- Have employees and subcontractors complete a safety training program which meets 29 CFR 1910.120 and 8 CCR 5192 covering the potential hazards as identified, prior to performing any excavation work at the locations containing material classified as hazardous.
- Educate employees and subcontractors in identification of contaminated soil and on contaminated soil handling and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

### ***Handling Procedures for Material with Aerially Deposited Lead (ADL)***

- Materials from areas designated as containing (ADL) may, if allowed by the contract special provisions, be excavated, transported, and used in the construction of embankments and/or backfill.
- Excavation, transportation, and placement operations should result in no visible dust.
- Caution should be exercised to prevent spillage of lead containing material during transport.

# Contaminated Soil Management

## WM-7

- Quality should be monitored during excavation of soils contaminated with lead.

### ***Handling Procedures for Contaminated Soils***

- Minimize onsite storage. Contaminated soil should be disposed of properly in accordance with all applicable regulations. All hazardous waste storage will comply with the requirements in Title 22, CCR, Sections 66265.250 to 66265.260.
- Test suspected soils at an approved certified laboratory.
- Work with the local regulatory agencies to develop options for treatment or disposal if the soil is contaminated.
- Avoid temporary stockpiling of contaminated soils or hazardous material.
- Take the following precautions if temporary stockpiling is necessary:
  - Cover the stockpile with plastic sheeting or tarps.
  - Install a berm around the stockpile to prevent runoff from leaving the area.
  - Do not stockpile in or near storm drains or watercourses.
- Remove contaminated material and hazardous material on exteriors of transport vehicles and place either into the current transport vehicle or into the excavation prior to the vehicle leaving the exclusion zone.
- Monitor the air quality continuously during excavation operations at all locations containing hazardous material.
- Procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying the contaminated material and the hazardous material.
- Collect water from decontamination procedures and treat or dispose of it at an appropriate disposal site.
- Collect non-reusable protective equipment, once used by any personnel, and dispose of at an appropriate disposal site.
- Install temporary security fence to surround and secure the exclusion zone. Remove fencing when no longer needed.
- Excavate, transport, and dispose of contaminated material and hazardous material in accordance with the rules and regulations of the following agencies (the specifications of these agencies supersede the procedures outlined in this BMP):
  - United States Department of Transportation (USDOT)
  - United States Environmental Protection Agency (USEPA)
  - California Environmental Protection Agency (CAL-EPA)

# Contaminated Soil Management

## WM-7

- California Division of Occupation Safety and Health Administration (CAL-OSHA)
- Local regulatory agencies

### ***Procedures for Underground Storage Tank Removals***

- Prior to commencing tank removal operations, obtain the required underground storage tank removal permits and approval from the federal, state, and local agencies that have jurisdiction over such work.
- To determine if it contains hazardous substances, arrange to have tested, any liquid or sludge found in the underground tank prior to its removal.
- Following the tank removal, take soil samples beneath the excavated tank and perform analysis as required by the local agency representative(s).
- The underground storage tank, any liquid or sludge found within the tank, and all contaminated substances and hazardous substances removed during the tank removal and transported to disposal facilities permitted to accept such waste.

### ***Water Control***

- All necessary precautions and preventive measures should be taken to prevent the flow of water, including ground water, from mixing with hazardous substances or underground storage tank excavations. Such preventative measures may consist of, but are not limited to, berms, cofferdams, grout curtains, freeze walls, and seal course concrete or any combination thereof.
- If water does enter an excavation and becomes contaminated, such water, when necessary to proceed with the work, should be discharged to clean, closed top, watertight transportable holding tanks, treated, and disposed of in accordance with federal, state, and local laws.

### ***Costs***

Prevention of leaks and spills is inexpensive. Treatment or disposal of contaminated soil can be quite expensive.

### ***Inspection and Maintenance***

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange for contractor's Water Pollution Control Manager, foreman, and/or construction supervisor to monitor onsite contaminated soil storage and disposal procedures.
- Monitor air quality continuously during excavation operations at all locations containing hazardous material.
- Coordinate contaminated soils and hazardous substances/waste management with the appropriate federal, state, and local agencies.

# Contaminated Soil Management

## WM-7

- Implement WM-4, Spill Prevention and Control, to prevent leaks and spills as much as possible.

### References

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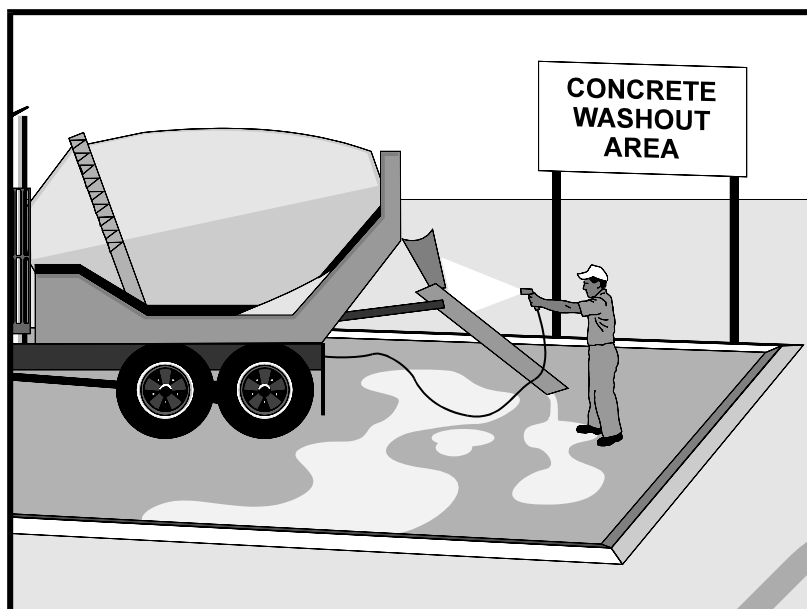
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Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

# Concrete Waste Management

## WM-8



### Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	<input checked="" type="checkbox"/>

### Legend:

- ☒ Primary Category  
☒ Secondary Category

### Description and Purpose

Prevent the discharge of pollutants to stormwater from concrete waste by conducting washout onsite or offsite in a designated area, and by employee and subcontractor training.

The General Permit incorporates Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials, including mortar, concrete, stucco, cement and block and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows and raising pH to levels outside the accepted range.

### Suitable Applications

Concrete waste management procedures and practices are implemented on construction projects where:

- Concrete is used as a construction material or where concrete dust and debris result from demolition activities.
- Slurries containing portland cement concrete (PCC) are generated, such as from saw cutting, coring, grinding, grooving, and hydro-concrete demolition.
- Concrete trucks and other concrete-coated equipment are washed onsite.

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	
Organics	

### Potential Alternatives

None

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# Concrete Waste Management

## WM-8

- Mortar-mixing stations exist.
- Stucco mixing and spraying.
- See also NS-8, Vehicle and Equipment Cleaning.

### Limitations

- Offsite washout of concrete wastes may not always be possible.
- Multiple washouts may be needed to assure adequate capacity and to allow for evaporation.

### Implementation

The following steps will help reduce stormwater pollution from concrete wastes:

- Incorporate requirements for concrete waste management into material supplier and subcontractor agreements.
- Store dry and wet materials under cover, away from drainage areas. Refer to WM-1, Material Delivery and Storage for more information.
- Avoid mixing excess amounts of concrete.
- Perform washout of concrete trucks in designated areas only, where washout will not reach stormwater.
- Do not wash out concrete trucks into storm drains, open ditches, streets, streams or onto the ground. Trucks should always be washed out into designated facilities.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- For onsite washout:
  - On larger sites, it is recommended to locate washout areas at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste.
  - Washout wastes into the temporary washout where the concrete can set, be broken up, and then disposed properly.
  - Washouts shall be implemented in a manner that prevents leaching to underlying soils. Washout containers must be water tight and washouts on or in the ground must be lined with a suitable impervious liner, typically a plastic type material.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose in the trash.
- See typical concrete washout installation details at the end of this fact sheet.

### Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.

# Concrete Waste Management

## WM-8

- Arrange for contractor's superintendent or representative to oversee and enforce concrete waste management procedures.
- Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.

### ***Concrete Demolition Wastes***

- Stockpile concrete demolition waste in accordance with BMP WM-3, Stockpile Management.
- Dispose of or recycle hardened concrete waste in accordance with applicable federal, state or local regulations.

### ***Concrete Slurry Wastes***

- PCC and AC waste should not be allowed to enter storm drains or watercourses.
- PCC and AC waste should be collected and disposed of or placed in a temporary concrete washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below).
- A foreman or construction supervisor should monitor onsite concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.
- Saw-cut concrete slurry should not be allowed to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine or by sweeping. Saw cutting residue should not be allowed to flow across the pavement and should not be left on the surface of the pavement. See also NS-3, Paving and Grinding Operations; and WM-10, Liquid Waste Management.
- Concrete slurry residue should be disposed in a temporary washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below) and allowed to dry. Dispose of dry slurry residue in accordance with WM-5, Solid Waste Management.

### ***Onsite Temporary Concrete Washout Facility, Transit Truck Washout Procedures***

- Temporary concrete washout facilities should be located a minimum of 50 ft from storm drain inlets, open drainage facilities, and watercourses. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking.
- A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.
- Temporary concrete washout facilities should be constructed above grade or below grade at the option of the contractor. Temporary concrete washout facilities should be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

# Concrete Waste Management

## WM-8

- Temporary washout facilities should have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.
- Temporary washout facilities should be lined to prevent discharge to the underlying ground or surrounding area.
- Washout of concrete trucks should be performed in designated areas only.
- Only concrete from mixer truck chutes should be washed into concrete wash out.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed of or recycled offsite.
- Once concrete wastes are washed into the designated area and allowed to harden, the concrete should be broken up, removed, and disposed of per WM-5, Solid Waste Management. Dispose of or recycle hardened concrete on a regular basis.
- Temporary Concrete Washout Facility (Type Above Grade)
  - Temporary concrete washout facility (type above grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft; however, smaller sites or jobs may only need a smaller washout facility. With any washout, always maintain a sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
  - Materials used to construct the washout area should conform to the provisions detailed in their respective BMPs (e.g., SE-8 Sandbag Barrier).
  - Plastic lining material should be a minimum of 10 mil in polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
  - Alternatively, portable removable containers can be used as above grade concrete washouts. Also called a “roll-off”; this concrete washout facility should be properly sealed to prevent leakage, and should be removed from the site and replaced when the container reaches 75% capacity.
- Temporary Concrete Washout Facility (Type Below Grade)
  - Temporary concrete washout facilities (type below grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft. The quantity and volume should be sufficient to contain all liquid and concrete waste generated by washout operations.
  - Lath and flagging should be commercial type.
  - Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

# Concrete Waste Management

## WM-8

- The base of a washout facility should be free of rock or debris that may damage a plastic liner.

### ***Removal of Temporary Concrete Washout Facilities***

- When temporary concrete washout facilities are no longer required for the work, the hardened concrete should be removed and properly disposed or recycled in accordance with federal, state or local regulations. Materials used to construct temporary concrete washout facilities should be removed from the site of the work and properly disposed or recycled in accordance with federal, state or local regulations..
- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities should be backfilled and repaired.

### **Costs**

All of the above are low cost measures. Roll-Off concrete washout facilities can be more costly than other measures due to removal and replacement; however, provide a cleaner alternative to traditional washouts. The type of washout facility, size, and availability of materials will determine the cost of the washout.

### **Inspection and Maintenance**

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Temporary concrete washout facilities should be maintained to provide adequate holding capacity with a minimum freeboard of 4 in. for above grade facilities and 12 in. for below grade facilities. Maintaining temporary concrete washout facilities should include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials should be removed and properly disposed or recycled in accordance with federal, state or local regulations.
- Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.
- Inspect washout facilities for damage (e.g. torn liner, evidence of leaks, signage, etc.). Repair all identified damage.

### **References**

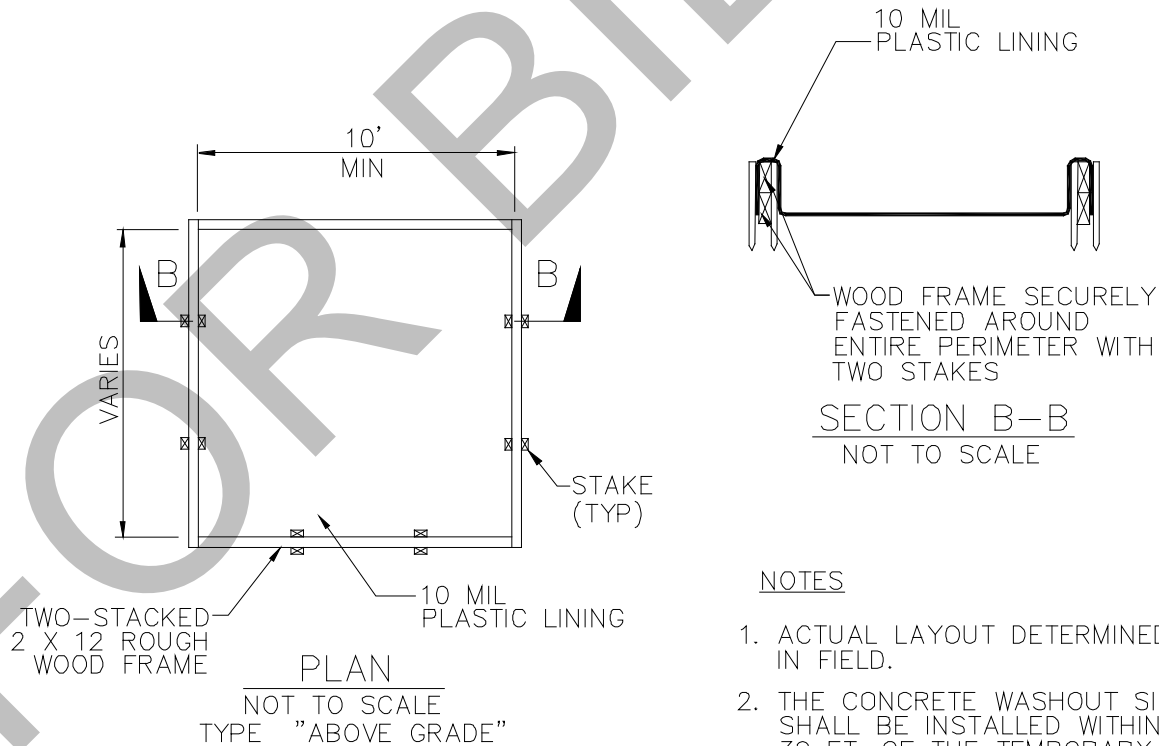
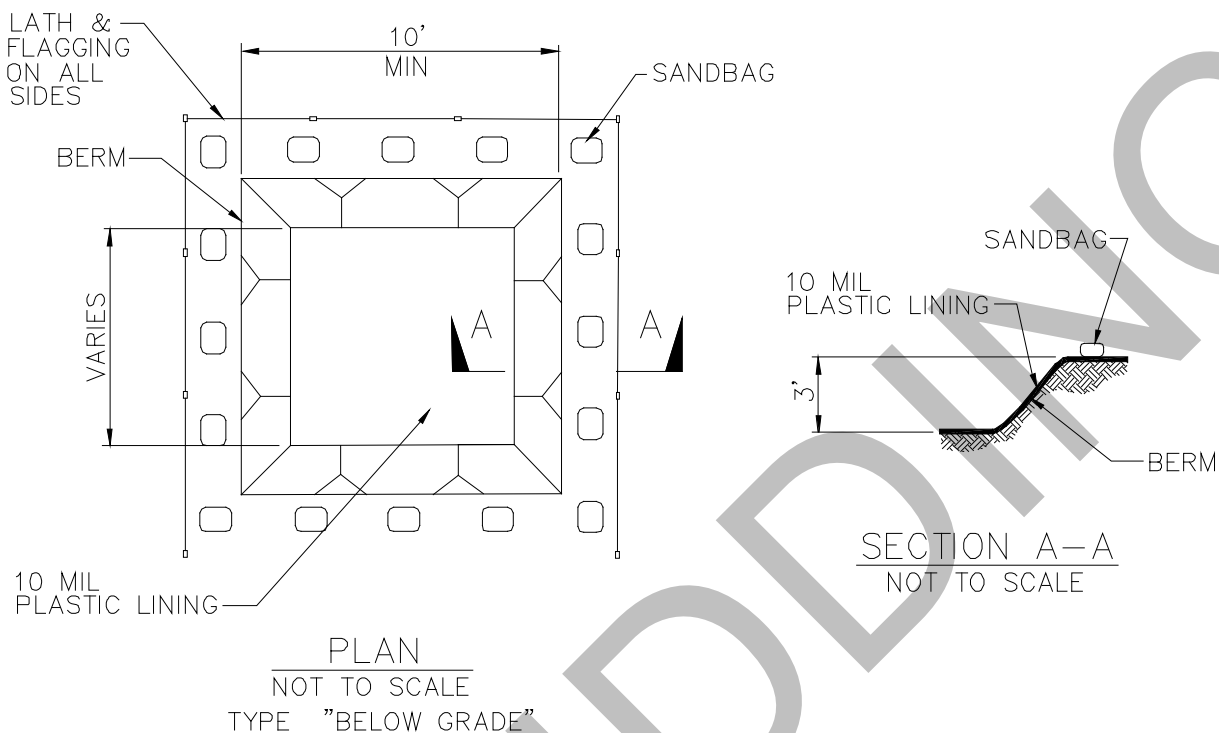
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000, Updated March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

# Concrete Waste Management

## WM-8

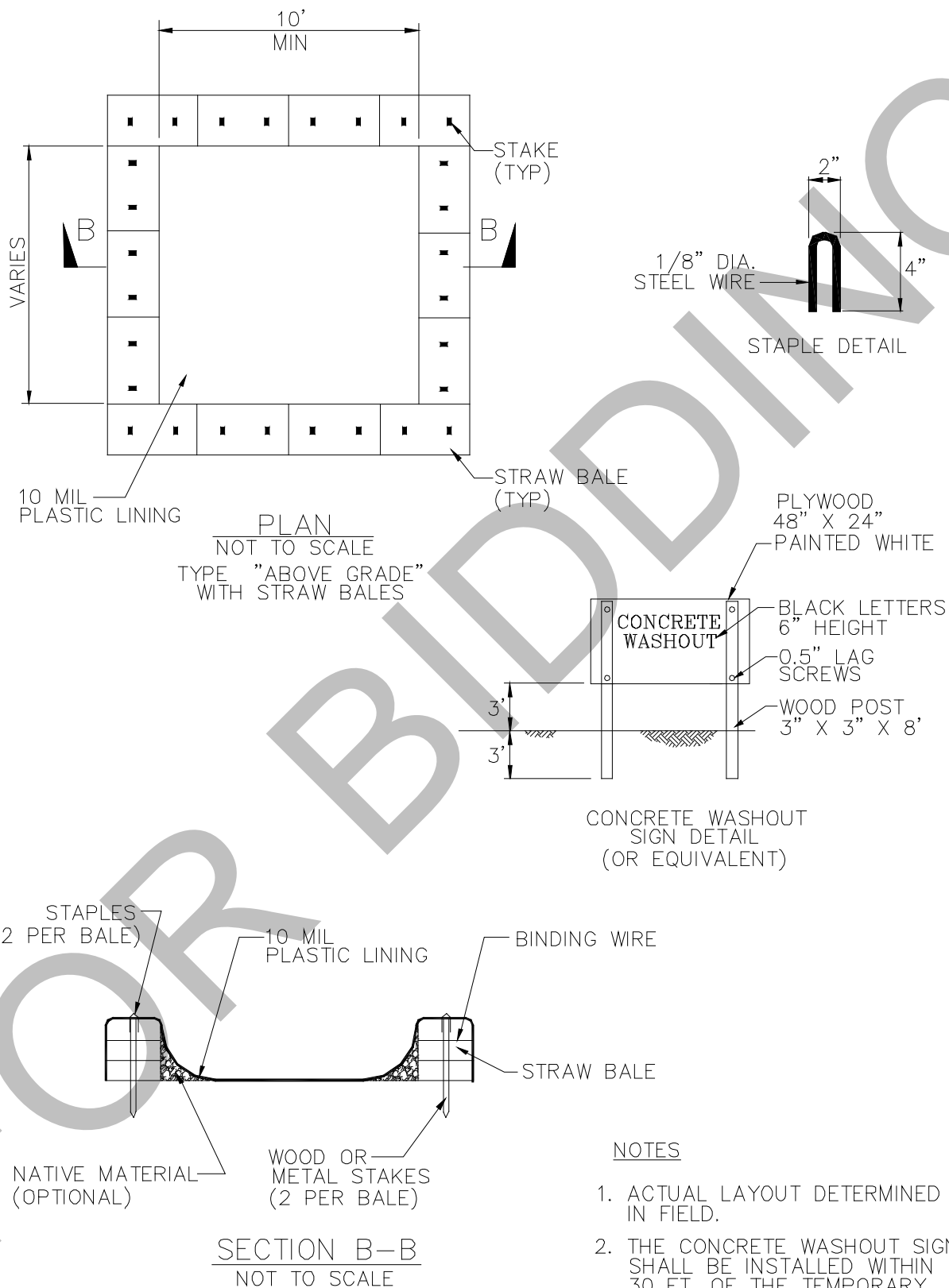


### NOTES

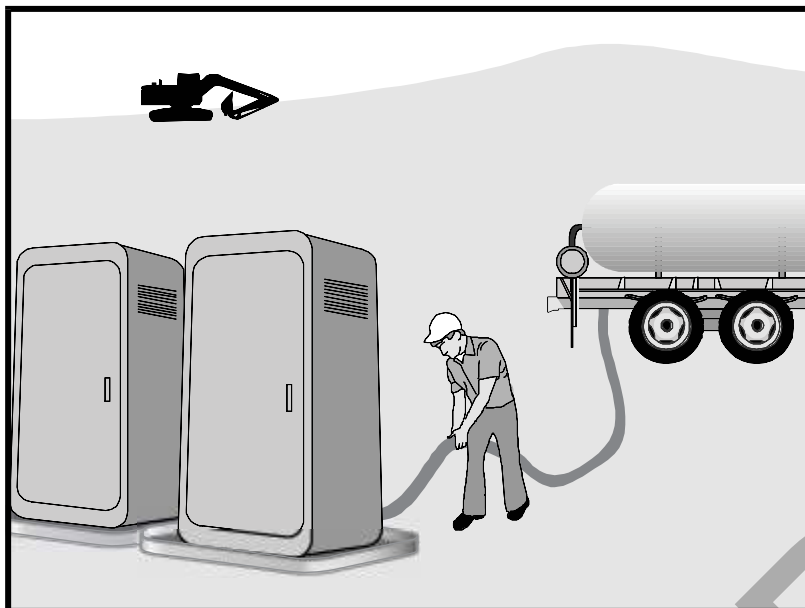
1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.

# Concrete Waste Management

## WM-8



# Sanitary/Septic Waste Management WM-9



## Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	<input checked="" type="checkbox"/>

## Legend:

- ☒ **Primary Category**  
☒ **Secondary Category**

## Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

## Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

## Limitations

None identified.

## Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

## Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and from traffic circulation. If site conditions allow, place portable facilities a minimum of 50 feet from drainage conveyances and traffic areas. When subjected to high winds or risk of high winds, temporary sanitary facilities should be secured to prevent overturning.

## Targeted Constituents

Sediment	
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	
Organics	<input checked="" type="checkbox"/>

## Potential Alternatives

None

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# Sanitary/Septic Waste Management WM-9

- Temporary sanitary facilities must be equipped with containment to prevent discharge of pollutants to the stormwater drainage system of the receiving water.
- Consider safety as well as environmental implications before placing temporary sanitary facilities.
- Wastewater should not be discharged or buried within the project site.
- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the local health agency, city, county, and sewer district requirements.
- Only reputable, licensed sanitary and septic waste haulers should be used.
- Sanitary facilities should be located in a convenient location.
- Temporary septic systems should treat wastes to appropriate levels before discharging.
- If using an onsite disposal system (OSDS), such as a septic system, local health agency requirements must be followed.
- Temporary sanitary facilities that discharge to the sanitary sewer system should be properly connected to avoid illicit discharges.
- Sanitary and septic facilities should be maintained in good working order by a licensed service.
- Regular waste collection by a licensed hauler should be arranged before facilities overflow.
- If a spill does occur from a temporary sanitary facility, follow federal, state and local regulations for containment and clean-up.

## **Education**

- Educate employees, subcontractors, and suppliers on sanitary and septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary and septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary and septic waste.
- Hold regular meetings to discuss and reinforce the use of sanitary facilities (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

## **Costs**

All of the above are low cost measures.

# **Sanitary/Septic Waste Management WM-9**

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## **Inspection and Maintenance**

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange for regular waste collection.
- If high winds are expected, portable sanitary facilities must be secured with spikes or weighed down to prevent over turning.
- If spills or leaks from sanitary or septic facilities occur that are not contained and discharge from the site, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

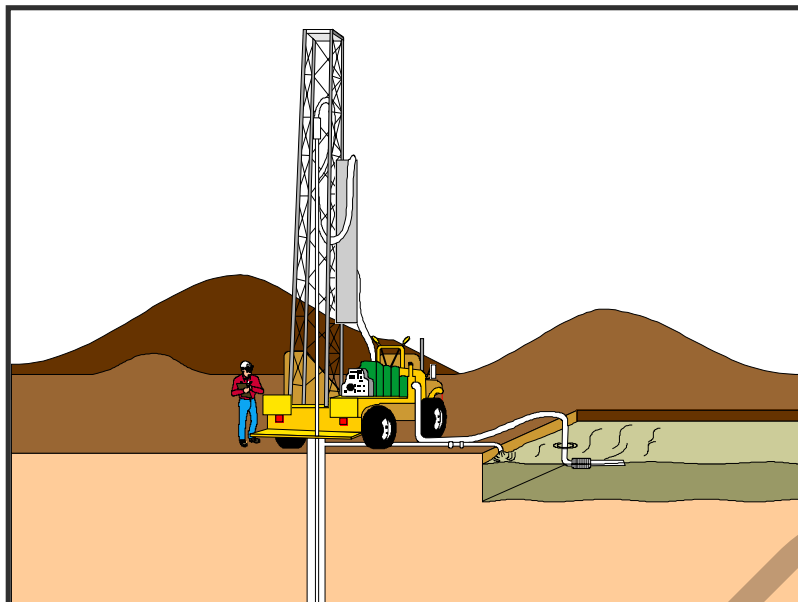
## **References**

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

# Liquid Waste Management

## WM-10



### Description and Purpose

Liquid waste management includes procedures and practices to prevent discharge of pollutants to the storm drain system or to watercourses as a result of the creation, collection, and disposal of non-hazardous liquid wastes.

### Suitable Applications

Liquid waste management is applicable to construction projects that generate any of the following non-hazardous by-products, residuals, or wastes:

- Drilling slurries and drilling fluids
- Grease-free and oil-free wastewater and rinse water
- Dredgings
- Other non-stormwater liquid discharges not permitted by separate permits

### Limitations

- Disposal of some liquid wastes may be subject to specific laws and regulations or to requirements of other permits secured for the construction project (e.g., NPDES permits, Army Corps permits, Coastal Commission permits, etc.).
- Liquid waste management does not apply to dewatering operations (NS-2 Dewatering Operations), solid waste management (WM-5, Solid Waste Management), hazardous wastes (WM-6, Hazardous Waste Management), or

### Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	<input checked="" type="checkbox"/>

### Legend:

- ☒ **Primary Objective**
- ☒ **Secondary Objective**

### Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	

### Potential Alternatives

None

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# Liquid Waste Management

## WM-10

concrete slurry residue (WM-8, Concrete Waste Management).

- Typical permitted non-stormwater discharges can include: water line flushing; landscape irrigation; diverted stream flows; rising ground waters; uncontaminated pumped ground water; discharges from potable water sources; foundation drains; irrigation water; springs; water from crawl space pumps; footing drains; lawn watering; flows from riparian habitats and wetlands; and discharges or flows from emergency fire fighting activities.

### Implementation

#### *General Practices*

- Instruct employees and subcontractors how to safely differentiate between non-hazardous liquid waste and potential or known hazardous liquid waste.
- Instruct employees, subcontractors, and suppliers that it is unacceptable for any liquid waste to enter any storm drainage device, waterway, or receiving water.
- Educate employees and subcontractors on liquid waste generating activities and liquid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Verify which non-stormwater discharges are permitted by the statewide NPDES permit; different regions might have different requirements not outlined in this permit.
- Apply NS-8, Vehicle and Equipment Cleaning for managing wash water and rinse water from vehicle and equipment cleaning operations.

#### *Containing Liquid Wastes*

- Drilling residue and drilling fluids should not be allowed to enter storm drains and watercourses and should be disposed of.
- If an appropriate location is available, drilling residue and drilling fluids that are exempt under Title 23, CCR § 2511(g) may be dried by infiltration and evaporation in a containment facility constructed in conformance with the provisions concerning the Temporary Concrete Washout Facilities detailed in WM-8, Concrete Waste Management.
- Liquid wastes generated as part of an operational procedure, such as water-laden dredged material and drilling mud, should be contained and not allowed to flow into drainage channels or receiving waters prior to treatment.
- Liquid wastes should be contained in a controlled area such as a holding pit, sediment basin, roll-off bin, or portable tank.
- Containment devices must be structurally sound and leak free.
- Containment devices must be of sufficient quantity or volume to completely contain the liquid wastes generated.

# Liquid Waste Management

## WM-10

- Precautions should be taken to avoid spills or accidental releases of contained liquid wastes. Apply the education measures and spill response procedures outlined in WM-4, Spill Prevention and Control.
- Containment areas or devices should not be located where accidental release of the contained liquid can threaten health or safety or discharge to water bodies, channels, or storm drains.

### ***Capturing Liquid Wastes***

- Capture all liquid wastes that have the potential to affect the storm drainage system (such as wash water and rinse water from cleaning walls or pavement), before they run off a surface.
- Do not allow liquid wastes to flow or discharge uncontrolled. Use temporary dikes or berms to intercept flows and direct them to a containment area or device for capture.
- Use a sediment trap (SE-3, Sediment Trap) for capturing and treating sediment laden liquid waste or capture in a containment device and allow sediment to settle.

### ***Disposing of Liquid Wastes***

- A typical method to handle liquid waste is to dewater the contained liquid waste, using procedures such as described in NS-2, Dewatering Operations, and SE-2, Sediment Basin, and dispose of resulting solids per WM-5, Solid Waste Management.
- Methods of disposal for some liquid wastes may be prescribed in Water Quality Reports, NPDES permits, Environmental Impact Reports, 401 or 404 permits, and local agency discharge permits, etc. Review the SWPPP to see if disposal methods are identified.
- Liquid wastes, such as from dredged material, may require testing and certification whether it is hazardous or not before a disposal method can be determined.
- For disposal of hazardous waste, see WM-6, Hazardous Waste Management.
- If necessary, further treat liquid wastes prior to disposal. Treatment may include, though is not limited to, sedimentation, filtration, and chemical neutralization.

### **Costs**

Prevention costs for liquid waste management are minimal. Costs increase if cleanup or fines are involved.

### **Inspection and Maintenance**

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

# Liquid Waste Management

## WM-10

- Remove deposited solids in containment areas and capturing devices as needed and at the completion of the task. Dispose of any solids as described in WM-5, Solid Waste Management.
- Inspect containment areas and capturing devices and repair as needed.

### References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

## ***APPENDIX I: BMP INSPECTION FORM***

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## **BMP INSPECTION REPORT**

Date and Time of Inspection:		Date Report Written:		
Inspection Type: (Circle one)	Weekly <i>Complete Parts I, II, III and VII</i>	Pre-Storm <i>Complete Parts I, II, III, IV and VII</i>	During Rain Event <i>Complete Parts I, II, III, V, and VII</i>	Post-Storm <i>Complete Parts I, II, III, VI and VII</i>
<b>Part I. General Information</b>				
<b>Site Information</b>				
Construction Site Name: Addams Elementary School				
Construction stage and completed activities:			Approximate area of site that is exposed:	
Photos Taken: (Circle one)	Yes	No	Photo Reference IDs:	
<b>Weather</b>				
Estimate storm beginning: (date and time)		Estimate storm duration: (hours)		
Estimate time since last storm: (days or hours)		Rain gauge reading and location: (in)		
Is a "Qualifying Event" predicted or did one occur (i.e., 0.5" rain with 48-hrs or greater between events)? (Y/N) If yes, summarize forecast:				
Exemption Documentation (explanation required if inspection could not be conducted). Visual inspections are not required outside of business hours or during dangerous weather conditions such as flooding or electrical storms.				
<b>Inspector Information</b>				
Inspector Name:			Inspector Title:	
Signature:			Date:	

<b>Part II. BMP Observations. Describe deficiencies in Part III.</b>			
<b>Minimum BMPs for Risk Level 1 Sites</b>	<b>Failures or other short comings (yes, no, N/A)</b>	<b>Action Required (yes/no)</b>	<b>Action Implemented (Date)</b>
<b>Good Housekeeping for Construction Materials</b>			
Inventory of products (excluding materials designed to be outdoors)			
Stockpiled construction materials not actively in use are covered and bermed			
All chemicals are stored in watertight containers with appropriate secondary containment, or in a completely enclosed storage shed			
Construction materials are minimally exposed to precipitation			
BMPs preventing the off-site tracking of materials are implemented and properly effective			
<b>Good Housekeeping for Waste Management</b>			
Wash/rinse water and materials are prevented from being disposed into the storm drain system			
Portable toilets are contained to prevent discharges of waste			
Sanitation facilities are clean and with no apparent for leaks and spills			
Equipment is in place to cover waste disposal containers at the end of business day and during rain events			
Discharges from waste disposal containers are prevented from discharging to the storm drain system / receiving water			
Stockpiled waste material is securely protected from wind and rain if not actively in use			
Procedures are in place for addressing hazardous and non-hazardous spills			
Appropriate spill response personnel are assigned and trained			
Equipment and materials for cleanup of spills is available onsite			
Washout areas (e.g., concrete) are contained appropriately to prevent discharge or infiltration into the underlying soil			
<b>Good Housekeeping for Vehicle Storage and Maintenance</b>			
Measures are in place to prevent oil, grease, or fuel from leaking into the ground, storm drains, or surface waters			
All equipment or vehicles are fueled, maintained, and stored in a designated area with appropriate BMPs			
Vehicle and equipment leaks are cleaned immediately and disposed of properly			

<b>Part II. BMP Observations Continued. Describe deficiencies in Part III.</b>			
<b>Minimum BMPs for Risk Level 1 Sites</b>	<b>Adequately designed, implemented and effective (yes, no, N/A)</b>	<b>Action Required (yes/no)</b>	<b>Action Implemented (Date)</b>
<b>Good Housekeeping for Landscape Materials</b>			
Stockpiled landscape materials such as mulches and topsoil are contained and covered when not actively in use			
Erodible landscape material has not been applied 2 days before a forecasted rain event or during an event			
Erodible landscape materials are applied at quantities and rates in accordance with manufacturer recommendations			
Bagged erodible landscape materials are stored on pallets and covered			
<b>Good Housekeeping for Air Deposition of Site Materials</b>			
Good housekeeping measures are implemented onsite to control the air deposition of site materials and from site operations			
<b>Non-Stormwater Management</b>			
Non-Stormwater discharges are properly controlled			
Vehicles are washed in a manner to prevent non-stormwater discharges to surface waters or drainage systems			
Streets are cleaned in a manner to prevent unauthorized non-stormwater discharges to surface waters or drainage systems.			
<b>Erosion Controls</b>			
Wind erosion controls are effectively implemented			
Effective soil cover is provided for disturbed areas inactive (i.e., not scheduled to be disturbed for 14 days) as well as finished slopes, open space, utility backfill, and completed lots			
The use of plastic materials is limited in cases when a more sustainable, environmentally friendly alternative exists.			
<b>Sediment Controls</b>			
Perimeter controls are established and effective at controlling erosion and sediment discharges from the site			
Entrances and exits are stabilized to control erosion and sediment discharges from the site			
Sediment basins are properly maintained			
<b>Run-On and Run-Off Controls</b>			
Run-on to the site is effectively managed and directed away from all disturbed areas.			
<b>Other</b>			
Are the project SWPPP and BMP plan up to date, available on-site and being properly implemented?			

### Part III. Descriptions of BMP Deficiencies

Deficiency	Repairs Implemented: Note - Repairs must begin within 72 hours of identification and, complete repairs as soon as possible.	
	Start Date	Action
1.		
2.		
3.		
4.		

### Part IV. Additional Pre-Storm Observations. Note the presence or absence of floating and suspended materials, sheen, discoloration, turbidity, odors, and source(s) of pollutants(s).

	Yes, No, N/A
Do stormwater storage and containment areas have adequate freeboard? If no, complete Part III.	
Are drainage areas free of spills, leaks, or uncontrolled pollutant sources? If no, complete Part VII and describe below.	
Notes:	
Are stormwater storage and containment areas free of leaks? If no, complete Parts III and/or VII and describe below.	
Notes:	

**Part V. Additional During Storm Observations.** If BMPs cannot be inspected during inclement weather, list the results of visual inspections at all relevant outfalls, discharge points, and downstream locations. Note odors or visible sheen on the surface of discharges. Complete Part VII (Corrective Actions) as needed.

Outfall, Discharge Point, or Other Downstream Location

Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description

**Part VI. Additional Post-Storm Observations.** Visually observe (inspect) stormwater discharges at all discharge locations within two business days (48 hours) after each qualifying rain event, and observe (inspect) the discharge of stored or contained stormwater that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Complete Part VII (Corrective Actions) as needed.

Discharge Location, Storage or Containment Area	Visual Observation

Part VII. Additional Corrective Actions Required. Identify additional corrective actions not included with BMP Deficiencies (Part III) above. Note if SWPPP change is required.	
Required Actions	Implementation Date

## ***APPENDIX J: TRAINING REPORTING FORM***

---

# Trained Contractor Personnel Log

## Stormwater Management Training Log and Documentation

Project Name: Addams Elementary School

WDID #: \_\_\_\_\_

Stormwater Management Topic: (check as appropriate)

- |  |   |
|--|---|
| <input type="checkbox"/> Erosion Control           | <input type="checkbox"/> Sediment Control                                 |
| <input type="checkbox"/> Wind Erosion Control      | <input type="checkbox"/> Tracking Control                                 |
| <input type="checkbox"/> Non-Stormwater Management | <input type="checkbox"/> Waste Management and Materials Pollution Control |
| <input type="checkbox"/> Stormwater Sampling       |   |

Specific Training Objective: \_\_\_\_\_

Location: \_\_\_\_\_

Date: \_\_\_\_\_

Instructor: \_\_\_\_\_

Telephone: \_\_\_\_\_

Course Length (hours): \_\_\_\_\_

### Attendee Roster (Attach additional forms if necessary)

Name	Company	Phone

As needed, add proof of external training (e.g., course completion certificates, credentials for QSP, QSD).

## ***APPENDIX K: RESPONSIBLE PARTIES***

---

**Authorization of Approved Signatories**Project Name: Addams Elementary School

WDID #: \_\_\_\_\_

Name of Personnel	Project Role	Company	Signature	Date

\_\_\_\_\_  
LRP's Signature\_\_\_\_\_  
Date\_\_\_\_\_  
Derek Vendenoff\_\_\_\_\_  
(559) 457-3055\_\_\_\_\_  
LRP Name and Title\_\_\_\_\_  
Telephone Number

## Identification of QSP

Project Name: Addams Elementary School

WDID #: \_\_\_\_\_

The following are QSPs associated with this project

Name of Personnel <sup>(1)</sup>	Company	Date

(1) If additional QSPs are required on the job site add additional lines and include information here

**OPTIONAL****Authorization of Data Submitters**Project Name: Addams Elementary School

WDID #: \_\_\_\_\_

Name of Personnel	Project Role	Company	Signature	Date

\_\_\_\_\_  
 Approved Signatory's Signature

\_\_\_\_\_  
 Date

\_\_\_\_\_  
 Approved Signatory  
 Name and Title

\_\_\_\_\_  
 Telephone Number

## ***APPENDIX L: CONTRACTORS AND SUBCONTRACTORS***

## ***APPENDIX M: CONSTRUCTION GENERAL PERMIT***

---

The State Water Resources Control Board National Pollutant Discharge Elimination System (NPDES) Construction General Permit, 2009-0009-DWQ as amended by 2010-0014-DWQ can be found at the following web site:

[http://www.swrcb.ca.gov/water\\_issues/programs/stormwater/constpermits.shtml](http://www.swrcb.ca.gov/water_issues/programs/stormwater/constpermits.shtml)

Attachment C Risk Level 1 Requirements from the Construction General Permit are included in this appendix.

**APPENDIX 'B'**  
**INTERIOR COLOR SCHEDULE**

**Project:** Adams Elementary School - New Building and Modernizations  
**Client:** Fresno Unified School District  
**Location:** Fresno, CA

**Darden Project #1725**

## **APPENDIX "B": INTERIOR COLOR SCHEDULE AD2**

PENDING OWNER APPROVAL

### **SCHEDULES:**

#### **INTERIOR COLOR SCHEDULE 1**

**Building L  
Building M**

**Administration  
Kindergarten**

#### **INTERIOR COLOR SCHEDULE 2**

**Building B & Site  
Building P**

**Classroom Infill, Shade Canopy  
Portables (New & Existing)**

### **DRAWINGS:**

**ID-202**

**Bldg L - Accent Paint Locations**

**ID-203**

**Bldg L - Accent Paint Locations**

Project: Adams Elementary School - New Buildings and Modernizations  
 Client: Fresno Unified School District  
 Location: Fresno, CA

Darden Project #1725

## APPENDIX "B": INTERIOR COLOR SCHEDULE

PENDING OWNER APPROVAL

### SCHEDULE 1 - Buildings L, M

<u>MATERIAL</u>	<u>MANUFACTURER</u>	<u>REF #</u>	<u>DESCRIPTION</u>
<i>MODULAR CASEWORK</i>			
<b>Plastic Laminate</b>			
Countertop/Splash PL1 @ Bldg L <i>Note: Rm 101 Lobby only @ 1/2 wall cap.</i>	Wilsonart	7909-60	Fusion Maple
PL2 @ Bldgs L, M <i>Unless otherwise noted.</i>	Wilsonart	4651-60	Navy Legacy
Base Cabinet	Wilsonart	7909-60	Fusion Maple
Tall Cabinet	Wilsonart	7909-60	Fusion Maple
Door	Wilsonart	7909-60	Fusion Maple
Drawer	Wilsonart	7909-60	Fusion Maple
<i>CAST-IN-PLACE CONCRETE</i>			
<b>Concrete</b>			Clear Floor Sealer
<i>POLISHED CONCRETE</i>			
Color 1	Bomanite		Natural
<i>RESILIENT SHEET</i>			
<b>Sheet Vinyl</b> <i>Note: Weld rod to match</i>	Armstrong	88717	Corlon; Color: Otter Gray
<i>RESILIENT BASE AND ACCESSORIES</i>			
<b>Rubber Base</b> Color 1 <i>Unless Otherwise Noted</i>	Burke	217	Charcoal
<b>Transition Mouldings</b>	Burke	217	Charcoal
<i>RESINOUS FLOORING</i>			
<b>Resinous Floor</b>	Sherwin Williams	Ceramic Carpet #400	336 - Charcoal
<i>CARPET</i>			
<b>Carpet (Broadloom)</b> BL-1 <i>Unless Otherwise Noted</i>	Tandus	3026 - 23512	Aftermath II, Color: Tapestry

Project: Adams Elementary School - New Buildings and Modernizations  
 Client: Fresno Unified School District  
 Location: Fresno, CA

Darden Project #1725

## APPENDIX "B": INTERIOR COLOR SCHEDULE

PENDING OWNER APPROVAL

### SCHEDULE 1 - Buildings L, M

<u>MATERIAL</u>	<u>MANUFACTURER</u>	<u>REF #</u>	<u>DESCRIPTION</u>
<b>Walk-Off</b> WO-1	Tandus	02578 - 19100	Abrasive Action Color: Charcoal
<b>WALLCOVERINGS</b>			
<b>Fiberglass Reinforced Panels</b>	Nudo		Ivory
<b>Vinyl Covered Tackboard</b> Color 1 <i>Note: @ Bldgs M only.</i>	Chatfield Clarke		Off-White
Color 2 <i>Note: @ Bldg L Admin only.</i>	Koroseal	621-81	Muratone, Color: Aqua
<b>PAINT</b>			
<b>Gypsum Board</b> Color 1 <i>Unless otherwise noted.</i>	ICI		Match District standard Swiss Coffee
Color 2 <i>Refer to attached drawing ID-201 &amp; ID-202.</i>	ICI		Match building standard 'Blue'
<b>Metal Doors/Frames</b> Metal Doors Metal Frames <i>Unless Otherwise Noted.</i> <i>Exception: See note</i>	ICI ICI		Match building standard 'Blue' Match existing building standard Swiss Coffee
<b>Steel and Fabrications</b> Roof hatch and ladder	ICI		Match District Standard Swiss Coffee
<b>WOOD DOORS</b>			
<b>Doors</b>			Match Wilsonart 7909-60 Fusion Maple
<b>ROUGH CARPENTRY</b>			
<b>Plywood Panels</b>	ICI		Match District Standard Swiss Coffee
<b>MISCELLANEOUS SPECIALTIES</b>			
<b>Vertical Blinds</b>	Louverdrape	To be selected from manufacturers full range of colors	
<b>Toilet Partitions</b>	Bobrick		Desert Beige

Project: **Adams Elementary School - New Buildings and Modernizations**  
 Client: **Fresno Unified School District**  
 Location: **Fresno, CA**

**Darden Project #1725**

## **APPENDIX "B": INTERIOR COLOR SCHEDULE**

**PENDING OWNER APPROVAL**

### **SCHEDULE 1 - Buildings L, M**

<u>MATERIAL</u>	<u>MANUFACTURER</u>	<u>REF #</u>	<u>DESCRIPTION</u>
<i>VISUAL DISPLAY BOARDS</i>			
<b>Liquid Markerboard</b>	Claridge		White
<i>IDENTIFYING DEVICES</i>			
<b>Signage</b>	Gravograph	To be selected from manufacturers full range of colors	

### **GENERAL NOTES**

1. The intent of this schedule is to clarify and detail the color and patterns of finishes. All information regarding construction conditions, casework, framing and ceiling details, etc. shall be per Architectural plans, unless otherwise noted.
2. Interior Color Schedule to be used in conjunction with Architectural plans and Specifications.
3. Paint colors listed on Interior Color Schedule are for color reference only. Refer to Architectural Specifications and Finish Schedules for information regarding paint systems.
4. Change of paint color to occur on an inside corner, unless otherwise noted.
5. All gypsum board surfaces to be painted Color 1, unless otherwise noted.
6. All vision light frames in doors to match door color, unless otherwise noted.
7. All access doors and frames to be painted to match color of adjacent surface. If access doors and frames occur on vinyl covered tackboard, paint to be Color 1. Stainless steel access doors to remain factory finish.
8. All miscellaneous exposed to view metal and mechanical equipment, louvers, receiving a field finish to be painted to match color of adjacent surface.
9. All interior ladders and ladder assemblies receiving a field finish to be painted to match color of adjacent surface.
10. All exposed to view sheet metal to match color of adjacent material. If adjacent material is vinyl covered tackboard paint to be Color 1.
11. All accent paint, changes in paint color and extent of paint and accent paint to be verified by Darden Architects at job site prior to commencement of work.
12. Samples and site mock-up of each polished concrete color (Color1) must be provided to, and approved by Darden Architects prior to commencement of work.
13. Not used
14. All polished concrete to be Color 1, unless otherwise noted.
15. All Steel and Fab to be painted to match adjacent color, unless otherwise noted.
16. All modular casework edgebanding to match adjacent plastic laminate.
17. All gyp board ceilings to be Color 1, unless otherwise noted.
18. Paint colors listed for metal frames and doors are for **interior** locations and **interior** face of frames and doors only. Refer to **Exterior** Color Schedule for **interior/exterior** face of **exterior** doors and frames.
19. Verify all District standard paint colors and formulas with Owner prior to submittals.  
Match District Standard paint Swiss Coffee to newly painted Room P37 (Preschool Portable).

Project: Adams Elementary School - New Building and Modernizations  
 Client: Fresno Unified School District  
 Location: Fresno, CA

Darden Project #1725

## APPENDIX "B": INTERIOR COLOR SCHEDULE

PENDING OWNER APPROVAL

### SCHEDULE 2 - Buildings B, P

<u>MATERIAL</u>	<u>MANUFACTURER</u>	<u>REF #</u>	<u>DESCRIPTION</u>
<b>MODULAR CASEWORK</b>			
<b>Plastic Laminate</b>			
Counter Top	Wilsonart	4651-60	Navy Legacy
Base Cabinet	Wilsonart	7909-60	Fusion Maple
Tall Cabinet	Wilsonart	7909-60	Fusion Maple
<b>RESILIENT BASE AND ACCESSORIES</b>			
<b>Rubber Base</b>			
Color 1	Burke	217	Charcoal
<b>CARPET</b>			
<b>Carpet (Broadloom)</b>			
BL-1	Tandus	3026 - 23512	Aftermath II, Color: Tapestry
<i>Unless Otherwise Noted</i>			
<b>Walk-Off</b>			
WO-1	Tandus	02578 - 19100	Abrasive Action, Color: Charcoal
<b>WALLCOVERINGS</b>			
<b>Vinyl Covered Tackboard</b>			
Color 1	Chatfield Clarke		Off-White
<i>Note: Building P Portables only - vinyl covered tackboard to be painted Color 1.</i>			
<b>PAINT</b>			
<b>Gypsum Board</b>			
Color 1	ICI		Match existing District standard Swiss Coffee
<i>Unless otherwise noted.</i>			
<b>Metal Doors/Frames</b>			
Metal Doors	ICI		Match existing building standard "Blue"
Metal Frames	ICI		Match existing building standard "Blue"
<i>Unless Otherwise Noted</i>			
<b>MISCELLANEOUS SPECIALTIES</b>			
<b>Vertical Blinds</b>	Louverdrape	To be selected from manufacturers full range of colors	
<b>Toilet Partitions</b>	Bobrick	Desert Beige	

Project: **Adams Elementary School - New Building and Modernizations**  
 Client: **Fresno Unified School District**  
 Location: **Fresno, CA**

**Darden Project #1725**

## **APPENDIX "B": INTERIOR COLOR SCHEDULE**

**PENDING OWNER APPROVAL**

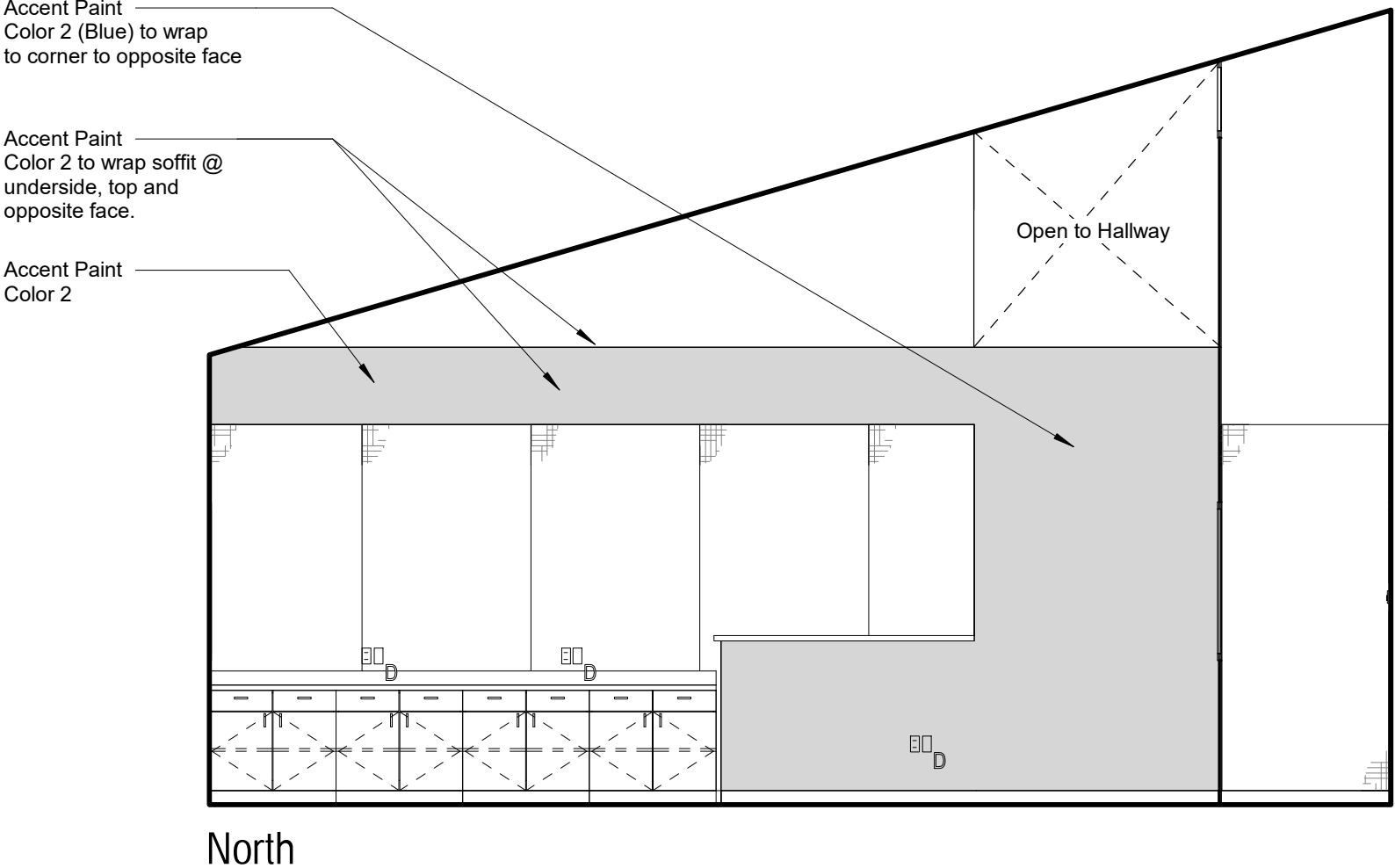
### **SCHEDULE 2 - Buildings B, P**

<u>MATERIAL</u>	<u>MANUFACTURER</u>	<u>REF #</u>	<u>DESCRIPTION</u>
<i>VISUAL DISPLAY BOARDS</i>			
<b>Liquid Markerboard</b>	Claridge		White
<i>IDENTIFYING DEVICES</i>			
<b>Signage</b>	Gravograph		To be selected from manufacturers full range of colors

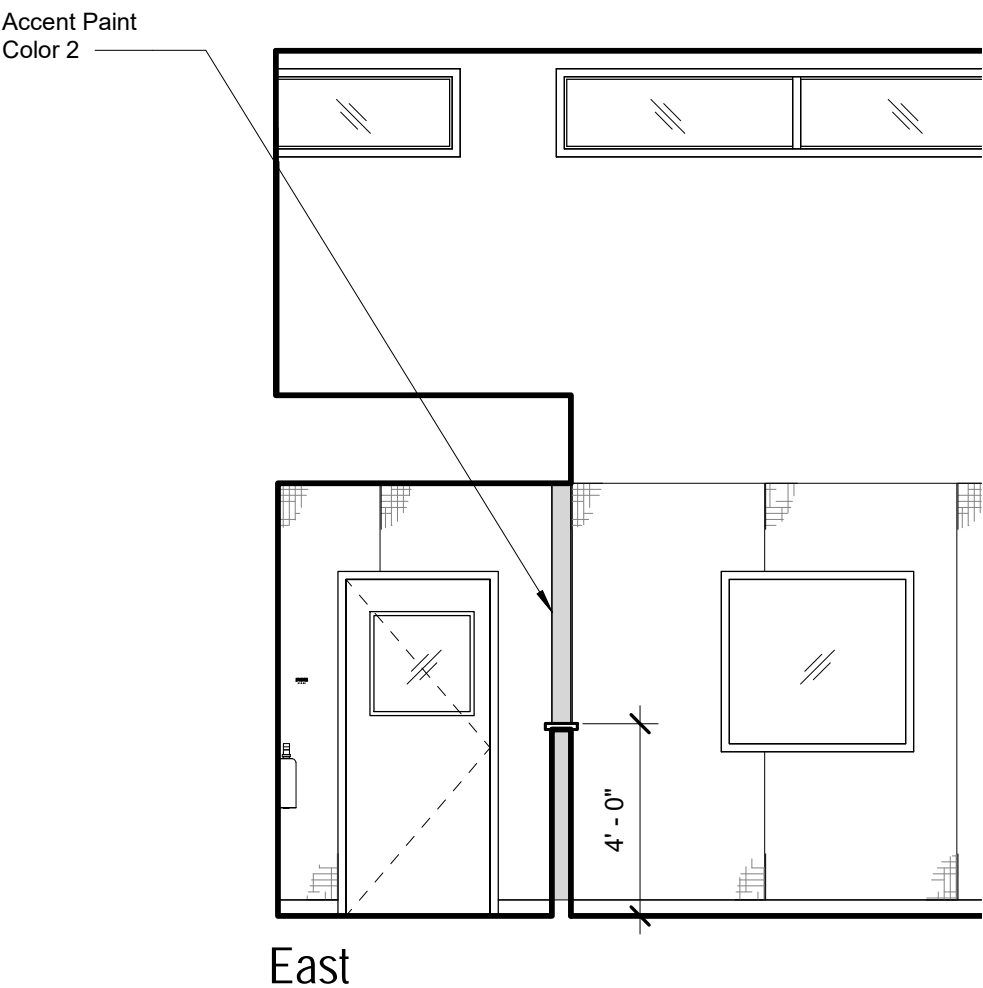
### **GENERAL NOTES**

1. The intent of this schedule is to clarify and detail the color and patterns of finishes. All information regarding construction conditions, casework, framing and ceiling details, etc. shall be per Architectural plans, unless otherwise noted.
2. Interior Color Schedule to be used in conjunction with Architectural plans and Specifications.
3. Paint colors listed on Interior Color Schedule are for color reference only. Refer to Architectural Specifications and Finish Schedules for information regarding paint systems.
4. Paint colors listed for metal frames and doors are for **interior** face of frames and doors only. Refer to **Exterior** Color Schedule for **exterior** face of doors and frames.
5. In classroom locations where patching occurs at tackboard, Match existing tackboard texture. All new and existing tackboard panels to be painted for consistent appearance.
6. Verify all District standard paint colors and formulas with Owner prior to submittals.  
Match District Standard paint Swiss Coffee to newly painted Room P37 (Preschool Portable).

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101 Lobby



DSA File No: 10-48  
DSA Appl No: 02-117220

Designed By:	AC	Project Number:	1725
Drawn By:	SS	Scale:	1/4" = 1'-0"
Checked By:	SS	Copyright 2018 Darden Architects	
Reviewed By:	TA	ID-201	
Date:	04/21/21		

-  
Bldg L-Lobby Accent Paint Location

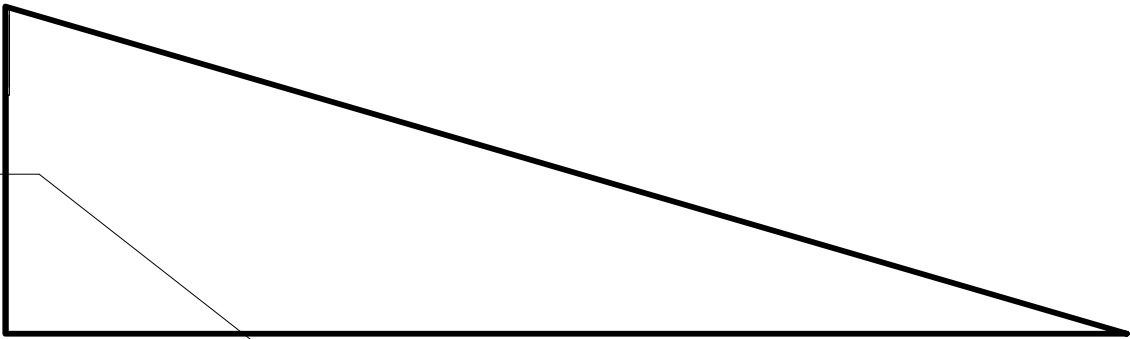
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and Modernization  
Fresno Unified School District



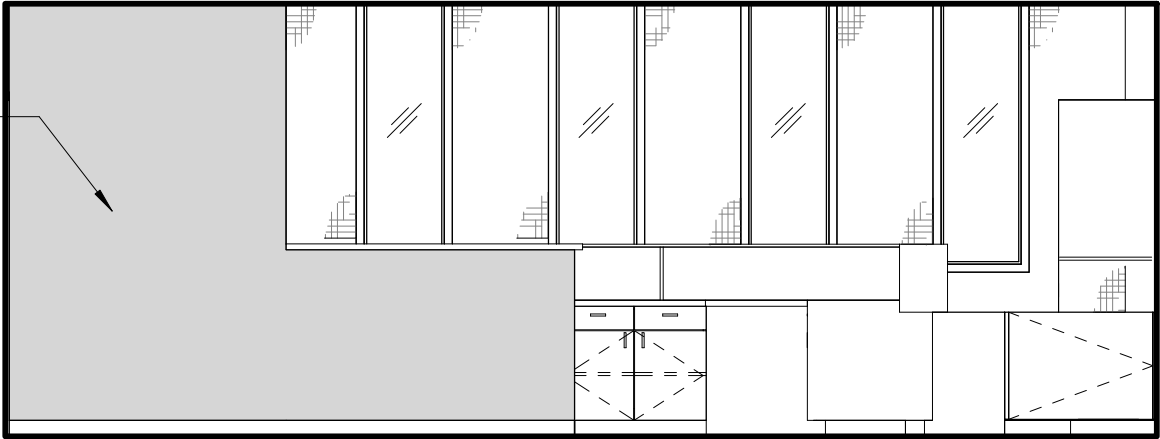
ARCHITECTURE · PLANNING · INTERIORS  
Robert L. Petithomme AIA · Antonio J. Avila AIA · DeDe Darnell ASID  
Grant E. Dodson AIA · Michael K. Fennacy AIA · Andrew A. Corral AIA  
Gerardo Padron · Leslie A. Rau IIDA · Martin A. Ilie · Mathew R. Heiss AIA  
Michael J. Nelson · Sean P. Mendoza AIA · William Brandle AIA  
6790 N. West Avenue · Fresno, California 93711 · 559 448-8051 · Fax 559 446-1765

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Accent Paint Color 2  
to wrap face of soffit



Accent Paint Color 2



South 2

DSA File No: 10-48  
DSA Appl No: 02-117220

-  
Bldg L-Lobby Accent Paint Locations 2

Addams Elementary School Building Additions  
and Modernization  
Fresno Unified School District



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6790 N. West Avenue · Fresno, California 93711 · 559 448-8051 · Fax 559 446-1765

Designed By:	SS	Project Number:	1725
Drawn By:	SS	Scale:	1/4" = 1'-0"
Checked By:	AC	Copyright 2018 Darden Architects	
Reviewed By:	TA	ID-202	
Date:	04/21/21		

**APPENDIX 'C'**  
**EXTERIOR COLOR SCHEDULE**

**Project:** Adams Elementary School - New Buildings and Modernization  
**Client:** Fresno Unified School District  
**Location:** Fresno, CA

**Darden Project #1725**

**APPENDIX "C": EXTERIOR COLOR SCHEDULE**

PENDING OWNER APPROVAL

---

**SCHEDULES:**

**EXTERIOR COLOR SCHEDULE 1**

**Building L  
Building M**

**Administration  
Kindergarten**

**EXTERIOR COLOR SCHEDULE 2**

**Building B  
Building P  
Shade Canopy**

**Classroom Infill  
Portables**

Project: Adams Elementary School - New Buildings and Modernization  
 Client: Fresno Unified School District  
 Location: Fresno, CA

Darden Project #1725

## APPENDIX "C": EXTERIOR COLOR SCHEDULE

PENDING OWNER APPROVAL

### SCHEDULE 1 - Buildings L, M

<u>MATERIAL</u>	<u>MANUFACTURER</u>	<u>REF #</u>	<u>DESCRIPTION</u>
CAST-IN-PLACE			
<b>Concrete Color</b>	--		Clear
CEMENT PLASTER			
<b>Cement Plaster</b>			
PC-1	ICI		Match existing building standard Charro
<i>Refer to Architectural Exterior Elevations for location of colors.</i>			
METAL PANELS			
<b>Metal Deck</b>			
MC-2	ICI		Match existing building standard Blue
PAINT			
<b>Steel and Fabrications</b>			
Downspouts:			
MC-1	ICI		Match existing building standard color Charro
<i>Unless otherwise noted.</i>			
Gutters:			
MC-2	ICI		Match existing building standard Blue
<i>Unless otherwise noted.</i>			
Entrance Canopy (Steel tube, angle)			
MC-2			Match existing building standard Blue
<b>Sheet Metal</b>			
Fascia Trim, Parapet Caps			
MC-2	ICI		Match existing building standard Blue
Panel @ Canopy			
MC-2	ICI		Match existing building standard Blue
<b>Metal Doors / Frames</b>			
Metal Doors:			
DC-1	ICI		Match existing building standard Blue
Metal Frames:			
MC-2	ICI		Match existing building standard Blue

Project: Adams Elementary School - New Buildings and Modernization  
Client: Fresno Unified School District  
Location: Fresno, CA

Darden Project #1725

## APPENDIX "C": EXTERIOR COLOR SCHEDULE

PENDING OWNER APPROVAL

### SCHEDULE 1 - Buildings L, M

<u>MATERIAL</u>	<u>MANUFACTURER</u>	<u>REF #</u>	<u>DESCRIPTION</u>
MISCELLANEOUS SPECIALTIES			
Dimensional Letters			Brushed Stainless Steel
SHINGLES			
Roof Shingles	Malarkey's		Legacy, color: Silverwood
Note: FUSD standard is Malarkey's Silverwood. Verify match at site and confirm with Owner.			
ACOUSTICAL CEILING			
Perforated Metal Panels			Match existing

### GENERAL NOTES:

1. Paint colors listed on Exterior Color Schedule are for color reference only. Refer to Architectural Specifications and Finish Schedules for type.
2. Change of color is to occur at control joints or an inside corner, unless otherwise noted.
3. Cement plaster accessories shall match primary color of adjacent material, unless otherwise noted. Cement plaster vents to remain unfinished.
4. Mechanical grille/louvers with factory baked enamel finish shall match primary color of adjacent surface, unless otherwise noted. Louvers located in doors shall match door color.
5. All miscellaneous visual architectural sheet metal and steel fabrications including, but not limited to, mechanical/ plumbing/ electrical equipment shall match color of adjacent material, unless otherwise noted.
6. Soffits shall match color of outer face wall, unless otherwise noted.
7. Paint colors listed for metal frames and doors are for *interior* and *exterior* face of **exterior** frames/doors only. Refer to *Interior* Color Schedule for interior locations and *Interior* face of **interior** doors and frames.
8. Verify all District standard paint colors and formulas with Owner prior to submittals.

Project: Adams Elementary School - New Buildings and Modernization  
 Client: Fresno Unified School District  
 Location: Fresno, CA

Darden Project #1725

## APPENDIX "C": EXTERIOR COLOR SCHEDULE

PENDING OWNER APPROVAL

### SCHEDULE 2 - Buildings B, P

<u>MATERIAL</u>	<u>MANUFACTURER</u>	<u>REF #</u>	<u>DESCRIPTION</u>
<i>CAST-IN-PLACE</i>			
<b>Concrete Color</b>			Clear
<i>CEMENT PLASTER</i>			
<b>Cement Plaster</b>			
PC-1	ICI		Match existing building standard
PC-2	ICI		Match existing building standard Blue
<i>Refer to Architectural Exterior Elevations for locations of colors.</i>			
<i>PORTABLES</i>			
<b>Wood Siding</b>			
PS-1	ICI		Match existing building standard
PS-2	ICI		Match existing building standard Blue
<i>Refer to Architectural Exterior Elevations for locations of colors.</i>			
<i>PAINT</i>			
<b>Steel and Fabrications</b>			
Downspouts:			
MC-1	ICI		Match existing building standard color Charro
Gutters:			
MC-2	ICI		Match existing building standard Blue
<i>Note: For Buildings B and P only. See "SHADE CANOPY" for associated downspouts and gutters.</i>			
Handrail:			Match existing building standard Blue
MC-2			
<b>Wood Trim</b>			
WD-2	ICI		Match existing building standard Blue
<b>Sheet Metal</b>			
Fascia Trim, Parapet & Roof Caps			
MC-2	ICI		Match existing building standard Blue
Flashing			
MC-1	ICI		Match existing building standard color Charro
<b>Metal Doors / Frames</b>			
Metal Doors:			
DC-1	ICI		Match existing building standard Blue

Project: Adams Elementary School - New Buildings and Modernization  
Client: Fresno Unified School District  
Location: Fresno, CA

Darden Project #1725

## APPENDIX "C": EXTERIOR COLOR SCHEDULE

PENDING OWNER APPROVAL

### SCHEDULE 2 - Buildings B, P

<u>MATERIAL</u>	<u>MANUFACTURER</u>	<u>REF #</u>	<u>DESCRIPTION</u>
Metal Frames: MC-2	ICI		Match existing building standard Blue

### SHADE CANOPY

#### METAL DECK

##### Roof Deck Canopy

MC-1			Match existing building standard Charro
------	--	--	---

#### METAL PANELS

##### Standing Seam

MC-3	Centria		
------	---------	--	--

**Note: Fascia trim to match MC-3.**

#### SHEET METAL

##### Gutters

MC-3			
------	--	--	--

#### PAINT

##### Steel & Fabrication Canopy Framing, Steel Beam, Tube, Column, Downspout)

MC-2			Match existing building standard Blue
------	--	--	---------------------------------------

#### MISCELLANEOUS SPECIALTIES

Dimensional Letters	Spanjger		Brushed Stainless Steel
---------------------	----------	--	-------------------------

### GENERAL NOTES:

1. Paint colors listed on Exterior Color Schedule are for color reference only. Refer to Architectural Specifications and Finish Schedules for type.
2. Change of color is to occur at control joints or an inside corner, unless otherwise noted.
3. Cement plaster accessories shall match primary color of adjacent material, unless otherwise noted.
4. Mechanical grille/louvers with factory baked enamel finish shall match primary color of adjacent surface, unless otherwise noted.
5. All miscellaneous visual architectural sheet metal and steel fabrications including, but not limited to, mechanical/ plumbing/ electrical equipment shall match color of adjacent material, unless otherwise noted.
6. Soffits shall match color of outer face wall, unless otherwise noted.
7. Paint colors listed for metal frames and doors are for *interior* /*exterior* face of **exterior** frames/doors only.
8. Verify all District standard paint colors and formulas with Owner prior to submittals.

**APPENDIX 'D'**  
**LIMITED ASBESTOS & LEAD SURVEY REPORT**



**November 16, 2018**

# Limited Asbestos and Lead Survey Report

**Addams Elementary School  
2117 W. McKinley Ave.  
Fresno, CA 93728**

Prepared for:

**Cecilia Castillo**  
**Fresno Unified School District**  
4600 N. Brawley Ave.  
Fresno, CA 93722  
559-457-6117 |  
cecilia.castillo@fresnounified.org

Prepared By:

**Joseph M. Vuglia, CAC, I/RA**  
**Forensic Analytical Consulting Services**  
371 E. Bullard Avenue, Suite 109  
Fresno, CA 93710  
559-436-0277 | jvuglia@forensicanalytical.com

FACS Project #PJ39403

# Contents

<b>List of Acronyms .....</b>	<b>1</b>
<b>Executive Summary .....</b>	<b>2</b>
<b>Introduction.....</b>	<b>4</b>
<b>Scope of Work .....</b>	<b>4</b>
<b>Site Characterization .....</b>	<b>4</b>
<b>Survey Methods .....</b>	<b>5</b>
<b>Findings and Recommendations .....</b>	<b>7</b>
<b>Limitations.....</b>	<b>9</b>

**Appendix A: Asbestos Sampling Summary, Asbestos Bulk Sample Chain-of-Custody and Laboratory Results Report**

**Appendix B: XRF Lead Testing Data, Lead Bulk Sample Chain-of-Custody, Laboratory Results Report, and CDPH Form 8552**

**Appendix C: Sample Location Drawings**

**Appendix D: Certifications of Personnel & Laboratories**

## List of Acronyms

ACCM	Asbestos Containing Construction Material
ACM	Asbestos Containing Material
AHERA	Asbestos Hazard Emergency Response Act
AIHA	American Industrial Hygiene Association
CAC	California - Certified Asbestos Consultant
Cal/OSHA	California Occupational Safety and Health Association
CCR	Code of California Regulations
CFR	Code of Federal Regulation
DOSH	Department of Occupational Safety and Health
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency (EPA)
FACS	Forensic Analytical Consulting Services, Inc.
FALI	Forensic Analytical Laboratories, Inc.
ND	None Detected
NESHAP	National Emissions Standard Hazardous Air Pollutants
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Science and Technology
NVLAP	National Voluntary Laboratory Accreditation Program
PLM	Polarized Light Microscopy
TEM	Transmission Electron Microscopy
TTLC	Total Threshold Limit Concentration

## Executive Summary

Hazard Management Services, a division of Forensic Analytical Consulting Services, Inc. (FACS) was retained by the Fresno Unified School District to perform a limited asbestos and lead paint survey of building materials in Building B and several portable classroom structures at Addams Elementary School, located at 2117 W. McKinley Avenue in Fresno, California. The survey was limited to suspect asbestos-containing materials and lead-containing paints or coatings which may be disturbed during renovation of Building B and relocation or demolition of 22 portable classrooms. A summary list of suspect asbestos-containing materials which were identified and sampled is included in Appendix A of this report. A table reporting lead-containing paints or coatings which were identified and tested is included in Appendix B of this report. The survey was performed between November 1 and November 5, 2018.

### Asbestos

No asbestos-containing materials were identified at Building B.

The following materials were identified as asbestos-containing at portable structures:

- Exterior sealant at the seam between the metal framing and the wood wall panels at the sides of PCR 378, PCR 423, PCR 542, PCR 560, PCR 649, and PCR 650.
- Exterior sealant at the vertical seam between the metal framing separating building segments at the front and back sides of PCR 375, PCR 542, PCR 560, PCR 649, and PCR 650.
- Mastic dabs at fastening bolts on the roofs of PCR 375, PCR 542, PCR 560, PCR 649, PCR 650, and PCR L16 (approximately 500 bolts per roof)

Any suspect materials not included in this inspection must be assumed to be asbestos-containing materials until tested and proven not to contain asbestos.

### Lead

Lead-based paints or coatings have lead content at or above 1.00 mg/cm<sup>2</sup>, 5,000 parts per million, or 0.5% by weight. The following paints or coatings were identified as lead-based:

- Tan paint at wood window frames and sills at the exterior of Building B (7.60 – 8.10 mg/cm<sup>2</sup>)
- Tan paint at metal windows at the exterior of Building B (4.00 mg/cm<sup>2</sup>)

In addition to the lead-based paints or coatings listed above, several components in restroom areas have lead content above the lead-based threshold:

- Porcelain sink in Men's Restroom at Building B (11.00 mg/cm<sup>2</sup>)

Lead was also detected in several other paints, coatings, or components at concentrations lower than lead-based. Detectable concentrations of lead were identified for the following items:

- Porcelain toilet in Men's and Nurse Restroom at Building B
- White paint at wood window components in Men's Restroom at Building B
- 6" Off-white ceramic wall tile in Nurse Restroom in Building B
- Brown paint at metal door frames at PCR 649 and PCR 650
- White and blue paint at metal doors at PCR 649 and PCR 650
- Tan paint at metal overhangs at PCR 649 and PCR 650
- Tan paint at metal downspouts at PCR 649 and PCR 650
- Blue paint at metal gutters and roof flashing at PCR 649 and PCR 650
- Blue paint at wood window trim at PCR 649 and PCR 650

- Blue paint at metal gutters and roof flashing at PCR 716
- White paint at metal doors at PCR 378 and PCR 423
- Brown paint at metal door frames at PCR 542
- Porcelain sinks and toilet at PCR 542
- Blue paint at metal doors at PCR L16
- Tan paint at wood walls at PCR L16
- Tan and blue paints at metal overhang at PCR L16
- Brown paint at metal doors at PCR L16
- White paint at metal doors and door frames at PCR L16
- Porcelain sink and toilet at PCR L16
- Blue paint at wood window trim at PCR 736, PCR 737, PCR 738, and PCR 739
- Tan paint at metal overhangs at PCR 736, PCR 737, PCR 738, and PCR 739
- Tan paint at metal HVAC housings at PCR 736, PCR 737, PCR 738, and PCR 739
- Tan paint at metal HVAC housing at PCR 375
- Tan paint at metal HVAC housing at PCR 560
- Tan paint at metal downspouts at PCR 560
- Tan paint at metal HVAC housing at PCR 940

Any untested paints or coatings not included in this inspection, or paints or coatings with unconfirmed 0.00 mg/cm<sup>2</sup> XRF test readings must be assumed to contain lead until tested and proven not to contain lead. 12 bulk paint chip samples were collected during the site assessment to verify XRF testing result; the following paints or coatings were found to not contain lead above the reporting limit for the samples analyzed, which can be considered “lead-free”:

- Blue paint at metal handrails
- Tan paint at wood exterior walls at PCR 375
- Blue paint at wood window trim at PCR 875
- Blue paint at wood door trim at PCR 1528
- Blue paint at metal door at PCR 1178
- Blue paint at metal door frames at PCR 649 and PCR 650
- Tan paint at metal downspouts at PCR 716
- Tan paint at wood exterior walls at PCR 316
- Tan paint at wood exterior walls at PCR 378
- Tan paint at exterior metal building frame and wood wall panels at PCR 542

FACS recommends that the results of this report be incorporated into any renovation plans provided for this project for informational purposes.

## Introduction

Hazard Management Services, a division of Forensic Analytical Consulting Services, Inc. (FACS) was retained by the Fresno Unified School District to perform a limited asbestos and lead paint survey of building materials in Building B and several portable classroom structures at Addams Elementary School, located at 2117 W. McKinley Avenue in Fresno, California. The survey was limited to suspect asbestos-containing materials and lead-containing paints or coatings which may be disturbed during renovation of Building B and relocation or demolition of 22 portable classrooms. A summary list of suspect asbestos-containing materials which were identified and sampled is included in Appendix A of this report. A table reporting lead-containing paints or coatings which were identified and tested is included in Appendix B of this report. The survey was performed between November 1 and November 5, 2018.

## Scope of Work

The purpose of this survey was to identify all asbestos-containing materials (ACMs) and lead-containing paints or coatings which may be disturbed as part of the renovation project impacting the administration areas at Building B, and relocation or demolition of portable classroom and restroom structures. The visual inspection, bulk sampling, XRF testing, and survey documentation were performed by Fred Tarazon and Jacob Sharp. Mr. Tarazon and Mr. Sharp are Department of Occupational Safety and Health (DOSH) Certified Site Surveillance Technicians (CSST # 16-5738 and CSST #16-5815), and California Department of Public Health (CDPH) Certified Lead Sampling Technicians (ST #27399 and ST #28717) working under the direction of Joseph Vuglia. Mr. Vuglia is a DOSH Certified Asbestos Consultant (CAC #13-5005) and CDPH Certified Lead Inspector / Risk Assessor (I/RA #22314), as required by California regulations. The scope of the survey and the services provided by FACS included:

- Review of architectural drawings showing extent of work in specified areas;
- Performing a visual inspection of the project areas to identify accessible suspect asbestos-containing materials (ACMs) that will be disturbed during the renovation project;
- Collection of bulk samples for asbestos analysis by polarized light microscopy (PLM);
- Testing of paints and coatings using an XRF analyzer to determine lead content;
- Ensuring the technical quality of all work by using Asbestos Hazard Emergency Response Act (AHERA) accredited Inspectors;
- Ensuring the technical quality of all work by using CDPH certified Lead Sampling Technicians and Inspector/Risk Assessors;
- Consolidating data and findings into a report format.

## Site Characterization

Addams Elementary School is a typical school site located in Fresno, California. Permanent buildings are single-story, wood-framed structures on concrete with stucco walls and wood roof decks with asphalt shingle roofing. Portable classrooms and restroom structures are typical portable structures comprised of metal-framed building segments with wood wall panels, wood floor substrates, and foamed-over metal roofs. The construction history of permanent building was unknown to the inspectors; construction history of portable structures was determined by examining manufacturer's tags on the structures and the District's portable classroom inventory list. The survey was limited to materials being disturbed at the

Building B areas as depicted on architectural drawings provided by the District, and interior and exterior materials at the designated 22 portable structures being relocated or demolished.

Suspect asbestos-containing materials observed in the Building B survey areas include the following:

- Concrete
- Vinyl floor tile and mastic
- Carpet and glue
- Ceramic tile grout
- Vinyl baseboards and mastic
- Tackboard and glue
- Fiber reinforced panels and glue
- Drywall walls and ceilings
- Plaster
- False ceiling panels
- Sealant at porcelain fixtures
- Sink undercoating
- Stucco
- Window putty

Suspect asbestos-containing materials observed in the portable structures include the following:

- Carpet and glue
- Vinyl sheet flooring and mastic
- Vinyl baseboards and mastic
- Tackboard and glue
- Fiber reinforced panels and glue
- Drywall walls
- False ceiling panels
- Sealant at porcelain fixtures
- Sink undercoating
- Exterior sealants
- Roof mastic

Materials suspect for containing lead include all paints and coatings on project area surfaces, and also ceramic floor and wall tile, and porcelain items including drinking fountains, sinks, toilets, and urinals.

## Survey Methods

### Document Review

Architectural drawings produced and provided by Darden Architects were reviewed prior to conducting the survey to ascertain the extent of work involved in the Building B project areas. Reference documents, including the District's portable classroom inventory list, were reviewed to determine manufacturers and construction dates of portable structures; portable classroom information was verified on site during the survey.

### Visual Inspection

Accessible building materials were visually inspected using the methods presented in the Federal AHERA regulations (40 CFR, Part 763). AHERA is required to be used for inspections of K-12 schools and is generally accepted as the industry standard for all ACM inspections regardless of structure or

facility type. Suspect ACMs were also physically assessed for friability, condition and possible disturbance factors.

All specified areas were accessible during this inspection. Other interior materials and exterior materials found in other areas at this site are not expected to be disturbed by the planned renovation and were not included in this survey.

## Asbestos Inspection

### Bulk Sample Collection

Bulk samples of identified homogeneous materials were collected in building areas that may be impacted by the planned renovation/demolition activities. Samples were collected of each separate homogeneous area (material). A homogeneous area (material) is defined as a surfacing material, thermal system insulation, or miscellaneous material that is uniform in use, color and texture. Examples of homogeneous areas could include:

- Vinyl floor tiles
- False ceiling panels
- Drywall with joint compound
- Vinyl sheet flooring

The specific number of samples collected was determined by using the methods required by the Federal AHERA regulations (40 CFR, Part 763.86) as noted below:

- 1) For Surfacing Material:
  - 1,000 ft<sup>2</sup> or less - collect 3 samples
  - 1,001 to 5,000 ft<sup>2</sup> - collect 5 samples
  - 5,001 ft<sup>2</sup> or greater - collect 7 samples
- 2) For Thermal System Insulation:
  - "In a randomly distributed manner" - collect 3 samples
  - 6 linear feet of patching or less - collect 1 sample
  - Cementitious pipe fittings - "In a manner sufficient to determine"
- 3) For all Miscellaneous Material:
  - Collect samples "In a manner sufficient to determine whether material is ACM (asbestos-containing material) or not ACM..."

The suspect ACMs were sampled using a knife, chisel, scraper, drill or other similar coring device suitable to the type of material sampled to cut through its entire thickness and to ensure that a cross-section of the material was obtained. The material was then placed in an appropriately labeled container that was sealed and submitted to Forensic Analytical Laboratories, Inc. for analysis. A unique sample number (e.g. PJ39403-01A) was assigned to each sample.

Bulk samples will be retained by the laboratory for one month unless otherwise instructed. After this period, the samples will be disposed of appropriately.

### Bulk Sample Analysis

A total of one hundred and sixty-five (165) bulk samples were collected during this survey. Bulk samples were analyzed by Forensic Analytical Laboratories, Inc. (FALI) in Hayward, California. FALI is accredited by the California Department of Public Health (CDPH) Environmental Laboratory Accreditation Program (ELAP) and the National Institute of Science and Technology's (NIST) National Voluntary Laboratory

Accreditation Program (NVLAP). FALI participates in the National Institute for Occupational Safety and Health (NIOSH) Proficiency Analytical Testing Program and has substantial experience in the analysis of asbestos.

All samples were analyzed using Polarized Light Microscopy with Dispersion Staining (PLM/DS) techniques in accordance with the methodology approved by the U.S. Environmental Protection Agency (EPA). The percentage of asbestos present in the samples was determined on the basis of a visual area estimation. The EPA defines asbestos-containing materials (ACM) as any material containing more than one percent (1%) asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy (PLM). 40 CFR Part 763 identifies the lower limit of reliable quantification for asbestos using the PLM method as approximately one percent (1%) by volume. Regulations in California (CAL/OSHA Title 8 CCR 1529) define asbestos-containing construction materials (ACCM) as those materials having asbestos content of greater than one tenth of one percent ( $> 0.1\%$ ). Therefore, for the purpose of this survey, any amount of asbestos detected will be considered positive. In addition to the percentages, the types of asbestos minerals are also reported. The PLM method is the standard method used to analyze asbestos bulk samples.

When "None Detected" (ND) appears in the laboratory results, it should be interpreted as meaning asbestos was not observed in the sample material.

### Lead Inspection

The client-defined lead inspection was conducted in accordance with the CDPH Lead-Related Construction Program and modeled upon the sampling protocol described in "Chapter 7: Lead Based Paint Inspection" of the HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing (1997 Revision.)

Cal/OSHA, in Title 8 California Code of Regulations (CCR) Section 1532.1, Lead in Construction Standard which implements California Labor Code 8716-6717, regulates all construction work where an employee may be occupationally exposed to lead. Paint or materials with any detectable level of lead is considered lead-containing by Cal/OSHA.

For purposes of this report, materials containing lead shall be defined as materials that XRF testing has determined contain a lead content at or above  $0.01 \text{ mg/cm}^2$ , or  $0.00 \text{ mg/cm}^2$  readings which have not been confirmed with laboratory analysis of bulk samples.

Construction work impacting materials with detectable levels of lead is subject to Cal/OSHA requirements. Construction activities, sometimes referred to as trigger tasks, impacting materials containing any amount of lead require an initial exposure assessment. Trigger tasks are defined in Cal/OSHA 1532.1, section (d) (2) and include but are not limited to such tasks as: manual demolition, manual scraping, manual sanding, lead burning, abrasive blasting, welding, cutting, and torch burning.

### XRF Testing Methodology

Surfaces and components were surveyed for lead content utilizing a portable X-ray fluorescence (XRF) analyzer, Niton Model 300 XLp, serial number 22263. The XRF analyzer contains a radioactive cadmium source which bombards tested surfaces with X-rays and gamma rays. This external energy source excites any lead atoms within the tested paint or coating, causing their atoms to emit X-ray photons with a characteristic energy profile. The instrument analyzes the emitted energy to identify and quantify the amount of lead in the tested paint or coating, with lead content reported in milligrams per square centimeter.

Testing combinations of homogeneous components in one area are representative of similar components found in other areas. During this survey, the inspectors visually identified the painted or

coated component to test, an XRF reading was collected, and the reading was documented in the XRF data table contained in Appendix B. For each test reading, the data table identifies the room equivalent/space designation, the tested component name, the substrate material, the sample location, paint/coating color, condition assessment, and the XRF result expressed as lead content by weight in milligrams per square centimeter.

## Findings and Recommendations

FACS' survey was limited to building materials associated with the specified restrooms. The following results were found regarding asbestos-containing materials and lead-containing paints, coatings or components in these restrooms:

### Asbestos

None of the suspect materials identified in the Building B project areas included in this survey were found to be asbestos-containing materials.

The following materials have been identified as asbestos-containing at portable classroom and restroom structures:

- Exterior sealant at the seam between the metal framing and the wood wall panels at the sides of PCR 378, PCR 423, PCR 542, PCR 560, PCR 649, and PCR 650.
- Exterior sealant at the vertical seam between the metal framing separating building segments at the front and back sides of PCR 375, PCR 542, PCR 560, PCR 649, and PCR 650.
- Mastic dabs at fastening bolts on the roofs of PCR 375, PCR 542, PCR 560, PCR 649, PCR 650, and PCR L16 (approximately 500 bolts per roof)

Demolitions or renovations impacting building materials included in this inspection are regulated by the EPA National Emission Standards for Hazardous Air Pollutants (NESHAP). In order to comply with NESHAP, an asbestos notification must be submitted to the San Joaquin Valley Air Pollution Control District (SJVAPCD), along with renovation/demolition permit release and a copy of this survey.

If any concealed suspect materials are discovered or if any other suspect materials are present which were not included in this report, they must be presumed to be asbestos-containing materials until such time as they are tested and proven not to contain asbestos.

Asbestos-containing materials identified at portable structures which will be impacted by renovation work or demolition of the structures must be removed by a contractor with the proper Contractor State Licensing Board license for the work to be performed and Division of Occupational Safety and Health registration for asbestos work. For portable structures being relocated, only the asbestos-containing materials to be disturbed during separation of building segments need be removed. Workers impacting asbestos must have the required training and AHERA-accreditation as an asbestos worker or supervisor, with at least one worker trained and accredited as a supervisor.

### Lead

Detectable concentrations of lead were identified in several of the paints, coatings and components which will be impacted during the project, and this project is thus regulated by Cal/OSHA (8 CCR 1532.1). Some paints, coatings or components in project areas were found to have high concentrations of lead, above the 1.00 mg/cm<sup>2</sup> lead-based threshold.

A contractor who has employees that may be occupationally exposed to lead during this project must perform an initial determination regarding worker exposures to lead, which may be based on personal air monitoring at the start of the project, prior employee monitoring from the past 12 months under workplace conditions closely resembling the current project, or objective data demonstrating that exposures will not exceed the Cal/OSHA action level (30 micrograms per cubic meter of air). It is the contractor's responsibility to conduct their initial determination and comply with any relevant Cal/OSHA requirements.

Workers disturbing lead during this project must have lead awareness or action level training depending on the initial exposure determination and lead-safe work practices must be used. Disturbance of lead-containing paints or coatings must be performed within a contained area to prevent the spread and build-up of lead dust in order to comply with CDPH requirements. HEPA vacuums, dustless tools or shrouds, and/or intact removal of components should be employed to minimize lead dust generation and properly cleanup work areas following disturbance to lead-containing materials during this project. Waste generated during disturbance to lead-containing materials must be profiled in a hazardous waste determination to ascertain proper disposal requirements.

If the initial determination or initial exposure monitoring shows that workers impacting lead can be expected to be or are shown to be exposed to lead above the Cal/OSHA permissible exposure level (50 micrograms per cubic meter of air) workers and supervisors must have the requisite training and CDPH lead worker or supervisor certification.

#### EPA Renovation, Repair and Painting Rule

The EPA's Renovation, Repair, and Painting (RRP) rule applies to disturbance of lead-based paints at child-occupied facilities constructed before 1978. In the context of the RRP rule, child-occupied facility is defined as visited by the same child under the age of 6 on two or more days per week for at least 3 hours per visit with a cumulative annual total of 60 hours. Lead-based paint was identified at Building B window components. Building B was constructed in 1948, and the site is an elementary school which has the potential for this structure to be classified as a child-occupied facility. It is FACS recommendation to treat the removal of the windows, as referenced on the supplied architectural drawings, as covered under the RRP rule.

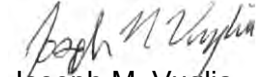
The RRP rule requires that contracting firms must have EPA RRP firm certification. RRP firm certification is required for the general contractor, regardless of whether their workers disturb the lead-based paint, and the sub-contractors(s) who will perform the actual lead-based paint disturbance. In addition, the lead-based paint disturbance must be supervised by a worker with training and certification under the RRP rule as a Certified Renovator; other workers disturbing lead-based paint need informal training regarding the RRP rule and its requirements, which the Certified Renovator can provide. The RRP rule also requires containment of lead work areas, lead-safe work practices, and proper clean-up following the work, including cleaning verification wipe sampling.

## Limitations

This investigation is limited to the conditions and practices observed and information made available to FACS. The methods, conclusions and recommendations provided are based on FACS' judgment, expertise and the standard of practice for professional service. They are subject to the limitations and variability inherent in the methodology employed. As with all environmental investigations, this investigation is limited to the defined scope and does not purport to set forth all hazards, nor indicate that other hazards do not exist.

Please do not hesitate to contact our office at 559-436-0277 with any questions or concerns. Thank you for the opportunity to assist Fresno Unified School District with promoting worker, staff and student safety and a healthy environment.

Respectfully,  
FORENSIC ANALYTICAL



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## **Appendix A**

# **Asbestos Sampling Summary, Asbestos Bulk Sample Chain of Custody and Laboratory Results Report**



<b>Asbestos Survey Summary (Lab Report # B268328)</b> <b>Addams Elementary School, 2117 W. McKinley Ave., Fresno, California</b> <b>Survey Date: November 1-5, 2018</b>						
<b>Sample Numbers</b>	<b>Material Description</b>	<b>Location(s) of Material</b>	<b>Material Number</b>	<b>Asbestos Content (percent)</b>	<b>Asbestos NESHAP Category</b>	<b>Approximate Quantity</b>
01A	16" Vinyl floor tile (white & blue) & mastic	Building B: Administration, Nurse	1	None detected in tile None detected in mastic	N/A	N/A
02A	6" Vinyl baseboard (off-white) & mastic	Building B: Administration	2	None detected in baseboard None detected in mastic	N/A	N/A
03A	Tackboard & glue	Building B: Administration, Principal, Vice-Principal 1, Vice-Principal 2, Home School	3	None detected in tackboard None detected in glue	N/A	N/A
04A	2'x2' False ceiling panel (small fissure & pinhole)	Building B: Administration, Principal, Vice-Principal 1, Vice-Principal 2, Work Room, Hallway, Home School	4	None detected in ceiling panel None detected in paint	N/A	N/A
05A, 05B	Carpet (grey/blue) & mastic, with floor filler	Building B: Administration, Principal, Vice-Principal 1, Vice-Principal 2, Home School, Work Area, Hallway, Storage	5	None detected in carpet None detected in glue None detected in floor filler	N/A	N/A
06A	4" Carpet baseboard (grey/blue)	Building B: Administration, Vice-Principal 2, Home School, Storage	6	None detected in carpet	N/A	N/A
07A	8" Carpet baseboard (grey/blue) & mastic	Building B: Principal, Vice-Principal 1, Work Area, Hallway	7	None detected in carpet None detected in mastic None detected in paint	N/A	N/A
08A, 08B	Drywall (smooth)	Building B: Administration, Principal, Vice-Principal 1, Vice-Principal 2, Home School, Storage	8	None detected in drywall None detected in joint compound None detected in tape None detected in texture None detected in paint	N/A	N/A

<b>Asbestos Survey Summary (Lab Report # B268328)</b> <b>Addams Elementary School, 2117 W. McKinley Ave., Fresno, California</b> <b>Survey Date: November 1-5, 2018</b>						
Sample Numbers	Material Description	Location(s) of Material	Material Number	Asbestos Content (percent)	Asbestos NESHAP Category	Approximate Quantity
09A, 09B, 09C	Plaster (sanded)	Building B: Nurse, Hallway, Storage, Work Room, Unisex Restroom, Women's Restroom	9	None detected in plaster None detected in paint	N/A	N/A
10A	Concrete	Building B: Unisex Restroom, Women's Restroom	10	None detected in concrete	N/A	N/A
11A	Fiber reinforced panel & glue	Building B: Nurse Restroom, Unisex Restroom, Women's Restroom	11	None detected in panel None detected in glue	N/A	N/A
12A, 12B	Drywall (smooth)	Building B: Unisex Restroom, Women's Restroom	12	None detected in drywall None detected in joint compound None detected in paint	N/A	N/A
13A	Sealant (white) at sink	Building B: Unisex Restroom	13	None detected in sealant	N/A	N/A
14A	Grout at toilet	Building B: Unisex Restroom	14	None detected in grout	N/A	N/A
15A	Sealant (white) at sink	Building B: Nurse Restroom, Women's Restroom	15	None detected in sealant	N/A	N/A
16A	Sealant (white) at toilet	Building B: Nurse Restroom, Women's Restroom	16	None detected in sealant	N/A	N/A
17A, 17B, 17C	Plaster (smooth)	Building B: Nurse, Nurse Restroom, Work Area	17	None detected in drywall None detected in plaster None detected in paint	N/A	N/A
18A	4" Vinyl baseboard (cream) & mastic	Building B: Nurse	18	None detected in baseboard None detected in mastic	N/A	N/A
19A	2" Ceramic floor tile (grey) grout	Building B: Nurse Restroom	19	None detected in grout	N/A	N/A
20A	4" Ceramic wall tile (beige) grout	Building B: Nurse Restroom	20	None detected in grout	N/A	N/A

<b>Asbestos Survey Summary (Lab Report # B268328)</b> <b>Addams Elementary School, 2117 W. McKinley Ave., Fresno, California</b> <b>Survey Date: November 1-5, 2018</b>						
Sample Numbers	Material Description	Location(s) of Material	Material Number	Asbestos Content (percent)	Asbestos NESHAP Category	Approximate Quantity
21A	Sink undercoating (black)	Building B: Hallway	21	None detected in coating	N/A	N/A
22A	Stucco	Building B: Exterior	22	None detected in grey stucco None detected in white stucco None detected in paint	N/A	N/A
23A	Window Putty	Building B: Exterior	23	None detected in putty None detected in paint	N/A	N/A
24A	Carpet (brown) & glue	PCR 736, PCR 737, PCR 738, PCR 739	24	None detected in carpet None detected in glue	N/A	N/A
25A	4" Vinyl baseboard (brown) & mastic	PCR 736, PCR 737, PCR 738, PCR 739	25	None detected in baseboard None detected in mastic	N/A	N/A
26A, 26B	Tackboard & glue on drywall	PCR 736, PCR 737, PCR 738, PCR 739	26	None detected in drywall None detected in tackboard None detected in glue	N/A	N/A
27A	2'x4' False ceiling panel (fiberglass)	PCR 736, PCR 737, PCR 738, PCR 739	27	None detected in fiberglass panel None detected in vinyl cover	N/A	N/A
28A	Carpet (purple) & glue	PCR 940	28	None detected in carpet None detected in glue	N/A	N/A
29A	4" Vinyl baseboard (green) & mastic	PCR 940	29	None detected in baseboard None detected in mastic	N/A	N/A
30A, 30B	Tackboard & glue on drywall	PCR 940	30	None detected in drywall None detected in tackboard None detected in glue	N/A	N/A
31A	2'x4' False ceiling panel (fiberglass)	PCR 940	31	None detected in fiberglass panel None detected in vinyl cover	N/A	N/A
32A	Sink undercoating (black)	PCR 940	32	None detected in coating	N/A	N/A
33A	Carpet (purple) & glue	PCR 560	33	None detected in carpet None detected in glue	N/A	N/A
34A	4" Vinyl baseboard (green) & mastic	PCR 560	34	None detected in baseboard None detected in mastic	N/A	N/A
35A, 35B	Tackboard & glue on drywall	PCR 560	35	None detected in drywall None detected in tackboard None detected in glue	N/A	N/A

<b>Asbestos Survey Summary (Lab Report # B268328)</b> <b>Addams Elementary School, 2117 W. McKinley Ave., Fresno, California</b> <b>Survey Date: November 1-5, 2018</b>						
<b>Sample Numbers</b>	<b>Material Description</b>	<b>Location(s) of Material</b>	<b>Material Number</b>	<b>Asbestos Content (percent)</b>	<b>Asbestos NESHAP Category</b>	<b>Approximate Quantity</b>
36A	2'x4' False ceiling panel (fiberglass)	PCR 560	36	None detected in fiberglass panel None detected in vinyl cover	N/A	N/A
37A	Sink undercoating (black)	PCR 560	37	None detected in coating	N/A	N/A
38A	Carpet (purple) & glue	PCR 375	38	None detected in carpet None detected in glue	N/A	N/A
39A	4" Vinyl baseboard (green) & mastic	PCR 375	39	None detected in baseboard None detected in mastic	N/A	N/A
40A, 40B	Tackboard & glue on drywall	PCR 375	40	None detected in drywall None detected in tackboard None detected in glue	N/A	N/A
41A	2'x4' False ceiling panel (fissure & pinhole)	PCR 375	41	None detected in ceiling panel None detected in paint	N/A	N/A
42A	Sink undercoating (black)	PCR 375	42	None detected in coating	N/A	N/A
43A	Carpet (purple) & glue	PCR 875	43	None detected in carpet None detected in glue	N/A	N/A
44A	4" Vinyl baseboard (green) & mastic	PCR 875	44	None detected in baseboard None detected in mastic	N/A	N/A
45A, 45B	Tackboard & glue on drywall	PCR 875	45	None detected in drywall None detected in tackboard None detected in glue	N/A	N/A
46A	2'x4' False ceiling panel (fiberglass)	PCR 875	46	None detected in fiberglass panel None detected in vinyl cover	N/A	N/A
47A	Sink undercoating (black)	PCR 875	47	None detected in coating	N/A	N/A
48A	Vinyl sheet flooring (blue pebble) & mastic	PCR 1528: Men's Restroom, Women's Restroom	48	None detected in vinyl None detected in fibrous backing None detected in backing layer None detected in mastic	N/A	N/A
49A	6" Vinyl baseboard (black) & mastic	PCR 1528: Men's Restroom, Women's Restroom	49	None detected in baseboard None detected in mastic	N/A	N/A

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<b>Sample Numbers</b>	<b>Material Description</b>	<b>Location(s) of Material</b>	<b>Material Number</b>	<b>Asbestos Content (percent)</b>	<b>Asbestos NESHAP Category</b>	<b>Approximate Quantity</b>
50A, 50B	Fiber reinforced panel & glue on drywall	PCR 1528: Men's Restroom, Women's Restroom	50	None detected in drywall None detected in panel None detected in glue	N/A	N/A
51A	2'x4' False ceiling panel (microdots)	PCR 1528: Men's Restroom, Women's Restroom	51	None detected in ceiling panel None detected in paint	N/A	N/A
52A	Sealant (white, at sinks, toilets, urinals)	PCR 1528: Men's Restroom, Women's Restroom	52	None detected in sealant	N/A	N/A
53A	Carpet (grey) & glue	PCR 1176, PCR 1177, PCR 1178, PCR 1179, PCR 1180	53	None detected in carpet None detected in glue	N/A	N/A
54A	4" Vinyl baseboard (grey) & mastic	PCR 1176, PCR 1177, PCR 1178, PCR 1179, PCR 1180	54	None detected in baseboard None detected in mastic	N/A	N/A
55A, 55B	Tackboard & glue on drywall	PCR 1176, PCR 1177, PCR 1178, PCR 1179, PCR 1180	55	None detected in drywall None detected in tackboard None detected in glue	N/A	N/A
56A	2'x4' False ceiling panel (fiberglass)	PCR 1176, PCR 1177, PCR 1178, PCR 1179, PCR 1180	56	None detected in fiberglass panel None detected in vinyl cover	N/A	N/A
57A	Sink undercoating (black)	PCR 1176, PCR 1177, PCR 1178, PCR 1179, PCR 1180	57	None detected in coating	N/A	N/A
58A	Carpet (brown) & glue	PCR 716	58	None detected in carpet None detected in glue	N/A	N/A
59A	4" Vinyl baseboard (brown) & mastic	PCR 716	59	None detected in baseboard None detected in mastic	N/A	N/A
60A, 60B	Tackboard & glue on drywall	PCR 716	60	None detected in drywall None detected in tackboard None detected in glue	N/A	N/A
61A	2'x4' False ceiling panel (fiberglass)	PCR 716	61	None detected in fiberglass panel None detected in vinyl cover	N/A	N/A

<b>Asbestos Survey Summary (Lab Report # B268328)</b> <b>Addams Elementary School, 2117 W. McKinley Ave., Fresno, California</b> <b>Survey Date: November 1-5, 2018</b>						
<b>Sample Numbers</b>	<b>Material Description</b>	<b>Location(s) of Material</b>	<b>Material Number</b>	<b>Asbestos Content (percent)</b>	<b>Asbestos NESHAP Category</b>	<b>Approximate Quantity</b>
62A	Sink undercoating (black)	PCR 716	62	None detected in coating	N/A	N/A
63A	Carpet (brown) & glue	PCR 649, PCR 650	63	None detected in carpet None detected in glue	N/A	N/A
64A	4" Vinyl baseboard (brown) & mastic	PCR 649, PCR 650	64	None detected in baseboard None detected in mastic	N/A	N/A
65A	Tackboard & glue on drywall	PCR 649, PCR 650	65	None detected in drywall None detected in tackboard None detected in glue	N/A	N/A
66A	2'x4' False ceiling panel (fiberglass)	PCR 649, PCR 650	66	None detected in fiberglass panel None detected in vinyl cover	N/A	N/A
67A	Sink undercoating (black)	PCR 649, PCR 650	67	None detected in coating	N/A	N/A
68A	Carpet (green) & glue	PCR 316	68	None detected in carpet None detected in glue None detected in floor filler	N/A	N/A
69A	4" Vinyl baseboard (green) & mastic	PCR 316	69	None detected in baseboard None detected in mastic	N/A	N/A
70A	Tackboard & glue on drywall	PCR 316	70	None detected in drywall None detected in tackboard None detected in glue	N/A	N/A
71A	2'x4' False ceiling panel (heavy texture)	PCR 316	71	None detected in ceiling panel None detected in paint	N/A	N/A
72A	Sink undercoating (black)	PCR 316	72	None detected in coating	N/A	N/A
73A	Carpet (green) & glue	PCR 378	73	None detected in carpet None detected in glue	N/A	N/A
74A	4" Vinyl baseboard (green) & mastic	PCR 378	74	None detected in baseboard None detected in mastic	N/A	N/A
75A, 75B	Tackboard & glue on drywall	PCR 378, PCR 423	75	None detected in drywall None detected in tackboard None detected in glue	N/A	N/A
76A	2'x4' False ceiling panel (heavy texture)	PCR 378, PCR 423	76	None detected in fiberglass panel None detected in vinyl cover	N/A	N/A
77A	Sink undercoating (black)	PCR 378, PCR 423	77	None detected in coating	N/A	N/A

<b>Asbestos Survey Summary (Lab Report # B268328)</b> <b>Addams Elementary School, 2117 W. McKinley Ave., Fresno, California</b> <b>Survey Date: November 1-5, 2018</b>						
<b>Sample Numbers</b>	<b>Material Description</b>	<b>Location(s) of Material</b>	<b>Material Number</b>	<b>Asbestos Content (percent)</b>	<b>Asbestos NESHAP Category</b>	<b>Approximate Quantity</b>
78A	Carpet (brown) & mastic	PCR 423	78	None detected in carpet None detected in glue	N/A	N/A
79A	4" Vinyl baseboard (brown) & mastic	PCR 423	79	None detected in baseboard None detected in mastic	N/A	N/A
80A	Sink undercoating (black)	PCR 736, PCR 737, PCR 738, PCR 739	80	None detected in coating	N/A	N/A
81A	2'x4' False ceiling panel (fissure & pinhole)	PCR 875	81	None detected in ceiling panel None detected in paint	N/A	N/A
82A	Sealant (white, at sinks, toilets, urinals)	PCR 542: Restroom	82	None detected in sealant	N/A	N/A
83A	Carpet (grey) & mastic	PCR 542: Classroom	83	None detected in carpet None detected in glue	N/A	N/A
84A	4" Vinyl baseboard (grey) & mastic	PCR 542: Classroom, Closet	84	None detected in baseboard None detected in mastic	N/A	N/A
85A, 85B	Tackboard on drywall	PCR 542: Classroom, Closet	85	None detected in drywall None detected in tackboard	N/A	N/A
86A	2'x4' False ceiling panel (fiberglass)	PCR 542: Classroom, Restroom, Closet	86	None detected in ceiling panel None detected in paint	N/A	N/A
87A	Vinyl sheet flooring (blue pebble) & mastic	PCR 542: Classroom, Restroom	87	None detected in vinyl None detected in backing layer None detected in mastic	N/A	N/A
88A	6" Vinyl baseboard (grey) & mastic	PCR 542: Classroom, Restroom	88	None detected in baseboard None detected in mastic	N/A	N/A
89A, 89B	Fiber reinforced panel & glue on drywall	PCR 542: Classroom	89	None detected in drywall None detected in panel None detected in glue	N/A	N/A
90A	Vinyl sheet flooring (cream pebble) & mastic	PCR 542: Classroom	90	None detected in vinyl None detected in backing layer None detected in mastic	N/A	N/A
91A	Carpet (grey) & mastic	PCR L16: Classroom	91	None detected in carpet None detected in glue	N/A	N/A
92A	4" Vinyl baseboard (blue) & mastic	PCR L16: Classroom	92	None detected in baseboard None detected in mastic	N/A	N/A

<b>Asbestos Survey Summary (Lab Report # B268328)</b> <b>Addams Elementary School, 2117 W. McKinley Ave., Fresno, California</b> <b>Survey Date: November 1-5, 2018</b>						
<b>Sample Numbers</b>	<b>Material Description</b>	<b>Location(s) of Material</b>	<b>Material Number</b>	<b>Asbestos Content (percent)</b>	<b>Asbestos NESHAP Category</b>	<b>Approximate Quantity</b>
93A, 93B	Tackboard	PCR L16: Classroom	93	None detected in tackboard None detected in paint	N/A	N/A
94A	2'x4' False ceiling panel (fiberglass)	PCR L16: Classroom	94	None detected in fiberglass panel None detected in vinyl cover	N/A	N/A
95A	Sink undercoating (black)	PCR L16: Classroom	95	None detected in coating	N/A	N/A
96A	Vinyl sheet flooring (cream) & mastic	PCR L16: Restroom	96	None detected in vinyl None detected in backing layer None detected in mastic None detected in floor filler	N/A	N/A
97A	6" Vinyl baseboard (blue) & mastic	PCR L16: Restroom	97	None detected in baseboard None detected in mastic	N/A	N/A
98A, 98B	Fiber reinforced panel & glue on drywall	PCR L16: Restroom	98	None detected in drywall None detected in panel None detected in glue	N/A	N/A
99A	2'x4' False ceiling panel	PCR L16: Restroom	99	None detected in ceiling panel None detected in paint	N/A	N/A
100A	Sealant (white, at sinks, toilets, urinals)	PCR L16: Restroom	100	None detected in sealant None detected in paint	N/A	N/A
101A	Sealant seam at frame/wall panel)	PCR 316: Exterior	101	None detected in sealant None detected in paint	N/A	N/A
102A	Sealant (vertical frame segment seam)	PCR 316: Exterior	102	None detected in sealant None detected in paint	N/A	N/A
103A	Sealant (seam at frame/wall panel)	PCR 649: Exterior PCR 650: Exterior	103	2% Chrysotile in sealant None detected in paint	Category II, non-friable	680 LF
104A	Sealant (vertical frame segment seam)	PCR 649: Exterior PCR 650: Exterior	104	2% Chrysotile in sealant None detected in paint	Category II, non-friable	40 LF
105A	Sealant (seam at frame/wall panel)	PCR 716: Exterior	105	None detected in sealant None detected in paint	N/A	N/A
106A	Sealant (vertical frame segment seam)	PCR 716: Exterior	106	None detected in sealant None detected in paint	N/A	N/A

<b>Asbestos Survey Summary (Lab Report # B268328)</b> <b>Addams Elementary School, 2117 W. McKinley Ave., Fresno, California</b> <b>Survey Date: November 1-5, 2018</b>						
Sample Numbers	Material Description	Location(s) of Material	Material Number	Asbestos Content (percent)	Asbestos NESHAP Category	Approximate Quantity
107A	Sealant (seam at frame/wall panel)	PCR 1176: Exterior PCR 1177: Exterior PCR 1178: Exterior PCR 1179: Exterior PCR 1180: Exterior	107	None detected in sealant	N/A	N/A
108A	Sealant (horizontal seam at ground/frame)	PCR 1176: Exterior PCR 1177: Exterior PCR 1178: Exterior PCR 1179: Exterior PCR 1180: Exterior	108	None detected in sealant None detected in paint	N/A	N/A
109A	Sealant (behind door & window trim)	PCR 1528: Exterior	109	None detected in sealant None detected in paint	N/A	N/A
110A	Sealant (seam at frame/wall panel)	PCR 875: Exterior	110	None detected in sealant None detected in paint	N/A	N/A
111A	Sealant (vertical frame segment seam)	PCR 875: Exterior	111	None detected in sealant None detected in paint	N/A	N/A
112A	Sealant (seam at frame/wall panel)	PCR 736: Exterior PCR 737: Exterior PCR 738: Exterior PCR 739: Exterior	112	None detected in sealant None detected in paint	N/A	N/A
113A	Sealant (vertical frame segment seam)	PCR 739: Exterior	113	None detected in sealant None detected in paint	N/A	N/A
114A	Sealant (seam at frame/wall panel)	PCR 560: Exterior	114	2% Chrysotile in sealant None detected in paint	Category II, non-friable	340 LF
115A	Sealant (vertical frame segment seam)	PCR 560: Exterior	115	2% Chrysotile in sealant None detected in paint	Category II, non-friable	20 LF
116A	Sealant (seam at frame/wall panel)	PCR 940: Exterior	116	None detected in sealant None detected in paint	N/A	N/A
117A	Sealant (vertical frame segment seam)	PCR 940: Exterior	117	None detected in sealant None detected in paint	N/A	N/A
118A	Sealant (seam at frame/wall panel)	PCR 375: Exterior	118	None detected in sealant None detected in paint	N/A	N/A
119A	Sealant (vertical frame segment seam)	PCR 375: Exterior	119	2% Chrysotile in sealant None detected in paint	Category II, non-friable	20 LF

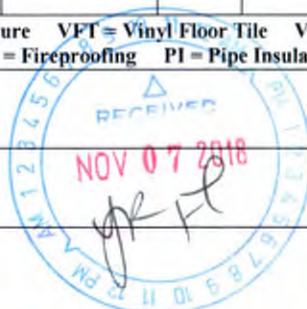
<b>Asbestos Survey Summary (Lab Report # B268328)</b> <b>Addams Elementary School, 2117 W. McKinley Ave., Fresno, California</b> <b>Survey Date: November 1-5, 2018</b>						
Sample Numbers	Material Description	Location(s) of Material	Material Number	Asbestos Content (percent)	Asbestos NESHAP Category	Approximate Quantity
120A	Sealant (seam at frame/wall panel)	PCR 378: Exterior PCR 423: Exterior	120	2% Chrysotile in sealant None detected in paint	Category II, non-friable	680 LF
121A	Sealant (vertical frame segment seam)	PCR 378: Exterior PCR 423: Exterior	121	None detected in sealant None detected in paint	N/A	N/A
122A	Sealant (seam at frame/wall panel)	PCR 542: Exterior	122	2% Chrysotile in sealant None detected in paint	Category II, non-friable	680 LF
123A, 123B	Sealant (vertical frame segment seam)	PCR 542: Exterior	123	2% Chrysotile in sealant None detected in paint	Category II, non-friable	20 LF
124A	Paint (textured)	PCR L16: Exterior	124	None detected in texture None detected in paint	N/A	N/A
125A	Sealant (horizontal seam at frame/ground)	PCR L16: Exterior	125	None detected in sealant None detected in paint	N/A	N/A
126A	Sealant (seam at frame/wall panel)	PCR L16: Exterior	126	None detected in sealant None detected in paint	N/A	N/A
127A	Sealant (vertical frame segment seam)	PCR L16: Exterior	127	None detected in sealant None detected in paint	N/A	N/A
128A	Sealant (behind door & window trim)	PCR L16: Exterior	128	None detected in sealant None detected in paint	N/A	N/A
129A	Fibrous wall coating	PCR L16: Exterior	129	None detected in coating None detected in paint	N/A	N/A
130A	Mastic (at roof perimeter)	PCR 316: Roof	130	None detected in mastic	N/A	N/A
131A	Fibrous repair cloth	PCR 316: Roof	131	None detected in repair cloth	N/A	N/A
132A	Mastic (at roof bolts)	PCR 649: Roof PCR 650: Roof	132	2% Chrysotile in mastic None detected in paint	Category I, non-friable	24 ft <sup>2</sup>
133A	Mastic (at roof bolts)	PCR 716: Roof	133	None detected in mastic None detected in paint	N/A	N/A
134A	Mastic (at roof bolts)	PCR 1176: Roof PCR 1177: Roof PCR 1178: Roof PCR 1179: Roof PCR 1180: Roof	134	None detected in mastic None detected in paint	N/A	N/A

<b>Asbestos Survey Summary (Lab Report # B268328)</b> <b>Addams Elementary School, 2117 W. McKinley Ave., Fresno, California</b> <b>Survey Date: November 1-5, 2018</b>						
<b>Sample Numbers</b>	<b>Material Description</b>	<b>Location(s) of Material</b>	<b>Material Number</b>	<b>Asbestos Content (percent)</b>	<b>Asbestos NESHAP Category</b>	<b>Approximate Quantity</b>
135A	Mastic (at roof bolts)	PCR 1528: Roof	135	None detected in mastic None detected in paint	N/A	N/A
136A	Mastic (at roof bolts)	PCR 875: Roof	136	None detected in mastic None detected in foam None detected in paint	N/A	N/A
137A	Mastic (at roof bolts)	PCR 736: Roof PCR 737: Roof PCR 738: Roof PCR 739: Roof	137	None detected in mastic None detected in foam None detected in paint	N/A	N/A
138A	Mastic (at roof bolts)	PCR 560: Roof	138	2% Chrysotile in mastic None detected in foam None detected in paint	Category I, non-friable	12 ft <sup>2</sup>
139A	Mastic (at roof bolts)	PCR 940: Roof	139	None detected in mastic None detected in foam None detected in paint	N/A	N/A
140A	Mastic (at roof bolts)	PCR 375: Roof	140	2% Chrysotile in mastic None detected in paint	Category I, non-friable	12 ft <sup>2</sup>
141A	Mastic (at roof bolts)	PCR 375: Roof	141	None detected in mastic None detected in paint	N/A	N/A
142A	Mastic (at roof bolts)	PCR 378: Roof PCR 423: Roof	142	None detected in mastic None detected in foam None detected in paint	N/A	N/A
143A	Mastic (at roof bolts)	PCR 542: Roof	143	2% Chrysotile in mastic None detected in paint	Category I, non-friable	12 ft <sup>2</sup>
144A	Mastic (at roof bolts)	PCR L16: Roof	144	2% Chrysotile in mastic None detected in foam None detected in paint	Category I, non-friable	12 ft <sup>2</sup>

CLIENT: FR09 FACS Fresno FRESNO UNIFIED SCHOOL DISTRICT		Sampled by: Jacob Sharp and Eric Farnsworth				Sample Date: 11-01-18-11-02-18	
Site/Bldg.: FRESNO UNIFIED SCHOOL DISTRICT Addams Elementary School 2117 W. McKinley Ave Fresno CA 93728		Turnaround Time: 48 hr					
		Analysis: PLM Standard					
FACS Proj. No.: PJ39403		Special Instructions E-mail results to E-mail results to jvuglia@forensicanalytical.com and dpyle@forensicanalytical.com					
HA#	Homogeneous Material Description (incl. color, texture, phase of construction)	Quant. in SF (LF for small pipe only)	Friable/ Cat. I/ Cat. II	Condition (good, fair, poor)	Sample Number	Sample Location	Lab Result (when rcvd)
01	16" Vinyl Floor Tile (white with blue specks) with mastic				PJ39403 -01A	Building B: Admin – south side west end	
02	6" Vinyl Baseboard (off-white) with mastic				PJ39403 -02A	Building B: Admin – north side west end	
03	Tackboard over Drywall				PJ39403 -03A	Building B: Admin – west side center above FCP's	
04	2' X 2' False Ceiling Panel (small fissure pinhole)				PJ39403 -04A	Building B: Hallway- east side south end	
05	Carpet (gray/blue) and mastic				PJ39403 -05A	Building B: Home School – south side west end	
05	Carpet (gray/blue) and mastic with filler				PJ39403 -05B	Building B: Work Area – south side east end	
06	4" Carpet (gray/blue) Baseboard and mastic				PJ39403 -06A	Building B: Storage – south side west end	
07	8" Carpet (gray/blue) Baseboard and mastic				PJ39403 -07A	Building B: Work Area – east side south end	
08	Drywall (Smooth) with Tape and Joint Compound				PJ39403 -08A	Building B: Storage – north side east end	
DW = Drywall JC = Joint Compound WT = Wall Texture VFT = Vinyl Floor Tile VSF = Vinyl Sheet Flooring BB = Baseboard BBM = Baseboard Mastic CM = Carpet Mastic ACT = Acoustic Ceiling Tile ACS = Sprayed-on Acoustical Ceiling Material FP = Fireproofing PI = Pipe Insulation PFI = Pipe fitting insulation WP = Plaster CP = Ceiling Plaster ES = Exterior Stucco							
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CLIENT: FR09 FACS Fresno FRESNO UNIFIED SCHOOL DISTRICT		Sampled by: Jacob Sharp and Eric Farnsworth				Sample Date: 11-01-18-11-02-18	
Site/Bldg.: FRESNO UNIFIED SCHOOL DISTRICT Addams Elementary School 2117 W. McKinley Ave Fresno CA 93728		Turnaround Time: 48 hr					
		Analysis: PLM Standard					
FACS Proj. No.: PJ39403		Special Instructions E-mail results to E-mail results to jvuglia@forensicanalytical.com and dpyle@forensicanalytical.com					
HA#	Homogeneous Material Description (incl. color, texture, phase of construction)	Quant. in SF (LF for small pipe only)	Friable/ Cat. I/ Cat. II	Condition (good, fair, poor)	Sample Number	Sample Location	Lab Result (when rcvd)
08	Drywall (Smooth) without Tape and Joint Compound				PJ39403 -08B	Building B: Storage – north side east end	
09	Plaster (Sanded) on the Ceiling				PJ39403 -09A	Building B: Storage – north side east end	
09	Plaster (Sanded) on the Wall				PJ39403 -09B	Building B: Storage – south side west end	
09	Plaster (Sanded) on the Wall				PJ39403 -09C	Building B: Hallway – north side east end	
10	Concrete (blue/green) (Sanded)				PJ39403 -10A	Building B: Unisex Restroom – south side east end	
11	Fiber Reinforced Panels and glue over Drywall				PJ39403 -11A	Building B: Nurse's Restroom – north side west end	
12	Drywall (Smooth) with tape and joint compound				PJ39403 -12A	Building B: Unisex Restroom – south side west end	
12	Drywall (Smooth) without tape and joint compound				PJ39403 -12B	Building B: Unisex Restroom – south side west end	
13	Sealant (white) on sink				PJ39403 -13A	Building B: Unisex Restroom – east side south end	
DW = Drywall JC = Joint Compound WT = Wall Texture VFT = Vinyl Floor Tile VSF = Vinyl Sheet Flooring BB = Baseboard BBM = Baseboard Mastic CM = Carpet Mastic ACT = Acoustic Ceiling Tile ACS = Sprayed-on Acoustical Ceiling Material FP = Fireproofing PI = Pipe Insulation PFI = Pipe fitting insulation WP = Plaster CP = Ceiling Plaster ES = Exterior Stucco							
Relinquished by: <i>[Signature]</i>				Relinquished by:		Relinquished by:	
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CLIENT: FR09 FACS Fresno FRESNO UNIFIED SCHOOL DISTRICT		Sampled by: Jacob Sharp and Eric Farnsworth				Sample Date: 11-01-18-11-02-18	
Site/Bldg.: FRESNO UNIFIED SCHOOL DISTRICT Addams Elementary School 2117 W. McKinley Ave Fresno CA 93728		Turnaround Time: 48 hr					
		Analysis: PLM Standard					
FACS Proj. No.: PJ39403		Special Instructions E-mail results to E-mail results to jvuglia@forensicanalytical.com and dpyle@forensicanalytical.com					
HA#	Homogeneous Material Description (incl. color, texture, phase of construction)	Quant. in SF (LF for small pipe only)	Friable/ Cat. I/ Cat. II	Condition (good, fair, poor)	Sample Number	Sample Location	Lab Result (when rcvd)
14	Grout (gray) at Toilet Base				PJ39403 -14A	Building B: Unisex Restroom – east side north end at toilet	
15	Sealant (white) on Sink				PJ39403 -15A	Building B: Women's Restroom – south side center	
16	Sealant (white) on Toilet				PJ39403 -16A	Building B: Women's Restroom – north side center	
17	Plaster (Smooth) on the Wall				PJ39403 -17A	Building B: Work Area – east side south end	
17	Plaster (Smooth) on the Ceiling				PJ39403 -17B	Building B: Nurse's Restroom – west side north end	
17	Plaster (Smooth) on the Wall				PJ39403 -17C	Building B: Nurse's Restroom – west side north end	
18	4" Vinyl Baseboard (Cream) and mastic				PJ39403 -18A	Building B: Nurse's Office – south side west end	
19	2" Ceramic Tile (Gray) and Grout				PJ39403 -19A	Building B: Nurse's Restroom – center of room	
20	6" Ceramic Tile (Beige) and Grout				PJ39403 -20A	Building B: Nurse's Restroom – east side south end	
DW = Drywall JC = Joint Compound WT = Wall Texture VFT = Vinyl Floor Tile VSF = Vinyl Sheet Flooring BB = Baseboard BBM = Baseboard Mastic CM = Carpet Mastic ACT = Acoustic Ceiling Tile ACS = Sprayed-on Acoustical Ceiling Material FP = Fireproofing PI = Pipe Insulation PFI = Pipe fitting insulation WP = Plaster CP = Ceiling Plaster ES = Exterior Stucco							
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<b>CLIENT: FR09 FACS Fresno</b>		<b>Sampled by: Jacob Sharp and Eric Farnsworth</b>				<b>Sample Date: 11-01-18-11-02-18</b>	
<b>Site/Bldg.:</b> FRESNO UNIFIED SCHOOL DISTRICT Addams Elementary School 2117 W. McKinley Ave Fresno CA 93728		<b>Turnaround Time:</b> 48 hr					
		<b>Analysis:</b> PLM Standard					
<b>FACS Proj. No.:</b> PJ39403		<b>Special Instructions</b> E-mail results to E-mail results to jvuglia@forensicanalytical.com and dpyle@forensicanalytical.com					
HA#	Homogeneous Material Description (incl. color, texture, phase of construction)	Quant. in SF (LF for small pipe only)	Friable/ Cat. I/ Cat. II	Condition (good, fair, poor)	Sample Number	Sample Location	Lab Result (when rcvd)
21	Sink Undercoating (black)				PJ39403 -21A	Building B: Hallway – south side east end	
22	Exterior Stucco				PJ39403 -22A	Building B: Exterior – south side west end at entry to office	
23	Window Putty				PJ39403 -23A	Building B: Exterior – north side east end near front entrance	
24	Carpet (Brown) and mastic				PJ39403 -24A	PCR 736: north side west end	
25	4" Vinyl Baseboard (Brown) and mastic				PJ39403 -25A	PCR 736: north side west end	
26	Tackboard and glue over drywall with tape and joint				PJ39403 -26A	PCR 736: north side west end	
26	Tackboard and glue over drywall without tape and joint				PJ39403 -26B	PCR 736: west side north end	
27	2' X 4' False Ceiling Panel (Fiberglass)				PJ39403 -27A	PCR 736: north side west end	
28	Carpet (Purple Multi) and mastic				PJ39403 -28A	PCR 940: north side west end	
DW = Drywall JC = Joint Compound WT = Wall Texture VFT = Vinyl Floor Tile VSF = Vinyl Sheet Flooring BB = Baseboard BBM = Baseboard Mastic CM = Carpet Mastic ACT = Acoustic Ceiling Tile ACS = Sprayed-on Acoustical Ceiling Material FP = Fireproofing PI = Pipe Insulation PFI = Pipe fitting insulation WP = Plaster CP = Ceiling Plaster ES = Exterior Stucco							
<b>Relinquished by:</b>					<b>Relinquished by:</b>		<b>Relinquished by:</b>
<b>Date &amp; Time:</b> 11-01-18 10:00 AM					<b>Date &amp; Time:</b>		<b>Date &amp; Time:</b>
<b>Received by:</b>					<b>Received by:</b>		<b>Relinquished by:</b>
<b>Date &amp; Time:</b>					<b>Date &amp; Time:</b>		<b>Date &amp; Time:</b>



CLIENT: FR09 FACS Fresno FRESNO UNIFIED SCHOOL DISTRICT		Sampled by: Jacob Sharp and Eric Farnsworth				Sample Date: 11-01-18-11-02-18	
Site/Bldg.: FRESNO UNIFIED SCHOOL DISTRICT Addams Elementary School 2117 W. McKinley Ave Fresno CA 93728		Turnaround Time: 48 hr					
		Analysis: PLM Standard					
FACS Proj. No.: PJ39403		Special Instructions E-mail results to E-mail results to jvuglia@forensicanalytical.com and dpyle@forensicanalytical.com					
HA#	Homogeneous Material Description (incl. color, texture, phase of construction)	Quant. in SF (LF for small pipe only)	Friable/ Cat. I/ Cat. II	Condition (good, fair, poor)	Sample Number	Sample Location	Lab Result (when rcvd)
29	4" Vinyl Baseboard (Green) and mastic				PJ39403 -29A	PCR 940: north side west end	
30	Tackboard and glue over drywall with tape and joint				PJ39403 -30A	PCR 940: west side north end	
30	Tackboard and glue over drywall without tape and joint				PJ39403 -30B	PCR 940: west side north end	
31	2' X 4' False Ceiling Panel (Fiberglass)				PJ39403 -31A	PCR 940: west side center	
32	Sink Undercoating (black)				PJ39403 -32A	PCR 940: south side west end	
33	Carpet (Purple Multi) and mastic				PJ39403 -33A	PCR 560: north side west end	
34	4" Vinyl Baseboard (Green) and mastic				PJ39403 -34A	PCR 560: north side west end	
35	Tackboard and glue over drywall with tape and joint				PJ39403 -35A	PCR 560: north side west end	
35	Tackboard and glue over drywall without tape and joint				PJ39403 -35B	PCR 560: north side west end	
DW = Drywall JC = Joint Compound WT = Wall Texture VET = Vinyl Floor Tile VSF = Vinyl Sheet Flooring BB = Baseboard BBM = Baseboard Mastic CM = Carpet Mastic ACT = Acoustic Ceiling Tile ACS = Sprayed-on Acoustical Ceiling Material FP = Fireproofing PI = Pipe Insulation PFI = Pipe fitting insulation WP = Plaster CP = Ceiling Plaster ES = Exterior Stucco							
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FACS Proj. No.: PJ39403		Special Instructions E-mail results to E-mail results to jvuglia@forensicanalytical.com and dpyle@forensicanalytical.com					
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36	2' X 4' False Ceiling Panel (Fiberglass)				PJ39403 -36A	PCR 560: north side west end	
37	Sink Undercoating (black)				PJ39403 -37A	PCR 560: south side west end	
38	Carpet (Purple Multi) and mastic				PJ39403 -38A	Classroom 34 (DSA57883): west side north end	
39	4" Vinyl Baseboard (green) and mastic				PJ39403 -39A	Classroom 34 (DSA57883): north side center	
40	Tackboard and glue over drywall with tape and joint				PJ39403 -40A	Classroom 34 (DSA57883): north east corner	
40	Tackboard and glue over drywall without tape and joint				PJ39403 -40B	Classroom 34 (DSA57883): east side north end	
41	2' X 4' False Ceiling Panel (Fissure Pinhole)				PJ39403 -41A	Classroom 34 (DSA57883): north side west end above door	
42	Sink Undercoating (black)				PJ39403 -42A	Classroom 34 (DSA57883): south side west end	
43	Carpet (Purple Multi) and mastic				PJ39403 -43A	PCR 875: east side north end	
DW = Drywall JC = Joint Compound WT = Wall Texture VET = Vinyl Floor Tile VSF = Vinyl Sheet Flooring BB = Baseboard BBM = Baseboard Mastic CM = Carpet Mastic ACT = Acoustic Ceiling Tile ACS = Sprayed-on Acoustical Ceiling Material FP = Fireproofing PI = Pipe Insulation PFI = Pipe fitting insulation WP = Plaster CP = Ceiling Plaster ES = Exterior Stucco							
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		Analysis: PLM Standard					
FACS Proj. No.: PJ39403		Special Instructions E-mail results to E-mail results to jvuglia@forensicanalytical.com and dpyle@forensicanalytical.com					
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44	4" Vinyl Baseboard (green) and mastic				PJ39403 -44A	PCR 875: west side south end	
45	Tackboard and glue over drywall with tape and joint				PJ39403 -45A	PCR 875: north side west end	
45	Tackboard and glue over drywall without tape and joint				PJ39403 -45B	PCR 875: west side north end	
46	2' X 4' False Ceiling Panel (Fiberglass)				PJ39403 -46A	PCR 875: north side west end	
47	Sink Undercoating (black)				PJ39403 -47A	PCR 875: South side west end	
48	Linoleum (blue pebble) and mastic				PJ39403 -48A	Portable restroom: Men's Restroom – east side south end	
49	6" Vinyl Baseboard (black) and mastic				PJ39403 -49A	Portable restroom: Men's Restroom – east side south end	
50	Fiber Reinforced Panel and Glue over Drywall with tape and joint				PJ39403 -50A	Portable restroom: Men's Restroom – east side north end	
50	Fiber Reinforced Panel and Glue over Drywall without tape and joint				PJ39403 -50B	Portable restroom: Men's Restroom – east side north end	
DW = Drywall JC = Joint Compound WT = Wall Texture VFT = Vinyl Floor Tile VSF = Vinyl Sheet Flooring BB = Baseboard BBM = Baseboard Mastic CM = Carpet Mastic ACT = Acoustic Ceiling Tile ACS = Sprayed-on Acoustical Ceiling Material FP = Fireproofing PI = Pipe Insulation PFI = Pipe fitting insulation WP = Plaster CP = Ceiling Plaster ES = Exterior Stucco							
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FACS Proj. No.: PJ39403		Special Instructions E-mail results to E-mail results to jvuglia@forensicanalytical.com and dpyle@forensicanalytical.com					
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51	2' X 4" False Ceiling Panel (micro dot)				PJ39403 -51A	Portable restroom: Men's Restroom – east side north end	
52	Sealant (white) on sink				PJ39403 -52A	Portable restroom: Women's Restroom – west side south end	
53	Carpet (Gray) and mastic				PJ39403 -53A	Portable 1178: north side west end	
54	4" Vinyl Baseboard (gray) and mastic				PJ39403 -54A	Portable 1178: north side west end	
55	Tackboard and glue over drywall with tape and joint				PJ39403 -55A	Portable 1178: north side west end	
55	Tackboard and glue over drywall without tape and joint				PJ39403 -55B	Portable 1178: west side north end	
56	2' X 4" False Ceiling Panel (Fiberglass)				PJ39403 -56A	Portable 1178: north side west end	
57	Sink Undercoating (black)				PJ39403 -57A	Portable 1178: south side west end	
58	Carpet (brown) and mastic				PJ39403 -58A	PCR 716: south side east end	
DW = Drywall JC = Joint Compound WT = Wall Texture VFT = Vinyl Floor Tile VSF = Vinyl Sheet Flooring BB = Baseboard BBM = Baseboard Mastic CM = Carpet Mastic ACT = Acoustic Ceiling Tile ACS = Sprayed-on Acoustical Ceiling Material FP = Fireproofing PI = Pipe Insulation PFI = Pipe fitting insulation WP = Plaster CP = Ceiling Plaster ES = Exterior Stucco							
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59	4" Vinyl Baseboard (brown) and mastic				PJ39403 -59A	PCR 716: south side east end	
60	Tackboard and glue over drywall with tape and joint				PJ39403 -60A	PCR 716: south side east end	
60	Tackboard and glue over drywall without tape and joint				PJ39403 -60B	PCR 716: east side south end	
61	2' X 4' False Ceiling Panel (Fiberglass)				PJ39403 -61A	PCR 716: south side east end	
62	Sink Undercoating (black)				PJ39403 -62A	PCR 716: north side east end	
63	Carpet (brown) and mastic				PJ39403 -63A	PCR 650: south side east end	
64	4" Vinyl Baseboard (brown) and mastic				PJ39403 -64A	PCR 650: south side east end	
65	Tackboard and glue over drywall without tape and joint				PJ39403 -65A	PCR 650: south side east end	
66	2' X 4' False Ceiling Panel (Fiberglass)				PJ39403 -66A	PCR 650: south side east end	
DW = Drywall JC = Joint Compound WT = Wall Texture VFT = Vinyl Floor Tile VSF = Vinyl Sheet Flooring BB = Baseboard BBM = Baseboard Mastic CM = Carpet Mastic ACT = Acoustic Ceiling Tile ACS = Sprayed-on Acoustical Ceiling Material FP = Fireproofing PI = Pipe Insulation PFI = Pipe fitting insulation WP = Plaster CP = Ceiling Plaster ES = Exterior Stucco							
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67	Sink undercoating (black)				PJ39403 -67A	PCR 650: north side east end	
68	Carpet (green) and mastic				PJ39403 -68A	PCR 316: north side east end	
69	4" Vinyl Baseboard (green) and mastic				PJ39403 -69A	PCR 316: north side east end	
70	Tackboard and glue over drywall without tape and joint				PJ39403 -70A	PCR 316: north side east end	
71	2' X 4' False Ceiling Panel (Heavy Texture)				PJ39403 -71A	PCR 316: north side east end	
72	Sink Undercoating				PJ39403 -72A	PCR 316: south side east end	
73	Carpet (green) and mastic				PJ39403 -73A	PCR 378: north side east end	
74	4" Vinyl Baseboard (green) and mastic				PJ39403 -74A	PCR 378: north side east end	
75	Tackboard and glue over drywall with tape and joint				PJ39403 -75A	PCR 378: north side west end	
DW = Drywall JC = Joint Compound WT = Wall Texture VFT = Vinyl Floor Tile VSF = Vinyl Sheet Flooring BB = Baseboard BBM = Baseboard Mastic CM = Carpet Mastic ACT = Acoustic Ceiling Tile ACS = Sprayed-on Acoustical Ceiling Material FP = Fireproofing PI = Pipe Insulation PFI = Pipe fitting insulation WP = Plaster CP = Ceiling Plaster ES = Exterior Stucco							
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75	Tackboard and glue over drywall without tape and joint				PJ39403 -75B	PCR 378: north side west end	
76	2' X 4' False Ceiling Panel (Heavy Texture)				PJ39403 -76A	PCR 378: north side west end	
77	Sink Undercoating				PJ39403 -77A	PCR 378: south side west end	
78	Carpet (brown) and mastic				PJ39403 -78A	PCR 423: north side west end	
79	4" Vinyl Baseboard (brown) and mastic				PJ39403 -79A	PCR 423: north side west end	
80	Sink undercoating (black)				PJ39403 -80A	PCR 736: south side west end	
81	2' X 4' False Ceiling Panel (medium fissure pinhole)				PJ39403 -81A	PCR 875: north side west end	
82	Sealant (white) on Sink				PJ39403 -82A	TK1 (PCR 542): Restroom – west side north end	
83	Carpet (gray multi) and mastic				PJ39403 -83A	TK1 (PCR 542): Classroom – west side north end	
DW = Drywall JC = Joint Compound WT = Wall Texture VET = Vinyl Floor Tile VSF = Vinyl Sheet Flooring BB = Baseboard BBM = Baseboard Mastic CM = Carpet Mastic ACT = Acoustic Ceiling Tile ACS = Sprayed-on Acoustical Ceiling Material FP = Fireproofing PI = Pipe Insulation PFI = Pipe fitting insulation WP = Plaster CP = Ceiling Plaster ES = Exterior Stucco							
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84	4" Vinyl Baseboard (gray) and mastic				PJ39403 -84A	TK1 (PCR 542): Classroom –west side north end	
85	Tackboard and glue over drywall with tape and joint				PJ39403 -85A	TK1 (PCR 542): Classroom – west side north end	
85	Tackboard and glue over drywall without tape and joint				PJ39403 -85B	TK1 (PCR 542): Classroom –north side west end	
86	2' X 4' False Ceiling Panel (fiberglass)				PJ39403 -86A	TK1 (PCR 542): Classroom – west side north end	
87	Linoleum (blue/pebble) and mastic				PJ39403 -87A	TK1 (PCR 542): Classroom – south side east end under sink	
88	6" Vinyl Baseboard (gray) and mastic				PJ39403 -88A	TK1 (PCR 542): Classroom – south side east end	
89	Fiber Reinforced Panel and Glue over drywall with tape and joint				PJ39403 -89A	TK1 (PCR 542): Restroom – north side west end	
89	Fiber Reinforced Panel and Glue over drywall without tape and joint				PJ39403 -89B	TK1 (PCR 542): Restroom –north side west end	
90	Linoleum (cream pebble) and mastic				PJ39403 -90A	TK1 (PCR 542): Closet – east end center	
DW = Drywall JC = Joint Compound WT = Wall Texture VFT = Vinyl Floor Tile VSF = Vinyl Sheet Flooring BB = Baseboard BBM = Baseboard Mastic CM = Carpet Mastic ACT = Acoustic Ceiling Tile ACS = Sprayed-on Acoustical Ceiling Material FP = Fireproofing PI = Pipe Insulation PFI = Pipe fitting insulation WP = Plaster CP = Ceiling Plaster ES = Exterior Stucco							
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91	Carpet (gray multi) and mastic				PJ39403 -91A	TK2 (DSA27146): Classroom – north side east end	
92	4" Vinyl Baseboard (blue) and glue				PJ39403 -92A	TK2 (DSA27146): Classroom – north side center	
93	Tackboard and glue over drywall with tape and joint				PJ39403 -93A	TK2 (DSA27146): Classroom -northwest corner	
93	Tackboard and glue over drywall without tape and joint				PJ39403 -93B	TK2 (DSA27146): Classroom – north side west end	
94	2' X 4' False Ceiling Panel (fiberglass)				PJ39403 -94A	TK2 (DSA27146): Classroom – north side east end	
95	Sink Undercoating (black)				PJ39403 -95A	TK2 (DSA27146): Classroom – north side center	
96	Linoleum (cream) and mastic				PJ39403 -96A	TK2 (DSA27146): Restroom – north side east end near entry	
97	6" Vinyl Baseboard (blue) and mastic				PJ39403 -97A	TK2 (DSA27146): Restroom – north side east end at entry	
98	Fiber Reinforced Panel and Glue over drywall with tape and joint				PJ39403 -98A	TK2 (DSA27146): Restroom – northeast corner	
DW = Drywall JC = Joint Compound WT = Wall Texture VFT = Vinyl Floor Tile VSF = Vinyl Sheet Flooring BB = Baseboard BBM = Baseboard Mastic CM = Carpet Mastic ACT = Acoustic Ceiling Tile ACS = Sprayed-on Acoustical Ceiling Material FP = Fireproofing PI = Pipe Insulation PFI = Pipe fitting insulation WP = Plaster CP = Ceiling Plaster ES = Exterior Stucco							
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98	Fiber Reinforced Panel and Glue over drywall with tape and joint				PJ39403 -98B	TK2 (DSA27146): Restroom – north side east end	
99	2' X 4' False Ceiling Panel				PJ39403 -99A	TK2 (DSA27146): Restroom – center of room at damage	
100	Sealant (white) on toilet				PJ39403 -100A	TK2 (DSA27146): Restroom – west side south end at corner	
101	Bottom sealant				PJ39403 -101A	PCR 316: Exterior – north side center	
102	Building Frame Sealant				PJ39403 -102A	PCR 316: Exterior – north side center	
103	Bottom sealant				PJ39403 -103A	PCR 650: Exterior – south side center	
104	Building Frame Sealant				PJ39403 -104A	PCR 650: Exterior – south side center	
105	Bottom sealant				PJ39403 -105A	PCR 716: Exterior – south side center	
106	Building Frame Sealant				PJ39403 -106A	PCR 716: Exterior – south side center	
DW = Drywall JC = Joint Compound WT = Wall Texture VET = Vinyl Floor Tile VSF = Vinyl Sheet Flooring BB = Baseboard BBM = Baseboard Mastic CM = Carpet Mastic ACT = Acoustic Ceiling Tile ACS = Sprayed-on Acoustical Ceiling Material FP = Fireproofing PI = Pipe Insulation PFI = Pipe fitting insulation WP = Plaster CP = Ceiling Plaster ES = Exterior Stucco							
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107	Bottom sealant				PJ39403 -107A	PCR 1178: Exterior – west side center	
108	Bottom sealant on concrete				PJ39403 -108A	PCR 1178: Exterior – west side center	
109	Sealant behind door trim				PJ39403 -109A	Portable Restroom – Exterior – south side west end	
110	Bottom sealant				PJ39403 -110A	PCR 875: Exterior – north side center	
111	Building Frame sealant				PJ39403 -111A	PCR 875: Exterior – north side center	
112	Bottom sealant				PJ39403 -112A	PCR 739: Exterior – east side north end	
113	Building Frame sealant				PJ39403 -113A	PCR 739: Exterior – north side center	
114	Bottom sealant				PJ39403 -114A	PCR 560: Exterior – south side east end	
115	Building Frame sealant				PJ39403 -115A	PCR 560: Exterior – north side center	
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CLIENT: FR09 FACS Fresno FRESNO UNIFIED SCHOOL DISTRICT		Sampled by: Jacob Sharp and Eric Farnsworth				Sample Date: 11-01-18-11-02-18	
Site/Bldg.: FRESNO UNIFIED SCHOOL DISTRICT Addams Elementary School 2117 W. McKinley Ave Fresno CA 93728		Turnaround Time: 48 hr					
		Analysis: PLM Standard					
FACS Proj. No.: PJ39403		Special Instructions E-mail results to E-mail results to jvuglia@forensicanalytical.com and dpyle@forensicanalytical.com					
HA#	Homogeneous Material Description (incl. color, texture, phase of construction)	Quant. in SF (LF for small pipe only)	Friable/ Cat. I/ Cat. II	Condition (good, fair, poor)	Sample Number	Sample Location	Lab Result (when rcvd)
116	Bottom sealant				PJ39403 -116A	PCR 940: Exterior – east side north end	
117	Building Frame sealant				PJ39403 -117A	PCR 940: Exterior – north side center	
118	Bottom sealant				PJ39403 -118A	Classroom 34 (DSA57883): Exterior – north side center	
119	Building Frame sealant				PJ39403 -119A	Classroom 34 (DSA57883): Exterior – north side center	
120	Bottom sealant				PJ39403 -120A	PCR 423: Exterior – north side center	
121	Building Frame sealant				PJ39403 -121A	PCR 423: Exterior – north side center	
122	Bottom sealant				PJ39403 -122A	TK1 (PCR 542): Exterior – south side center	
123	Building Frame sealant				PJ39403 -123A	TK1 (PCR 542): Exterior – west side south end	
123	Building Frame sealant				PJ39403 -123B	TK1 (PCR 542): Exterior – west side north end	
DW = Drywall JC = Joint Compound WT = Wall Texture VFT = Vinyl Floor Tile VSF = Vinyl Sheet Flooring BB = Baseboard BBM = Baseboard Mastic CM = Carpet Mastic ACT = Acoustic Ceiling Tile ACS = Sprayed-on Acoustical Ceiling Material FP = Fireproofing PI = Pipe Insulation PFI = Pipe fitting insulation WP = Plaster CP = Ceiling Plaster ES = Exterior Stucco							
Relinquished by: <i>[Signature]</i> Date & Time 1500 11/6/18				Relinquished by: Date & Time:		Relinquished by: Date & Time:	
Received by: Date & Time				Received by: Date & Time		Relinquished by: Date & Time:	

CLIENT: FR09 FACS Fresno FRESNO UNIFIED SCHOOL DISTRICT		Sampled by: Jacob Sharp and Eric Farnsworth				Sample Date: 11-01-18-11-02-18	
Site/Bldg.: FRESNO UNIFIED SCHOOL DISTRICT Addams Elementary School 2117 W. McKinley Ave Fresno CA 93728		Turnaround Time: 48 hr					
		Analysis: PLM Standard					
FACS Proj. No.: PJ39403		Special Instructions E-mail results to E-mail results to jvuglia@forensicanalytical.com and dpyle@forensicanalytical.com					
HA#	Homogeneous Material Description (incl. color, texture, phase of construction)	Quant. in SF (LF for small pipe only)	Friable/ Cat. I/ Cat. II	Condition (good, fair, poor)	Sample Number	Sample Location	Lab Result (when rcvd)
124	Paint Texture				PJ39403 -124A	TK2 (DSA27146): Exterior – north side center	
125	Bottom sealant				PJ39403 -125A	TK2 (DSA27146): Exterior – south side center	
126	Side Building Frame sealant				PJ39403 -126A	TK2 (DSA27146): Exterior – west side north end	
127	Building Frame sealant				PJ39403 -127A	TK2 (DSA27146): Exterior – north side center	
128	Window sealant				PJ39403 -128A	TK2 (DSA27146): Exterior – north side west end	
129	Fibrous Material on Wall				PJ39403 -129A	TK2 (DSA27146): Exterior – south side center	
130	Edge Mastic				PJ39403 -130A	PCR 316: Exterior – north side west end	
131	Repair Cloth Fibrous Material				PJ39403 -131A	PCR 316: Exterior – east side south end	
132	Edge Mastic				PJ39403 -132A	PCR 650: Exterior – south side east end	
DW = Drywall JC = Joint Compound WT = Wall Texture VFT = Vinyl Floor Tile VSF = Vinyl Sheet Flooring BB = Baseboard BBM = Baseboard Mastic CM = Carpet Mastic ACT = Acoustic Ceiling Tile ACS = Sprayed-on Acoustical Ceiling Material FP = Fireproofing PI = Pipe Insulation PFI = Pipe fitting insulation WP = Plaster CP = Ceiling Plaster ES = Exterior Stucco							
Relinquished by: <i>[Signature]</i> Date & Time 1500 11/06/18				Relinquished by: Date & Time:		Relinquished by: Date & Time:	
Received by: Date & Time				Received by: Date & Time		Relinquished by: Date & Time:	



CLIENT: FR09 FACS Fresno FRESNO UNIFIED SCHOOL DISTRICT		Sampled by: Jacob Sharp and Eric Farnsworth				Sample Date: 11-01-18-11-02-18	
Site/Bldg.: FRESNO UNIFIED SCHOOL DISTRICT Addams Elementary School 2117 W. McKinley Ave Fresno CA 93728		Turnaround Time: 48 hr					
		Analysis: PLM Standard					
FACS Proj. No.: PJ39403		Special Instructions E-mail results to E-mail results to jvuglia@forensicanalytical.com and dpyle@forensicanalytical.com					
HA#	Homogeneous Material Description (incl. color, texture, phase of construction)	Quant. in SF (LF for small pipe only)	Friable/ Cat. I/ Cat. II	Condition (good, fair, poor)	Sample Number	Sample Location	Lab Result (when rcvd)
133	Edge Mastic				PJ39403 -133A	PCR 716: Exterior – north side east end	
134	Edge Mastic				PJ39403 -134A	PCR 1178: Exterior – north side east end	
135	Edge Mastic				PJ39403 -135A	Portable restrooms: Exterior –west side center	
136	Edge Mastic				PJ39403 -136A	PCR 875: Exterior – south side center	
137	Edge Mastic				PJ39403 -137A	PCR 737: Exterior – south side east end	
138	Edge Mastic				PJ39403 -138A	PCR 650: Exterior – north side west end	
139	Edge Mastic				PJ39403 -139A	PCR 940: Exterior – north side east end	
140	Edge Mastic				PJ39403 -140A	Classroom 34 (DSA57883): Exterior – south side east end	
141	Bolt Mastic				PJ39403 -141A	Classroom 34 (DSA57883): Exterior – south side center	
DW = Drywall JC = Joint Compound WT = Wall Texture VET = Vinyl Floor Tile VSF = Vinyl Sheet Flooring BB = Baseboard BBM = Baseboard Mastic CM = Carpet Mastic ACT = Acoustic Ceiling Tile ACS = Sprayed-on Acoustical Ceiling Material FP = Fireproofing PI = Pipe Insulation PFI = Pipe fitting insulation WP = Plaster CP = Ceiling Plaster ES = Exterior Stucco							
Relinquished by:					Relinquished by:		Relinquished by:
Date & Time 15:00 11/06/18					Date & Time:		Date & Time:
Received by:					Received by:		Relinquished by:
Date & Time					Date & Time		Date & Time:



<b>CLIENT: FR09 FACS Fresno</b>		<b>Sampled by: Jacob Sharp and Eric Farnsworth</b>				<b>Sample Date: 11-01-18-11-02-18</b>	
<b>Site/Bldg.: FRESNO UNIFIED SCHOOL DISTRICT</b> Addams Elementary School 2117 W. McKinley Ave Fresno CA 93728		<b>Turnaround Time: 48 hr</b>					
		<b>Analysis: PLM Standard</b>					
<b>FACS Proj. No.: PJ39403</b>		<b>Special Instructions</b> E-mail results to E-mail results to jvuglia@forensicanalytical.com and dpyle@forensicanalytical.com					
HA#	Homogeneous Material Description (incl. color, texture, phase of construction)	Quant. in SF (LF for small pipe only)	Friable/ Cat. I/ Cat. II	Condition (good, fair, poor)	Sample Number	Sample Location	Lab Result (when rcvd)
142	Edge Mastic				PJ39403 -142A	PCR 423: Exterior – south side east end	
143	Edge Mastic				PJ39403 -143A	TK1 (PCR 542): Exterior – west side south end	
144	Edge Mastic				PJ39403 -144A	TK2 (DSA27146): Exterior – north side south end	
DW = Drywall JC = Joint Compound WT = Wall Texture VFT = Vinyl Floor Tile VSF = Vinyl Sheet Flooring BB = Baseboard BBM = Baseboard Mastic CM = Carpet Mastic ACT = Acoustic Ceiling Tile ACS = Sprayed-on Acoustical Ceiling Material FP = Fireproofing PI = Pipe Insulation PFI = Pipe fitting insulation WP = Plaster CP = Ceiling Plaster ES = Exterior Stucco							
<b>Relinquished by:</b> <i>[Signature]</i>				<b>Relinquished by:</b>		<b>Relinquished by:</b>	
<b>Date &amp; Time:</b> 15:00 11/06/18				<b>Date &amp; Time:</b>		<b>Date &amp; Time:</b>	
<b>Received by:</b>				<b>Received by:</b>		<b>Relinquished by:</b>	
<b>Date &amp; Time</b>				<b>Date &amp; Time</b>		<b>Date &amp; Time:</b>	





# Bulk Asbestos Analysis

(EPA Method 40CFR, Part 763, Appendix E to Subpart E and EPA 600/R-93-116, Visual Area Estimation)

FACS - Fresno  
Joseph Vuglia  
21228 Cabot Blvd.  
  
Hayward, CA 94545

**Client ID:** FR09  
**Report Number:** B268328  
**Date Received:** 11/07/18  
**Date Analyzed:** 11/08/18  
**Date Printed:** 11/09/18  
**First Reported:** 11/09/18

**Job ID/Site:** PJ39403; FRESNO UNIFIED SCHOOL DISTRICT Addams Elementary School  
2117 W. McKinley Ave Fresno CA 93728

**FALI Job ID:** FR09  
**Total Samples Submitted:** 165  
**Total Samples Analyzed:** 165

**Date(s) Collected:**

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-01A</b>	12094207						
Layer: White Tile			ND				
Layer: Yellow Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-02A</b>	12094208						
Layer: White Baseboard			ND				
Layer: White Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-03A</b>	12094209						
Layer: Tan Fibrous Material			ND				
Layer: White Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (95 %) Synthetic (3 %)							
<b>PJ39403-04A</b>	12094210						
Layer: Beige Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (75 %) Fibrous Glass (5 %)							
<b>PJ39403-05A</b>	12094211						
Layer: Grey Carpet			ND				
Layer: Yellow Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace) Synthetic (85 %)							
<b>PJ39403-05B</b>	12094212						
Layer: Grey Carpet			ND				
Layer: Yellow Mastic			ND				
Layer: Grey Cementitious Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace) Synthetic (65 %)							

Client Name: FACS - Fresno

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Date Printed: 11/09/18

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-06A</b>	12094213						
Layer: Grey Carpet			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-07A</b>	12094214						
Layer: Grey Carpet			ND				
Layer: White Mastic			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)	Synthetic (85 %)						
<b>PJ39403-08A</b>	12094215						
Layer: White Drywall			ND				
Layer: White Joint Compound			ND				
Layer: White Tape			ND				
Layer: White Joint Compound			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (20 %)	Fibrous Glass (10 %)						
<b>PJ39403-08B</b>	12094216						
Layer: White Drywall			ND				
Layer: White Joint Compound			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (20 %)	Fibrous Glass (10 %)						
<b>PJ39403-09A</b>	12094217						
Layer: White Plaster			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-09B</b>	12094218						
Layer: White Plaster			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-09C</b>	12094219						
Layer: White Plaster			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-10A</b>	12094220						
Layer: Blue Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					

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Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-11A</b>	12094221						
Layer: White Semi-Fibrous Material			ND				
Layer: Grey Cementitious Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Fibrous Glass (20 %)							
<b>PJ39403-12A</b>	12094222						
Layer: White Drywall			ND				
Layer: White Joint Compound			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (20 %)      Fibrous Glass (10 %)							
<b>PJ39403-12B</b>	12094223						
Layer: White Drywall			ND				
Layer: White Joint Compound			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (20 %)      Fibrous Glass (10 %)							
<b>PJ39403-13A</b>	12094224						
Layer: White Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-14A</b>	12094225						
Layer: Blue Grout			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-15A</b>	12094226						
Layer: White Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-16A</b>	12094227						
Layer: White Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-17A</b>	12094228						
Layer: Tan Drywall			ND				
Layer: White Plaster			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (20 %)      Fibrous Glass (10 %)							

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Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-17B</b>	12094229						
Layer: Off-White Plaster			ND				
Layer: White Plaster			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-17C</b>	12094230						
Layer: Tan Drywall			ND				
Layer: White Plaster			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (20 %) Fibrous Glass (10 %)							
<b>PJ39403-18A</b>	12094231						
Layer: Beige Baseboard			ND				
Layer: White Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-19A</b>	12094232						
Layer: White Grout			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-20A</b>	12094233						
Layer: White Grout			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-21A</b>	12094234						
Layer: Black Coating			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-22A</b>	12094235						
Layer: Grey Cementitious Material			ND				
Layer: White Cementitious Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-23A</b>	12094236						
Layer: Grey Putty			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							

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Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-24A</b>	12094237						
Layer: Brown Carpet			ND				
Layer: Yellow Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)	Synthetic (85 %)						
<b>PJ39403-25A</b>	12094238						
Layer: Brown Baseboard			ND				
Layer: White Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-26A</b>	12094239						
Layer: White Drywall			ND				
Layer: Tan Fibrous Material			ND				
Layer: Beige Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (75 %)	Synthetic (3 %)						
<b>PJ39403-26B</b>	12094240						
Layer: White Drywall			ND				
Layer: Tan Fibrous Material			ND				
Layer: Beige Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (75 %)	Synthetic (3 %)						
<b>PJ39403-27A</b>	12094241						
Layer: Yellow Fibrous Material			ND				
Layer: White Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Fibrous Glass (Trace)							
<b>PJ39403-28A</b>	12094242						
Layer: Blue Carpet			ND				
Layer: Yellow Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)	Synthetic (85 %)						
<b>PJ39403-29A</b>	12094243						
Layer: Green Baseboard			ND				
Layer: White Mastic			ND				
Layer: White Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Synthetic (2 %)							
<b>PJ39403-30A</b>	12094244						
Layer: White Drywall			ND				
Layer: Tan Fibrous Material			ND				
Layer: Beige Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (75 %)	Synthetic (3 %)						

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Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-30B</b>	12094245						
Layer: White Drywall			ND				
Layer: Tan Fibrous Material			ND				
Layer: Beige Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (75 %)      Synthetic (3 %)							
<b>PJ39403-31A</b>	12094246						
Layer: Yellow Fibrous Material			ND				
Layer: White Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Fibrous Glass (95 %)							
<b>PJ39403-32A</b>	12094247						
Layer: Black Coating			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-33A</b>	12094248						
Layer: Blue Carpet			ND				
Layer: Yellow Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)      Synthetic (85 %)							
<b>PJ39403-34A</b>	12094249						
Layer: Green Baseboard			ND				
Layer: White Mastic			ND				
Layer: White Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Synthetic (3 %)							
<b>PJ39403-35A</b>	12094250						
Layer: White Drywall			ND				
Layer: Tan Fibrous Material			ND				
Layer: Beige Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (75 %)      Synthetic (3 %)							
<b>PJ39403-35B</b>	12094251						
Layer: White Drywall			ND				
Layer: Tan Fibrous Material			ND				
Layer: Beige Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (75 %)      Synthetic (3 %)							
<b>PJ39403-36A</b>	12094252						
Layer: Yellow Fibrous Material			ND				
Layer: White Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Fibrous Glass (95 %)							

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Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-37A</b>	12094253						
Layer: Black Coating			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-38A</b>	12094254						
Layer: Blue Carpet			ND				
Layer: Yellow Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)	Synthetic (85 %)						
<b>PJ39403-39A</b>	12094255						
Layer: Green Baseboard			ND				
Layer: White Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-40A</b>	12094256						
Layer: White Drywall			ND				
Layer: Tan Fibrous Material			ND				
Layer: Beige Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (75 %)	Synthetic (3 %)						
<b>PJ39403-40B</b>	12094257						
Layer: Tan Fibrous Material			ND				
Layer: Beige Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (95 %)	Synthetic (3 %)						
<b>PJ39403-41A</b>	12094258						
Layer: Beige Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (35 %)	Fibrous Glass (45 %)						
<b>PJ39403-42A</b>	12094259						
Layer: Black Coating			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-43A</b>	12094260						
Layer: Blue Carpet			ND				
Layer: Yellow Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)	Synthetic (85 %)						
<b>PJ39403-44A</b>	12094261						
Layer: Green Baseboard			ND				
Layer: White Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					

Client Name: FACS - Fresno

Report Number: B268328

Date Printed: 11/09/18

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-45A</b>	12094262						
Layer: White Drywall			ND				
Layer: Tan Fibrous Material			ND				
Layer: Beige Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (75 %)      Synthetic (3 %)							
<b>PJ39403-45B</b>	12094263						
Layer: White Drywall			ND				
Layer: Tan Fibrous Material			ND				
Layer: Beige Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (75 %)      Synthetic (3 %)							
<b>PJ39403-46A</b>	12094264						
Layer: Yellow Fibrous Material			ND				
Layer: White Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Fibrous Glass (95 %)							
<b>PJ39403-47A</b>	12094265						
Layer: Black Coating			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-48A</b>	12094266						
Layer: White Sheet Flooring			ND				
Layer: Fibrous Backing			ND				
Layer: Grey Non-Fibrous Material			ND				
Layer: Clear Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (20 %)      Fibrous Glass (5 %)      Synthetic (10 %)							
<b>PJ39403-49A</b>	12094267						
Layer: Black Baseboard			ND				
Layer: White Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-50A</b>	12094268						
Layer: White Drywall			ND				
Layer: White Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (20 %)      Fibrous Glass (5 %)							

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Report Number: B268328

Date Printed: 11/09/18

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-50B</b>	12094269						
Layer: White Drywall			ND				
Layer: White Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (20 %)      Fibrous Glass (5 %)							
<b>PJ39403-51A</b>	12094270						
Layer: White Drywall			ND				
Layer: White Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (20 %)							
<b>PJ39403-52A</b>	12094271						
Layer: White Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-53A</b>	12094272						
Layer: Grey Carpet			ND				
Layer: Yellow Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)      Synthetic (85 %)							
<b>PJ39403-54A</b>	12094273						
Layer: Grey Baseboard			ND				
Layer: White Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-55A</b>	12094274						
Layer: White Drywall			ND				
Layer: Brown Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (50 %)      Fibrous Glass (5 %)							
<b>PJ39403-55B</b>	12094275						
Layer: White Drywall			ND				
Layer: Tan Fibrous Material			ND				
Layer: Beige Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (75 %)      Fibrous Glass (3 %)      Synthetic (3 %)							
<b>PJ39403-56A</b>	12094276						
Layer: White Drywall			ND				
Layer: Yellow Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Fibrous Glass (25 %)							

Client Name: FACS - Fresno

Report Number: B268328

Date Printed: 11/09/18

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-57A</b>	12094277						
Layer: Black Coating			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-58A</b>	12094278						
Layer: Brown Carpet			ND				
Layer: Yellow Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)		Synthetic (85 %)					
<b>PJ39403-59A</b>	12094279						
Layer: Brown Baseboard			ND				
Layer: White Mastic			ND				
Layer: White Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Synthetic (2 %)							
<b>PJ39403-60A</b>	12094280						
Layer: White Drywall			ND				
Layer: Tan Fibrous Material			ND				
Layer: Beige Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (75 %)		Synthetic (3 %)					
<b>PJ39403-60B</b>	12094281						
Layer: White Drywall			ND				
Layer: Tan Fibrous Material			ND				
Layer: Beige Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (75 %)		Synthetic (3 %)					
<b>PJ39403-61A</b>	12094282						
Layer: Yellow Fibrous Material			ND				
Layer: White Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Fibrous Glass (95 %)							
<b>PJ39403-62A</b>	12094283						
Layer: Black Coating			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-63A</b>	12094284						
Layer: Brown Carpet			ND				
Layer: Yellow Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)		Synthetic (85 %)					

Client Name: FACS - Fresno

Report Number: B268328

Date Printed: 11/09/18

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-64A</b>	12094285						
Layer: Brown Baseboard			ND				
Layer: White Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-65A</b>	12094286						
Layer: White Drywall			ND				
Layer: Tan Fibrous Material			ND				
Layer: Beige Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (75 %)	Synthetic (3 %)						
<b>PJ39403-66A</b>	12094287						
Layer: Yellow Fibrous Material			ND				
Layer: White Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Fibrous Glass (95 %)							
<b>PJ39403-67A</b>	12094288						
Layer: Black Coating			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-68A</b>	12094289						
Layer: Green Carpet			ND				
Layer: Clear Mastic			ND				
Layer: Grey Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)	Synthetic (85 %)						
<b>PJ39403-69A</b>	12094290						
Layer: Green Baseboard			ND				
Layer: White Mastic			ND				
Layer: White Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Synthetic (3 %)							
<b>PJ39403-70A</b>	12094291						
Layer: White Drywall			ND				
Layer: Tan Fibrous Material			ND				
Layer: Beige Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (75 %)	Fibrous Glass (5 %)	Synthetic (3 %)					
<b>PJ39403-71A</b>	12094292						
Layer: Beige Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (35 %)	Fibrous Glass (45 %)						

Client Name: FACS - Fresno

Report Number: B268328

Date Printed: 11/09/18

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-72A</b>	12094293						
Layer: Black Coating			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-73A</b>	12094294						
Layer: Green Carpet			ND				
Layer: Yellow Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)	Synthetic (85 %)						
<b>PJ39403-74A</b>	12094295						
Layer: Green Baseboard			ND				
Layer: White Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-75A</b>	12094296						
Layer: White Drywall			ND				
Layer: Tan Fibrous Material			ND				
Layer: Beige Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (75 %)	Synthetic (3 %)						
<b>PJ39403-75B</b>	12094297						
Layer: White Drywall			ND				
Layer: Tan Fibrous Material			ND				
Layer: Beige Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (75 %)	Synthetic (3 %)						
<b>PJ39403-76A</b>	12094298						
Layer: Yellow Fibrous Material			ND				
Layer: White Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Fibrous Glass (95 %)							
<b>PJ39403-77A</b>	12094299						
Layer: Black Coating			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-78A</b>	12094300						
Layer: Brown Carpet			ND				
Layer: White Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)	Synthetic (85 %)						

Client Name: FACS - Fresno

Report Number: B268328

Date Printed: 11/09/18

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-79A</b>	12094301						
Layer: Brown Baseboard			ND				
Layer: White Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-80A</b>	12094302						
Layer: Black Coating			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-81A</b>	12094303						
Layer: Beige Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (80 %)							
<b>PJ39403-82A</b>	12094304						
Layer: White Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
<b>PJ39403-83A</b>	12094305						
Layer: Grey Carpet			ND				
Layer: Yellow Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace) Synthetic (85 %)							
<b>PJ39403-84A</b>	12094306						
Layer: Grey Baseboard			ND				
Layer: White Mastic			ND				
Layer: White Semi-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Synthetic (2 %)							
<b>PJ39403-85A</b>	12094307						
Layer: White Drywall			ND				
Layer: Tan Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (70 %) Fibrous Glass (10 %)							
<b>PJ39403-85B</b>	12094308						
Layer: Tan Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (99 %)							
<b>PJ39403-86A</b>	12094309						
Layer: Beige Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (35 %) Fibrous Glass (45 %)							

Client Name: FACS - Fresno

Report Number: B268328

Date Printed: 11/09/18

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-87A</b>	12094310						
Layer: Grey Sheet Flooring			ND				
Layer: Fibrous Backing			ND				
Layer: Yellow Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)	Synthetic (80 %)						
<b>PJ39403-88A</b>	12094311						
Layer: Grey Non-Fibrous Material			ND				
Layer: Off-White Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-89A</b>	12094312						
Layer: White Semi-Fibrous Material			ND				
Layer: Off-White Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)	Fibrous Glass (5 %)						
<b>PJ39403-89B</b>	12094313						
Layer: Off-White Non-Fibrous Material			ND				
Layer: Yellow Mastic			ND				
Layer: White Drywall			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (20 %)	Fibrous Glass (10 %)						
<b>PJ39403-90A</b>	12094314						
Layer: Off-White Sheet Flooring			ND				
Layer: Fibrous Backing			ND				
Layer: Yellow Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (20 %)	Fibrous Glass (5 %)	Synthetic (10 %)					
<b>PJ39403-91A</b>	12094315						
Layer: Grey Carpet			ND				
Layer: Off-White Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)	Synthetic (85 %)						
<b>PJ39403-92A</b>	12094316						
Layer: Blue Non-Fibrous Material			ND				
Layer: Off-White Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-93A</b>	12094317						
Layer: Tan Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (95 %)							

Client Name: FACS - Fresno

Report Number: B268328

Date Printed: 11/09/18

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-93B</b>	12094318						
Layer: Tan Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (99 %)							
<b>PJ39403-94A</b>	12094319						
Layer: Yellow Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)      Fibrous Glass (99 %)							
<b>PJ39403-95A</b>	12094320						
Layer: Black Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-96A</b>	12094321						
Layer: Grey Sheet Flooring			ND				
Layer: Fibrous Backing			ND				
Layer: Yellow Mastic			ND				
Layer: Grey Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)      Synthetic (80 %)							
<b>PJ39403-97A</b>	12094322						
Layer: Blue Non-Fibrous Material			ND				
Layer: Off-White Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-98A</b>	12094323						
Layer: Tan Fibrous Material			ND				
Layer: Off-White Mastic			ND				
Layer: White Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (70 %)							
<b>PJ39403-98B</b>	12094324						
Layer: Tan Fibrous Material			ND				
Layer: Grey Mastic			ND				
Layer: White Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (70 %)							
<b>PJ39403-99A</b>	12094325						
Layer: Tan Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (95 %)							

Client Name: FACS - Fresno

Report Number: B268328

Date Printed: 11/09/18

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-100A</b>	12094326						
Layer: White Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-101A</b>	12094327						
Layer: Grey Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-102A</b>	12094328						
Layer: Brown Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-103A</b>	12094329						
Layer: Grey Non-Fibrous Material		Chrysotile	2 %				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (2%)					
Cellulose (Trace)							
<b>PJ39403-104A</b>	12094330						
Layer: Grey Non-Fibrous Material		Chrysotile	2 %				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (2%)					
Cellulose (Trace)							
<b>PJ39403-105A</b>	12094331						
Layer: Grey Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-106A</b>	12094332						
Layer: Grey Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-107A</b>	12094333						
Layer: White Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-108A</b>	12094334						
Layer: Grey Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							

Client Name: FACS - Fresno

Report Number: B268328

Date Printed: 11/09/18

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-109A</b>	12094335						
Layer: Grey Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-110A</b>	12094336						
Layer: Grey Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-111A</b>	12094337						
Layer: Grey Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-112A</b>	12094338						
Layer: White Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-113A</b>	12094339						
Layer: Grey Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-114A</b>	12094340						
Layer: Grey Non-Fibrous Material		Chrysotile	2 %				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (2%)					
Cellulose (Trace)							
<b>PJ39403-115A</b>	12094341						
Layer: Grey Non-Fibrous Material		Chrysotile	2 %				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (2%)					
Cellulose (Trace)							
<b>PJ39403-116A</b>	12094342						
Layer: Grey Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							

Client Name: FACS - Fresno

Report Number: B268328

Date Printed: 11/09/18

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-117A</b>	12094343						
Layer: Grey Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-118A</b>	12094344						
Layer: Grey Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-119A</b>	12094345						
Layer: Grey Non-Fibrous Material		Chrysotile	2 %				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (2%)					
Cellulose (Trace)							
<b>PJ39403-120A</b>	12094346						
Layer: Grey Non-Fibrous Material		Chrysotile	2 %				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (2%)					
Cellulose (Trace)							
<b>PJ39403-121A</b>	12094347						
Layer: Brown Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-122A</b>	12094348						
Layer: Grey Non-Fibrous Material		Chrysotile	2 %				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (2%)					
Cellulose (Trace)							
<b>PJ39403-123A</b>	12094349						
Layer: Grey Non-Fibrous Material		Chrysotile	2 %				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (2%)					
Cellulose (Trace)							
<b>PJ39403-123B</b>	12094350						
Layer: Grey Non-Fibrous Material		Chrysotile	2 %				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (2%)					
Cellulose (Trace)							

Client Name: FACS - Fresno

Report Number: B268328

Date Printed: 11/09/18

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-124A</b>	12094351						
Layer: Tan Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (95 %)							
<b>PJ39403-125A</b>	12094352						
Layer: Grey Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-126A</b>	12094353						
Layer: Grey Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-127A</b>	12094354						
Layer: Grey Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-128A</b>	12094355						
Layer: Grey Non-Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-129A</b>	12094356						
Layer: Tan Fibrous Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (95 %)							
<b>PJ39403-130A</b>	12094357						
Layer: Grey Mastic			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-131A</b>	12094358						
Layer: White Non-Fibrous Material			ND				
Layer: White Fibrous Material			ND				
Layer: Grey Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace) Synthetic (30 %)							

Client Name: FACS - Fresno

Report Number: B268328

Date Printed: 11/09/18

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-132A</b>	12094359						
Layer: Grey Mastic		Chrysotile	2 %				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (2%)					
Cellulose (Trace)							
<b>PJ39403-133A</b>	12094360						
Layer: Grey Mastic			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-134A</b>	12094361						
Layer: Grey Mastic			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-135A</b>	12094362						
Layer: Grey Mastic			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-136A</b>	12094363						
Layer: Grey Mastic			ND				
Layer: Yellow Foam			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-137A</b>	12094364						
Layer: Grey Mastic			ND				
Layer: Yellow Foam			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-138A</b>	12094365						
Layer: Grey Mastic		Chrysotile	2 %				
Layer: Yellow Foam			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (Trace)					
Cellulose (Trace)							
<b>PJ39403-139A</b>	12094366						
Layer: Grey Mastic			ND				
Layer: Yellow Foam			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							

Client Name: FACS - Fresno

Report Number: B268328

Date Printed: 11/09/18

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>PJ39403-140A</b>	12094367						
Layer: Grey Mastic		Chrysotile	2 %				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (2%)					
Cellulose (Trace)							
<b>PJ39403-141A</b>	12094368						
Layer: Brown Mastic			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-142A</b>	12094369						
Layer: Grey Mastic			ND				
Layer: Yellow Foam			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>PJ39403-143A</b>	12094370						
Layer: Grey Mastic		Chrysotile	2 %				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (2%)					
Cellulose (Trace)							
<b>PJ39403-144A</b>	12094371						
Layer: Off-White Mastic		Chrysotile	2 %				
Layer: Yellow Foam			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (Trace)					
Cellulose (Trace)							



Tad Thrower, Laboratory Supervisor, Hayward Laboratory

Note: Limit of Quantification ('LOQ') = 1%. 'Trace' denotes the presence of asbestos below the LOQ. 'ND' = 'None Detected'.

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## **Appendix B**

### **XRF Lead Testing Data, Chain of Custody, Lead Bulk Sample Chain of Custody, Laboratory Results Report and CDPH Form 8552**



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## **Fresno Unified School District**

**Addams Elementary School**

**Building B & Portables**

**Lead Based Paint Survey By XRF**

**November 1, 2018**

**SURVEY BY**

**HAZARD MANAGEMENT SERVICES**

**A DIVISION OF**

**FORENSIC ANALYTICAL CONSULTING SERVICES**

**371 E BULLARD AVE., SUITE 109**

**FRESNO, CA 93710**

**(559) 436-0277**



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**Fresno Unified School District**

**Addams Elementary School**

**Building B & Portables**

**Lead Based Paint Survey By XRF**

**REVIEWED BY**

**Joseph Vuglia**

**CDPH CERTIFIED LEAD INSPECTOR/ASSESSOR  
CERT. #IA-22314 EXPIRATION 8-10-19**



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## LEAD-BASED PAINT (LBP) INSPECTION AND SAMPLE PROTOCOL

The lead-based paint survey at this site was conducted using the following inspection and sampling protocol:

### DEFINITION OF LEAD-BASED PAINT

EPA/HUD/DHS: Paint which contains at least 1.0 mg/cm<sup>2</sup>, 5000 parts per million, or 0.5% by weight of lead.

OSHA/Cal/OSHA: Lead containing paint which contains any detectable lead.

Cal/OSHA requires notification if over 100 sq. ft. of lead-based paint (1.0 mg/cm<sup>2</sup> or higher) or presumed LBP (untested paint) is disturbed.

### CONSTRUCTION YEARS

The building construction years were provided by FUSD, were listed on manufacturer's tags (portables), or were unknown to the inspector.

The condition of the paint was classified as follows:

**INTACT:** Paint is in good condition, with no chips, abrasions or delamination.

**FAIR:** Paint is reasonably intact, with minor chips and slight abrasions.

**POOR:** Paint is chipped, scraped, delaminated, or peeling.

### EQUIPMENT AND CALIBRATION

Lead-based paint determination was performed using a Niton X-Ray Fluorescence (XRF) detector. Verification of calibration was performed prior to, and immediately following testing.

### DISCLAIMER

Hazard Management Services, Inc. (HMS, Inc.) has made every effort to sample every non-intact paint type and substrate within the structures at this site. If a painted surface that will be disturbed is not intact, and the paint is not listed in this report, the paint must be assumed to contain lead.



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**SURVEY FOR LEAD BASED PAINT  
Fresno Unified School District**

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<b>Site Name:</b>	Addams Elementary School							<b>Date:</b>	November 1, 2018	
<b>Address:</b>	2117 W. McKinley Ave., Fresno, CA 93728							<b>HMS Job #:</b>	Pj39403	
<b>Start Time:</b>	9:20	<b>Calibration:</b>	<b>1.04 =</b>	1.0	<b>1.04 =</b>	0.9	<b>1.04 =</b>	0.9	<b>Technician:</b>	Jacob Sharp - 28717
<b>End Time:</b>	12:20	<b>Calibration:</b>	<b>1.04 =</b>	0.9	<b>1.04 =</b>	1.0	<b>1.04 =</b>	0.8	<b>Inspector/Assessor:</b>	Joseph M Vuglia - 22314
<b>Niton XLP 300 22263</b>		<b>See Lead-Based Paint Inspections, Sampling Protocol, &amp; Definition of Lead-Based Paint on Page 1</b>							<b>Condition Codes: I = Intact, F = Fair, P = Poor</b>	
<b>No.</b>	<b>Sample Location</b>					<b>Component</b>	<b>Substrate</b>	<b>Color</b>	<b>Condition</b>	<b>XRF Result (mg/cm2)</b>
1.	<b>Building B – Interior (Built Date Unknown)</b>									
2.	Administration - South Side West End					Door	Metal	White	I	0.00
3.	Administration - South Side West End					Window Frame	Metal	White	I	0.00
4.	Administration - East Side North End					Window Frame	Metal	White	I	0.00
5.	Hallway - North Side West End					Wall	Plaster	Cream	I	0.00
6.	Hallway - South Side West End At Vice Principal 2					Door Frame	Metal	White	I	0.00
7.	Hallway - South Side West End At Vice Principal 2					Door	Wood	Varnish	I	0.00
8.	Hallway - South Side West End At Vice Principal 2					Door Window	Metal	White	I	0.00
9.	Hallway - North Side Center					Door	Metal	White	I	0.00
10.	Restroom Foyer - North Side East End					Wall	Drywall	White	I	0.00
11.	Work Room - East Side Center					Wall	Concrete	White	I	0.00
12.	Men's Restroom - East Side Center					Wall	Drywall	White	I	0.00
13.	Men's Restroom - East Side Center					Wall	Fiber Reinf. Panel	White	I	0.00
14.	Men's Restroom - East Side					Sink	Porcelain	White	I	11.00
15.	Men's Restroom - East Side					Toilet	Porcelain	White	I	0.01
16.	Men's Restroom - North Side					Window Sill	Wood	White	I	0.08
17.	Men's Restroom - North Side					Window Frame	Wood	White	I	0.18
18.	Men's Restroom - North Side					Window	Wood	White	I	0.17



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**SURVEY FOR LEAD BASED PAINT**  
**Fresno Unified School District**

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<b>Address:</b>	2117 W. McKinley Ave., Fresno, CA 93728							<b>HMS Job #:</b>	Pj39403	
<b>Start Time:</b>	9:20	<b>Calibration:</b>	<b>1.04 =</b>	1.0	<b>1.04 =</b>	0.9	<b>1.04 =</b>	0.9	<b>Technician:</b>	Jacob Sharp - 28717
<b>End Time:</b>	12:20	<b>Calibration:</b>	<b>1.04 =</b>	0.9	<b>1.04 =</b>	1.0	<b>1.04 =</b>	0.8	<b>Inspector/Assessor:</b>	Joseph M Vuglia - 22314
<b>Niton XLP 300 22263</b>		<b>See Lead-Based Paint Inspections, Sampling Protocol, &amp; Definition of Lead-Based Paint on Page 1</b>							<b>Condition Codes:</b> I = Intact, F = Fair, P = Poor	
No.	Sample Location	Component	Substrate	Color	Condition	XRF Result (mg/cm2)				
19.	<b>Building B – Interior (Continued)</b>									
20.	Men's Restroom - North Side Center	Floor	Epoxy	Blue	I	0.00				
21.	Nurse Restroom – At Center	Floor	Ceramic Tile - 2"	Gray	I	0.00				
22.	Nurse Restroom - East Side Center	Wall	Ceramic Tile - 6"	Cream	I	0.01				
23.	Nurse Restroom - East Side Center	Wall	Plaster	Off-White	I	0.00				
24.	Nurse Restroom - East Side Center	Wall	Fiber Reinf. Panel	White	I	0.00				
25.	Nurse Restroom - North Side	Sink	Porcelain	White	I	0.00				
26.	Nurse Restroom - South Side	Toilet	Porcelain	White	I	0.01				
27.	<b>Building B – Exterior</b>									
28.	South Side West End	Door	Metal	Blue	I	0.00				
29.	South Side West End	Door Frame	Metal	Blue	I	0.00				
30.	South Side West End	Wall	Stucco	Tan	I	0.00				
31.	South Side West End	Window	Wood	Tan	I	0.00				
32.	South Side West End	Window Screen	Metal	Tan	I	0.00				
33.	North Side Center	Window Lite	Metal	Blue	I	0.00				
34.	North Side Center	Window	Metal	Tan	I	4.00				
35.	North Side Center	Window Sill	Wood	Tan	I	8.10				
36.	North Side Center	Window Frame	Wood	Tan	I	7.60				



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<b>Niton XLP 300 22263</b>		<b>See Lead-Based Paint Inspections, Sampling Protocol, &amp; Definition of Lead-Based Paint on Page 1</b>								<b>Condition Codes: I = Intact, F = Fair, P = Poor</b>	
<b>No.</b>	<b>Sample Location</b>					<b>Component</b>	<b>Substrate</b>	<b>Color</b>	<b>Condition</b>	<b>XRF Result (mg/cm2)</b>	
37.	<b>PCR 650 (with PCR 649) - Interior (1988)</b>										
38.	South Side East End					Door Frame	Metal	Brown	I	0.02	
39.	South Side East End					Door	Metal	White	I	0.01	
40.	South Side East Of Center					Wall	Tackboard	Beige	I	0.00	
41.	<b>PCR 650 (with PCR 649) - Exterior</b>										
42.	South Side East End					Door	Metal	Blue	I	0.02	
43.	South Side East End					Door Frame	Metal	Blue	I	0.01	
44.	South Side East End					Wall	Wood	Tan	I	0.00	
45.	South Side East End					Building Frame	Metal	Tan	I	0.00	
46.	South Side East End					Downspout	Metal	Tan	I	0.08	
47.	South Side East End					Overhang	Metal	Tan	I	0.08	
48.	South Side East End					Gutter	Metal	Blue	I	0.02	
49.	South Side East End					Roof Flashing	Metal	Blue	I	0.02	
50.	South Side West End					Window Trim	Wood	Blue	I	0.04	
51.	North Side Center					HVAC Cabinet	Metal	Tan	I	0.00	
52.	<b>PCR 1178 (with PCR 1176, 1177, 1179, 1180) – Exterior (1998)</b>										
53.	North Side West End					Door	Metal	Blue	I	0.00	
54.	North Side West End					Door Frame	Metal	Blue	I	0.00	



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<b>End Time:</b>	12:20	<b>Calibration:</b>	<b>1.04 =</b>	0.9	<b>1.04 =</b>	1.0	<b>1.04 =</b>	0.8	<b>Inspector/Assessor:</b>	Joseph M Vuglia - 22314	
<b>Niton XLP 300 22263</b>		<b>See Lead-Based Paint Inspections, Sampling Protocol, &amp; Definition of Lead-Based Paint on Page 1</b>								<b>Condition Codes: I = Intact, F = Fair, P = Poor</b>	
<b>No.</b>	<b>Sample Location</b>					<b>Component</b>	<b>Substrate</b>	<b>Color</b>	<b>Condition</b>	<b>XRF Result (mg/cm2)</b>	
55.	<b>PCR 1178 (with PCR 1176, 1177, 1179, 1180) – Exterior (Cont.)</b>										
56.	North Side West End					Door Trim	Wood	Blue	I	0.00	
57.	North Side West End					Wall	Wood	Tan	I	0.00	
58.	North Side West End					Building Frame	Metal	Tan	I	0.00	
59.	North Side East End					Window Frame	Wood	Blue	I	0.00	
60.	East Side Center					Wall	Wood	Black	I	0.00	
61.	East Side Center					Wall	Wood	Brown	I	0.00	
62.	East Side Center					Wall	Wood	Blue	I	0.00	
63.	East Side Center					Wall	Wood	Teal	I	0.00	
64.	East Side Center					Wall	Wood	White	I	0.00	
65.	East Side Center					Wall	Wood	Pink	I	0.00	
66.	East Side Center					Wall	Wood	Green	I	0.00	
67.	East Side Center					Wall	Wood	Gold	I	0.00	
68.	North Side East End					Overhang	Metal	Tan	I	0.00	
69.	North Side East End					Roof Flashing	Metal	Blue	I	0.00	
70.	South Side East End					Downspout	Metal	Tan	I	0.00	
71.	South Side Center					HVAC Cabinet	Metal	Tan	I	0.00	
72.											



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<b>Niton XLP 300 22263</b>		<b>See Lead-Based Paint Inspections, Sampling Protocol, &amp; Definition of Lead-Based Paint on Page 1</b>							<b>Condition Codes: I = Intact, F = Fair, P = Poor</b>	
<b>No.</b>	<b>Sample Location</b>					<b>Component</b>	<b>Substrate</b>	<b>Color</b>	<b>Condition</b>	<b>XRF Result (mg/cm2)</b>
73.	<b>PCR 1176 - Exterior (1998)</b>									
74.	North Side West East					Door Frame	Metal	Brown	I	0.00
75.	North Side West End					Door	Metal	White	I	0.00
76.	North Side West End					Window Frame	Wood	White	I	0.00
77.	<b>PCR 716 – Interior (1989)</b>									
78.	South Side East End					Door Frame	Metal	Brown	I	0.00
79.	South Side East End					Door	Metal	Black	I	0.00
80.	South Side East OF Center					Wall	Tackboard	Beige	I	0.00
81.	<b>PCR 716 – Exterior</b>									
82.	South Side East End					Door	Metal	Blue	I	0.00
83.	South Side East End					Door Frame	Metal	Blue	I	0.00
84.	South Side East End					Wall	Wood	Tan	I	0.00
85.	South Side East End					Downspout	Metal	Tan	I	0.00
86.	South Side West End					Window Frame	Wood	Blue	I	0.00
87.	South Side West End					Window Screen	Metal	Black	I	0.00
88.	South Side East End					Handrail	Metal	Blue	I	0.00
89.	South Side East End					Overhang	Metal	Tan	I	0.00
90.	South Side East End					Gutter	Metal	Blue	I	0.01



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<b>Start Time:</b>	9:20	<b>Calibration:</b>	<b>1.04 =</b>	1.0	<b>1.04 =</b>	0.9	<b>1.04 =</b>	0.9	<b>Technician:</b>	Jacob Sharp - 28717
<b>End Time:</b>	12:20	<b>Calibration:</b>	<b>1.04 =</b>	0.9	<b>1.04 =</b>	1.0	<b>1.04 =</b>	0.8	<b>Inspector/Assessor:</b>	Joseph M Vuglia - 22314
<b>Niton XLP 300 22263</b>		<b>See Lead-Based Paint Inspections, Sampling Protocol, &amp; Definition of Lead-Based Paint on Page 1</b>							<b>Condition Codes: I = Intact, F = Fair, P = Poor</b>	
No.	Sample Location				Component	Substrate	Color	Condition	XRF Result (mg/cm2)	
91.	<b>PCR 716 – Exterior (Continued)</b>									
92.	South Side East End				Roof Flashing	Metal	Blue	I	0.01	
93.	North Side Center				HVAC Unit	Metal	Tan	I	0.00	
94.	<b>PCR 316 – Interior (1985)</b>									
95.	North Side East End				Door	Metal	White	I	0.00	
96.	North Side East End				Door Frame	Metal	Brown	I	0.00	
97.	North side East Of Center				Wall	Tackboard	Beige	I	0.00	
98.	<b>PCR 316 – Exterior</b>									
99.	North Side East End				Door	Metal	Blue	I	0.00	
100.	North Side East End				Door Frame	Metal	Blue	I	0.00	
101.	North Side West End				Wall	Wood	Tan	I	0.00	
102.	North Side West End				Downspout	Metal	Tan	I	0.00	
103.	North Side West End				Overhang	Metal	Tan	I	0.00	
104.	North Side West End				Gutter	Metal	Blue	I	0.00	
105.	North Side West End				HVAC Unit	Metal	Tan	I	0.00	
106.	North Side West End				Building Frame	Metal	Tan	I	0.00	
107.	North Side West End				Window Trim	Wood	Blue	I	0.00	
108.	North Side East End				Door Trim	Wood	Blue	I	0.00	



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<b>Niton XLP 300 22263</b>		<b>See Lead-Based Paint Inspections, Sampling Protocol, &amp; Definition of Lead-Based Paint on Page 1</b>							<b>Condition Codes: I = Intact, F = Fair, P = Poor</b>	
<b>No.</b>	<b>Sample Location</b>					<b>Component</b>	<b>Substrate</b>	<b>Color</b>	<b>Condition</b>	<b>XRF Result (mg/cm2)</b>
109.	<b>PCR 378 (with PCR 423) - Interior (1986)</b>									
110.	North Side East End					Door	Metal	White	I	0.03
111.	North Side East End					Door Frame	Metal	Brown	I	0.00
112.	<b>PCR 378 (with PCR 423) - Exterior</b>									
113.	North Side East End					Door	Metal	Blue	I	0.00
114.	North Side East End					Door Frame	Metal	Blue	I	0.00
115.	North Side East End					Wall	Wood	Tan	I	0.00
116.	North Side East End					Building Frame	Metal	Tan	I	0.00
117.	North Side East End					Overhang	Metal	Tan	I	0.00
118.	North Side East End					Gutter	Metal	Blue	I	0.00
119.	North Side East End					Downspout	Metal	Tan	I	0.00
120.	North Side West End					Window Trim	Wood	Blue	I	0.00
121.	<b>PCR 542 - Interior (1987)</b>									
122.	East Side North End					Door	Metal	White	I	0.00
123.	East Side North End					Door Frame	Metal	Brown	I	0.01
124.	South Side Center at Restroom					Door	Metal	White	I	0.00
125.	South Side Center at Restroom					Door Frame	Metal	White	I	0.00



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<b>Niton XLP 300 22263</b>		<b>See Lead-Based Paint Inspections, Sampling Protocol, &amp; Definition of Lead-Based Paint on Page 1</b>							<b>Condition Codes: I = Intact, F = Fair, P = Poor</b>	
No.	Sample Location				Component	Substrate	Color	Condition	XRF Result (mg/cm2)	
126.	<b>PCR 542 - Interior (Continued)</b>									
127.	West Side Center in Restroom				Wall	FRP	Cream	I	0.00	
128.	West Side Center in Restroom				Sink	Porcelain	White	I	0.01	
129.	West Side Center in Restroom				Toilet	Porcelain	White	I	0.02	
130.	East Side South End at Wet Area				Sink	Porcelain	White	I	0.09	
131.	<b>PCR 542 - Exterior</b>									
132.	West Side North End				Door	Metal	Blue	I	0.00	
133.	West Side North End				Door Frame	Metal	Blue	I	0.00	
134.	West Side North End				Wall	Wood	Tan	I	0.00	
135.	West Side North End				Building Frame	Metal	Tan	I	0.00	
136.	West Side South End				Building Frame	Metal	Tan	I	0.00	
137.	West Side North End				Overhang	Metal	Tan	I	0.00	
138.	West Side North End				Gutter	Metal	Blue	I	0.00	
139.	West Side North End				Downspout	Metal	Tan	I	0.00	
140.	West Side South End				Window Trim	Wood	Blue	I	0.00	
141.	East Side Center				HVAC Unit	Metal	Tan	I	0.00	
142.	<b>PCR L16 - Interior (1965)</b>									
143.	Classroom - North Side West End				Door	Metal	Brown	I	0.02	



**Hazard  
Management  
Services**

A Division of Forensic Analytical Consulting Services

**SURVEY FOR LEAD BASED PAINT  
Fresno Unified School District**

*A Division of FACS*

<b>Site Name:</b>	Addams Elementary School							<b>Date:</b>	November 1, 2018	
<b>Address:</b>	2117 W. McKinley Ave., Fresno, CA 93728							<b>HMS Job #:</b>	Pj39403	
<b>Start Time:</b>	9:20	<b>Calibration:</b>	<b>1.04 =</b>	1.0	<b>1.04 =</b>	0.9	<b>1.04 =</b>	0.9	<b>Technician:</b>	Jacob Sharp - 28717
<b>End Time:</b>	12:20	<b>Calibration:</b>	<b>1.04 =</b>	0.9	<b>1.04 =</b>	1.0	<b>1.04 =</b>	0.8	<b>Inspector/Assessor:</b>	Joseph M Vuglia - 22314
<b>Niton XLP 300 22263</b>		<b>See Lead-Based Paint Inspections, Sampling Protocol, &amp; Definition of Lead-Based Paint on Page 1</b>							<b>Condition Codes: I = Intact, F = Fair, P = Poor</b>	
No.	Sample Location					Component	Substrate	Color	Condition	XRF Result (mg/cm2)
144.	<b>PCR L16 - Interior (Continued)</b>									
145.	Classroom - North Side West End					Door Frame	Metal	White	I	0.04
146.	Restroom - South Side West End					Door	Metal	White	I	0.17
147.	Restroom - South Side West End					Door Frame	Metal	White	I	0.02
148.	Restroom - East Side Center					Sink	Porcelain	White	I	0.10
149.	Restroom - West Side Center					Toilet	Porcelain	White	I	0.23
150.	<b>PCR L16 - Exterior</b>									
151.	North Side Center					Door	Metal	Blue	I	0.07
152.	North Side Center					Door Frame	Metal	Blue	I	0.00
153.	North Side Center					Wall	Wood	Tan	I	0.08
154.	North Side Center					Building Frame	Metal	Tan	I	0.00
155.	North Side Center					Overhang	Metal	Tan	I	0.30
156.	North Side Center					Overhang Lite	Metal	Blue	I	0.30
157.	North Side Center					Downspout	Metal	Tan	I	0.00
158.	North Side Center					Window Lite	Metal	Tan	I	0.00
159.	<b>PCR 739 (with PCR 736, 737, 738) - Interior (1989)</b>									
160.	North Side East End					Door	Metal	White	I	0.00
161.	North Side East End					Door Frame	Metal	Brown	I	0.00



**Hazard  
Management  
Services**

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<b>Address:</b>	2117 W. McKinley Ave., Fresno, CA 93728								<b>HMS Job #:</b>	Pj39403
<b>Start Time:</b>	9:20	<b>Calibration:</b>	<b>1.04 =</b>	1.0	<b>1.04 =</b>	0.9	<b>1.04 =</b>	0.9	<b>Technician:</b>	Jacob Sharp - 28717
<b>End Time:</b>	12:20	<b>Calibration:</b>	<b>1.04 =</b>	0.9	<b>1.04 =</b>	1.0	<b>1.04 =</b>	0.8	<b>Inspector/Assessor:</b>	Joseph M Vuglia - 22314
<b>Niton XLP 300 22263</b>		<b>See Lead-Based Paint Inspections, Sampling Protocol, &amp; Definition of Lead-Based Paint on Page 1</b>							<b>Condition Codes: I = Intact, F = Fair, P = Poor</b>	
<b>No.</b>	<b>Sample Location</b>					<b>Component</b>	<b>Substrate</b>	<b>Color</b>	<b>Condition</b>	<b>XRF Result (mg/cm2)</b>
162.	<b>PCR 739 (with PCR 736, 737, 738) - Exterior</b>									
163.	North Side East End					Wall	Wood	Tan	I	0.00
164.	North Side East End					Building Frame	Metal	Tan	I	0.00
165.	North Side East End					Door	Metal	Blue	I	0.00
166.	North Side East End					Door Frame	Metal	Blue	I	0.00
167.	North Side East End					Handrail	Metal	Blue	I	0.00
168.	North Side West End					Window Trim	Wood	Blue	I	0.01
169.	North Side East End					Overhang	Metal	Tan	I	0.02
170.	North Side East End					Gutter	Metal	Blue	I	0.00
171.	North Side East End					Downspout	Metal	Tan	I	0.00
172.	South Side Center					HVAC Unit	Metal	Tan	I	0.01
173.	<b>PCR 875 - Interior (1990)</b>									
174.	North Side West End					Door	Metal	White	I	0.00
175.	North Side West End					Door Frame	Metal	Brown	I	0.00
176.	<b>PCR 875 - Exterior</b>									
177.	North Side West End					Door	Metal	Blue	I	0.00
178.	North Side West End					Door Frame	Metal	Blue	I	0.00
179.	North Side West End					Wall	Wood	Tan	I	0.00



**Hazard  
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A Division of Forensic Analytical Consulting Services

**SURVEY FOR LEAD BASED PAINT  
Fresno Unified School District**

*A Division of FACS*

<b>Site Name:</b>	Addams Elementary School								<b>Date:</b>	November 1, 2018
<b>Address:</b>	2117 W. McKinley Ave., Fresno, CA 93728								<b>HMS Job #:</b>	Pj39403
<b>Start Time:</b>	9:20	<b>Calibration:</b>	<b>1.04 =</b>	1.0	<b>1.04 =</b>	0.9	<b>1.04 =</b>	0.9	<b>Technician:</b>	Jacob Sharp - 28717
<b>End Time:</b>	12:20	<b>Calibration:</b>	<b>1.04 =</b>	0.9	<b>1.04 =</b>	1.0	<b>1.04 =</b>	0.8	<b>Inspector/Assessor:</b>	Joseph M Vuglia - 22314
<b>Niton XLP 300 22263</b>		<b>See Lead-Based Paint Inspections, Sampling Protocol, &amp; Definition of Lead-Based Paint on Page 1</b>							<b>Condition Codes: I = Intact, F = Fair, P = Poor</b>	
No.	Sample Location					Component	Substrate	Color	Condition	XRF Result (mg/cm2)
180.	<b>PCR 875 – Exterior (Continued)</b>									
181.	North Side West End					Building Frame	Metal	Tan	I	0.00
182.	North Side East End					Window Trim	Wood	Blue	I	0.00
183.	North Side West End					Handrail	Metal	Blue	I	0.00
184.	North Side West End					Gutter	Metal	Blue	I	0.00
185.	North Side West End					Downspout	Metal	Tan	I	0.00
186.	<b>PCR 375 - Interior (1986)</b>									
187.	North Side East End					Door	Metal	White	I	0.00
188.	North Side East End					Door Frame	Metal	Brown	I	0.00
189.	<b>PCR 375 - Exterior</b>									
190.	North Side East End					Door	Metal	Blue	I	0.00
191.	North Side East End					Door Frame	Metal	Blue	I	0.00
192.	North Side East End					Wall	Wood	Tan	I	0.00
193.	North Side East End					Building Frame	Metal	Tan	I	0.00
194.	North Side West End					Window Trim	Wood	Blue	I	0.00
195.	North Side East End					Handrail	Metal	Blue	I	0.00
196.	North Side East End					Gutter	Metal	Blue	I	0.00
197.	North Side East End					Downspout	Metal	Tan	I	0.00



A Division of Forensic Analytical Consulting Services

**SURVEY FOR LEAD BASED PAINT**  
**Fresno Unified School District**

A Division of FACS

<b>Site Name:</b>	Addams Elementary School							<b>Date:</b>	November 1, 2018	
<b>Address:</b>	2117 W. McKinley Ave., Fresno, CA 93728							<b>HMS Job #:</b>	Pj39403	
<b>Start Time:</b>	9:20	<b>Calibration:</b>	<b>1.04 =</b>	1.0	<b>1.04 =</b>	0.9	<b>1.04 =</b>	0.9	<b>Technician:</b>	Jacob Sharp - 28717
<b>End Time:</b>	12:20	<b>Calibration:</b>	<b>1.04 =</b>	0.9	<b>1.04 =</b>	1.0	<b>1.04 =</b>	0.8	<b>Inspector/Assessor:</b>	Joseph M Vuglia - 22314
<b>Niton XLP 300 22263</b>		<b>See Lead-Based Paint Inspections, Sampling Protocol, &amp; Definition of Lead-Based Paint on Page 1</b>							<b>Condition Codes:</b> I = Intact, F = Fair, P = Poor	
No.	Sample Location	Component	Substrate	Color	Condition	XRF Result (mg/cm2)				
198.	<b>PCR 375 – Exterior (Continued)</b>									
199.	South Side Center	HVAC Unit	Metal	Tan	I	0.01				
200.	<b>PCR 560 - Interior (1987)</b>									
201.	North Side West End	Door	Metal	White	I	0.00				
202.	North Side West End	Door Frame	Metal	Brown	I	0.00				
203.	<b>PCR 560 - Exterior</b>									
204.	North Side West End	Door	Metal	Blue	I	0.00				
205.	North Side West End	Door Frame	Metal	Blue	I	0.00				
206.	North Side West End	Wall	Wood	Tan	I	0.00				
207.	North Side West End	Building Frame	Metal	Tan	I	0.00				
208.	North Side East End	Window Trim	Wood	Blue	I	0.00				
209.	North Side West End	Gutter	Metal	Blue	I	0.00				
210.	North Side West End	Downspout	Metal	Tan	I	0.00				
211.	South Side Center	HVAC Unit	Metal	Tan	I	0.01				
212.	<b>PCR 940 - Interior (1991)</b>									
213.	North Side West End	Door	Metal	White	I	0.00				
214.	North Side West End	Door Frame	Metal	Brown	I	0.00				



**Hazard  
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**SURVEY FOR LEAD BASED PAINT  
Fresno Unified School District**

*A Division of FACS*

<b>Site Name:</b>	Addams Elementary School								<b>Date:</b>	November 1, 2018
<b>Address:</b>	2117 W. McKinley Ave., Fresno, CA 93728								<b>HMS Job #:</b>	Pj39403
<b>Start Time:</b>	9:20	<b>Calibration:</b>	<b>1.04 =</b>	1.0	<b>1.04 =</b>	0.9	<b>1.04 =</b>	0.9	<b>Technician:</b>	Jacob Sharp - 28717
<b>End Time:</b>	12:20	<b>Calibration:</b>	<b>1.04 =</b>	0.9	<b>1.04 =</b>	1.0	<b>1.04 =</b>	0.8	<b>Inspector/Assessor:</b>	Joseph M Vuglia - 22314
<b>Niton XLP 300 22263</b>		<b>See Lead-Based Paint Inspections, Sampling Protocol, &amp; Definition of Lead-Based Paint on Page 1</b>							<b>Condition Codes: I = Intact, F = Fair, P = Poor</b>	
No.	Sample Location	Component	Substrate	Color	Condition	XRF Result (mg/cm2)				
215.	<b>PCR 940 - Exterior</b>									
216.	North Side West End	Door	Metal	Blue	I	0.00				
217.	North Side West End	Door Frame	Metal	Blue	I	0.00				
218.	North Side West End	Wall	Wood	Tan	I	0.00				
219.	North Side West End	Building Frame	Metal	Tan	I	0.00				
220.	North Side East End	Window Trim	Wood	Blue	I	0.00				
221.	North Side East End	Handrail	Metal	Blue	I	0.00				
222.	North Side West End	Gutter	Metal	Blue	I	0.00				
223.	North Side West End	Downspout	Metal	Tan	I	0.00				
224.	South Side Center	HVAC Unit	Metal	Tan	I	0.01				
225.	<b>PCR 1528 (Restrooms) - Interior (2007)</b>									
226.	East Side Center at Women's Restroom	Door	Metal	Green	I	0.00				
227.	East Side Center at Women's Restroom	Door Frame	Metal	Green	I	0.00				
228.	East Side Center at Women's Restroom	Wall	FRP	White	I	0.00				
229.	West Side Center at Women's Restroom	Sink	Porcelain	White	I	0.00				
230.	West Side Center at Women's Restroom	Toilet	Porcelain	White	I	0.00				
231.	West Side Center at Women's Restroom	Partition	Plastic	Brown	I	0.00				
232.										



A Division of Forensic Analytical Consulting Services

**SURVEY FOR LEAD BASED PAINT**  
**Fresno Unified School District**

*A Division of FACS*

<b>Site Name:</b>	Addams Elementary School							<b>Date:</b>	November 1, 2018	
<b>Address:</b>	2117 W. McKinley Ave., Fresno, CA 93728							<b>HMS Job #:</b>	Pj39403	
<b>Start Time:</b>	9:20	<b>Calibration:</b>	<b>1.04 =</b>	1.0	<b>1.04 =</b>	0.9	<b>1.04 =</b>	0.9	<b>Technician:</b>	Jacob Sharp - 28717
<b>End Time:</b>	12:20	<b>Calibration:</b>	<b>1.04 =</b>	0.9	<b>1.04 =</b>	1.0	<b>1.04 =</b>	0.8	<b>Inspector/Assessor:</b>	Joseph M Vuglia - 22314
<b>Niton XLP 300 22263</b>		<b>See Lead-Based Paint Inspections, Sampling Protocol, &amp; Definition of Lead-Based Paint on Page 1</b>							<b>Condition Codes:</b> I = Intact, F = Fair, P = Poor	
No.	Sample Location	Component	Substrate	Color	Condition	XRF Result (mg/cm2)				
233.	<b>PCR 1528 (Restrooms) - Exterior</b>									
234.	East Side Center at Women's Restroom	Door	Metal	Blue	I	0.00				
235.	East Side Center at Women's Restroom	Door Frame	Metal	Blue	I	0.00				
236.	East Side Center at Women's Restroom	Wall	Wood	Tan	I	0.00				
237.	South Side West End	Door Trim	Wood	Blue	I	0.00				
238.	North Side Center	Overhang	Metal	Tan	I	0.00				
239.	North Side West End	Downspout	Metal	Tan	I	0.00				
240.	North Side West End	Gutter	Metal	Blue	I	0.00				
241.										



# PAINT CHIP SAMPLE REQUEST FORM

Page 1 of 2

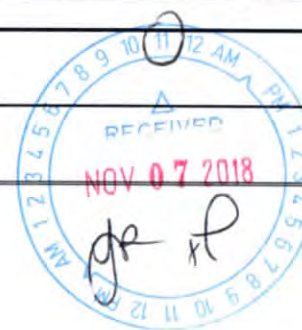
Client:	<b>FR09 FACS Fresno</b> <b>FRESNO UNIFIED SCHOOL DISTRICT</b>	Sampled by:	<b>Jacob Sharp</b>	PM:	<b>Joseph Vuglia</b>	Date:	<b>11/05/18</b>
Contact:	<b>Joseph Vuglia</b>	Phone:	<b>(559) 436-0277</b>				
Site:	<b>FRESNO UNIFIED SCHOOL DISTRICT</b> <b>Addams Elementary School</b>		Special Instructions:	E-mail results to E-mail results to jvuglia@forensicanalytical.com and dpyle@forensicanalytical.com			
Turnaround Time:	1-Day	2-Day	3-Day	5-Day	Other	Due Date and Time:	
			<b>X</b>			<b>Standard</b>	
Client No.:	<b>C23033</b>	FACS Job #:	<b>PJ39403</b>				
Analysis:	Flame AA (Pb)						

Sample Number	Sample Location	Component	Color	Substrate	Condition
PJ39403-01pb	PCR 940: Exterior – north side east end	Handrail	Blue	Metal	Fair
PJ39403-02pb	PCR 560: Exterior – north side west end	Downspout	Tan	Metal	Intact
PJ39403-03pb	Classroom 34 (DSA57883): Exterior – south side west end	Wall	Tan	Wood	Fair
PJ39403-04pb	PCR 875: Exterior - south side east end	Window trim	Blue	Wood	Intact
PJ39403-05pb	Portable Restroom: Exterior – south side west end	Door trim	Blue	Wood	Fair
PJ39403-06pb	PCR 1178: Exterior – north side east end	Door	Blue	Metal	Intact
PJ39403-07pb	PCR 650: Exterior – south side west end	Door Frame	Blue	Metal	Intact
PJ39403-08pb	PCR 716: Exterior – south side east end	Downspout	Tan	Metal	Fair

Substrate: wood metal concrete plaster drywall brick

Shipped via: Fed Ex

Relinquished by:	Date & Time: <b>11/5/18</b> <b>11:00</b>	Received by:	Date & Time:
Relinquished by:	Date & Time:	Received by:	Date & Time:
Condition Acceptable <input type="checkbox"/> Yes <input type="checkbox"/> No		Condition Acceptable <input type="checkbox"/> Yes <input type="checkbox"/> No	





# PAINT CHIP SAMPLE REQUEST FORM

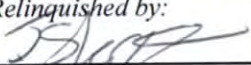
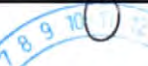
Page 2 of 2

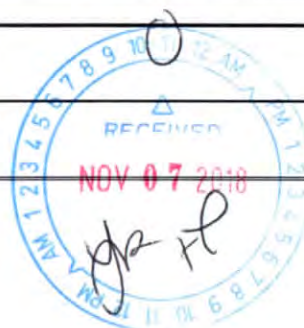
Client: <b>FR09 FACS Fresno</b> <b>FRESNO UNIFIED SCHOOL DISTRICT</b>	Sampled by: <b>Jacob Sharp</b>	PM: <b>Joseph Vuglia</b>	Date: <b>11/05/18</b>
Contact: <b>Joseph Vuglia</b> Phone: <b>(559) 436-0277</b>	Special Instructions: E-mail results to E-mail results to jvuglia@forensicanalytical.com and dpyle@forensicanalytical.com		
Site: <b>FRESNO UNIFIED SCHOOL DISTRICT</b> <b>Addams Elementary School</b>	Turnaround Time:	1-Day	2-Day
		3-Day <b>X</b>	5-Day
		Other	Due Date and Time: <b>Standard</b>
Client No.: <b>C23033</b>	<b>FACS</b> Job #: <b>PJ39403</b>	Analysis: <b>Flame AA (Pb)</b>	

Sample Number	Sample Location	Component	Color	Substrate	Condition
PJ39403-09pb	PCR 316: Exterior – north side west end	Wall	Tan	Wood	Intact
PJ39403-10pb	PCR 378: Exterior – north side east end	Wall	Tan	Wood	Fair
PJ39403-11pb	PCR 542 (TK1): Exterior – south side west end	Building Frame	Tan	Metal	Fair
PJ39403-12pb	Tk2 (DSA 27146): Exterior – south side center	Wall	Tan	Wood	Fair

Substrate: wood metal concrete plaster drywall brick

Shipped via: Fed Ex

Relinquished by: 	Date & Time: <b>11/5/18</b> <b>11:00</b>	Received by: 	Date & Time:
Relinquished by:	Date & Time:	Received by:	Condition Acceptable <input type="checkbox"/> Yes <input type="checkbox"/> No
			Date & Time:
			Condition Acceptable <input type="checkbox"/> Yes <input type="checkbox"/> No





# Metals Analysis of Paints

(AIHA-LAP, LLC Accreditation, Lab ID #101762)

FACS - Fresno  
Joseph Vuglia  
21228 Cabot Blvd.  
  
Hayward, CA 94545

**Client ID:** FR09  
**Report Number:** M204643  
**Date Received:** 11/07/18  
**Date Analyzed:** 11/12/18  
**Date Printed:** 11/12/18  
**First Reported:** 11/12/18

**Job ID / Site:** PJ39403; FRESNO UNIFIED SCHOOL DISTRICT Addams Elementary School  
2117 W. McKinley Ave Fresno CA 93728

**FALI Job ID:** FR09

**Date(s) Collected:** 11/5/18

**Total Samples Submitted:** 12

**Total Samples Analyzed:** 12

Sample Number	Lab Number	Analyte	Result	Result Units	Reporting Limit*	Method Reference
PJ39403-01PB	30818894	Pb	< 0.007	wt%	0.007	EPA 3050B/7000B
PJ39403-02PB	30818895	Pb	0.015	wt%	0.006	EPA 3050B/7000B
PJ39403-03PB	30818896	Pb	< 0.007	wt%	0.007	EPA 3050B/7000B
PJ39403-04PB	30818897	Pb	< 0.007	wt%	0.007	EPA 3050B/7000B
PJ39403-05PB	30818898	Pb	< 0.009	wt%	0.009	EPA 3050B/7000B
PJ39403-06PB	30818899	Pb	< 0.02	wt%	0.02	EPA 3050B/7000B
PJ39403-07PB	30818900	Pb	< 0.03	wt%	0.03	EPA 3050B/7000B
Comment: Sample submission below 0.1 grams.						
PJ39403-08PB	30818901	Pb	< 0.007	wt%	0.007	EPA 3050B/7000B
PJ39403-09PB	30818902	Pb	< 0.008	wt%	0.008	EPA 3050B/7000B
PJ39403-10PB	30818903	Pb	< 0.007	wt%	0.007	EPA 3050B/7000B
PJ39403-11PB	30818904	Pb	< 0.006	wt%	0.006	EPA 3050B/7000B
PJ39403-12PB	30818905	Pb	< 0.007	wt%	0.007	EPA 3050B/7000B

\* The Reporting Limit represents the lowest amount of analyte that the laboratory can confidently detect in the sample, and is not a regulatory level. The Units for the Reporting Limit are the same as the Units for the Final Results.

*Daniele Siu*

Daniele Siu, Laboratory Supervisor, Hayward Laboratory

Analytical results and reports are generated by Forensic Analytical at the request of and for the exclusive use of the person or entity (client) named on such report. Results, reports or copies of same will not be released by Forensic Analytical to any third party without prior written request from client. This report applies only to the sample(s) tested. Supporting laboratory documentation is available upon request. This report must not be reproduced except in full, unless approved by Forensic Analytical. The client is solely responsible for the use and interpretation of test results and reports requested from Forensic Analytical. Forensic Analytical is not able to assess the degree of hazard resulting from materials analyzed. Forensic Analytical reserves the right to dispose of all samples after a period of thirty (30) days, according to all state and federal guidelines, unless otherwise specified. Any modifications that have been made to referenced test methods are documented in Forensic Analytical's Standard Operating Procedures Manual. Sample results have not been blank corrected. Quality control and sample receipt condition were acceptable unless otherwise noted.

## LEAD HAZARD EVALUATION REPORT

**Section 1 — Date of Lead Hazard Evaluation** November 5, 2018
**Section 2 — Type of Lead Hazard Evaluation (Check one box only)**
☐ Lead Inspection    ☐ Risk assessment    ☐ Clearance Inspection    ☒ Other (specify) Client Defined
**Section 3 — Structure Where Lead Hazard Evaluation Was Conducted**

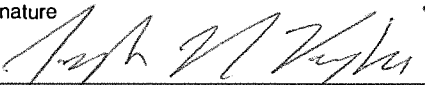
Address [number, street, apartment (if applicable)] <b>Addams ES: 2117 W McKinley Ave</b>		City <b>Fresno</b>	County <b>Fresno</b>	Zip Code <b>93728</b>
Construction date (year) of structure <b>1948</b>	Type of structure <input type="checkbox"/> Multi-unit building <input checked="" type="checkbox"/> School or daycare <input type="checkbox"/> Single family dwelling <input type="checkbox"/> Other _____		Children living in structure? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Don't Know	

**Section 4 — Owner of Structure (if business/agency, list contact person)**

Name <b>Fresno Unified School District - ATTN Cecilia Castillo</b>		Telephone number <b>559-457-6117</b>	
Address [number, street, apartment (if applicable)] <b>4600 N Brawley Ave</b>		City <b>Fresno</b>	State <b>CA</b>
			Zip Code <b>93722</b>

**Section 5 — Results of Lead Hazard Evaluation (check all that apply)**
☐ No lead-based paint detected    ☒ Intact lead-based paint detected    ☐ Deteriorated lead-based paint detected  
☒ No lead hazards detected    ☐ Lead-contaminated dust found    ☐ Lead-contaminated soil found    ☐ Other \_\_\_\_\_

**Section 6 — Individual Conducting Lead Hazard Evaluation**

Name <b>Joseph M Vuglia</b>		Telephone number <b>559-436-0277</b>	
Address [number, street, apartment (if applicable)] <b>371 E Bullard Ave Ste 109</b>		City <b>Fresno</b>	State <b>CA</b>
			Zip Code <b>93710</b>
CDPH certification number <b>22314</b>	Signature 		Date <b>11-16-18</b>

Name and CDPH certification number of any other individuals conducting sampling or testing (if applicable)

**Fred Tarazon - Sample Tech 27399, Jacob Sharp - Sample Tech 28717**
**Section 7 — Attachments**

- A. A foundation diagram or sketch of the structure indicating the specific locations of each lead hazard or presence of lead-based paint;
- B. Each testing method, device, and sampling procedure used;
- C. All data collected, including quality control data, laboratory results, including laboratory name, address, and phone number.

First copy and attachments retained by inspector

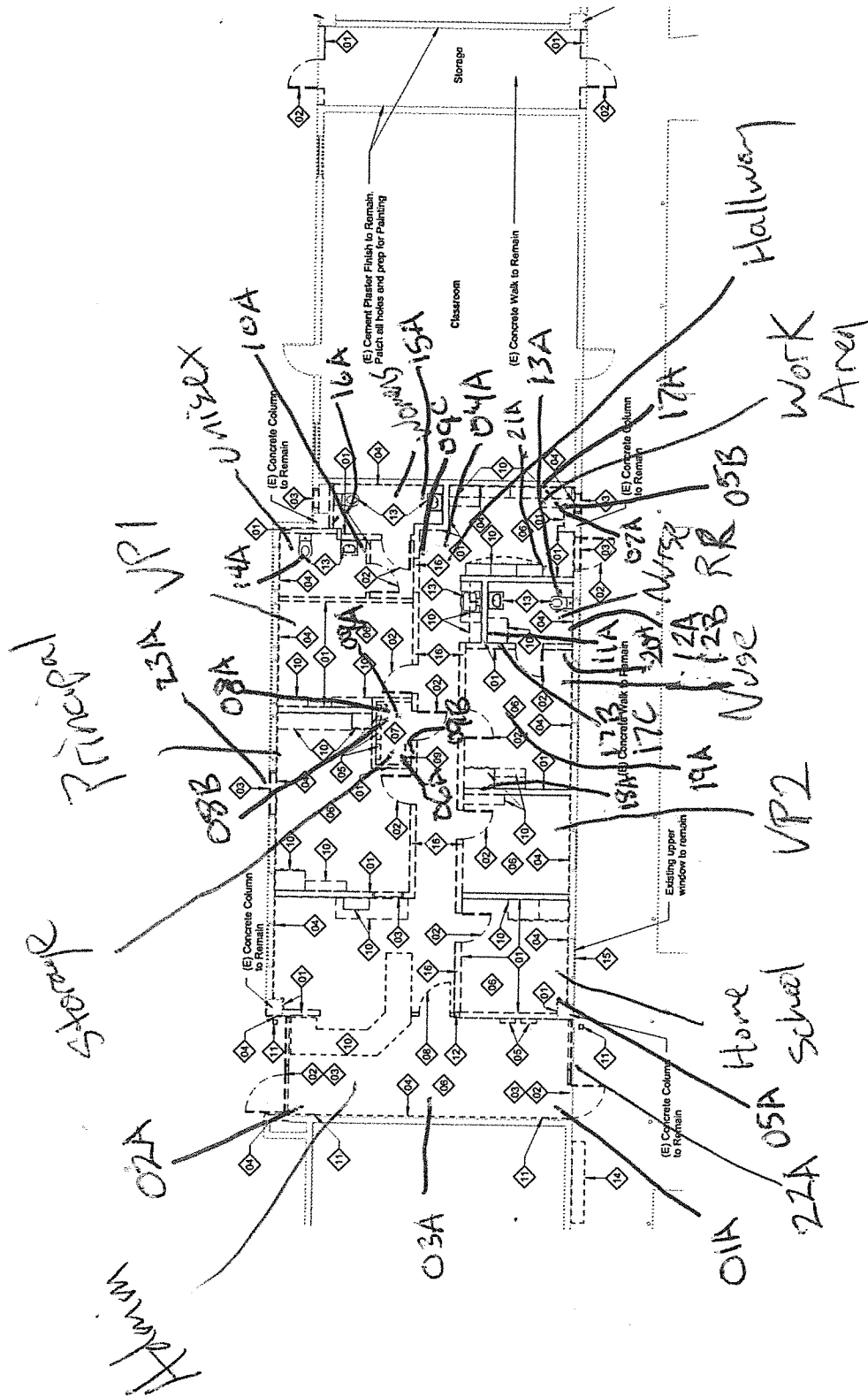
Second copy and attachments retained by owner

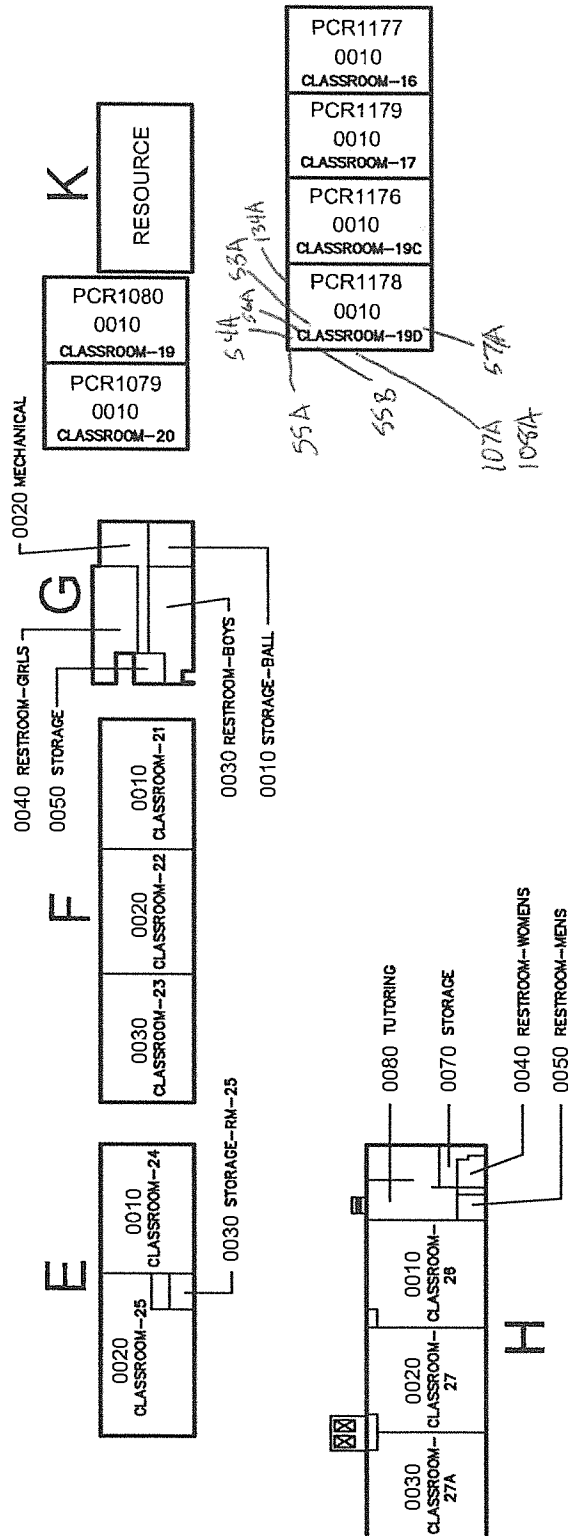
Third copy only (no attachments) mailed or faxed to:

California Department of Public Health  
 Childhood Lead Poisoning Prevention Branch Reports  
 850 Marina Bay Parkway, Building P, Third Floor  
 Richmond, CA 94804-6403  
 Fax: (510) 620-5656

## Appendix C

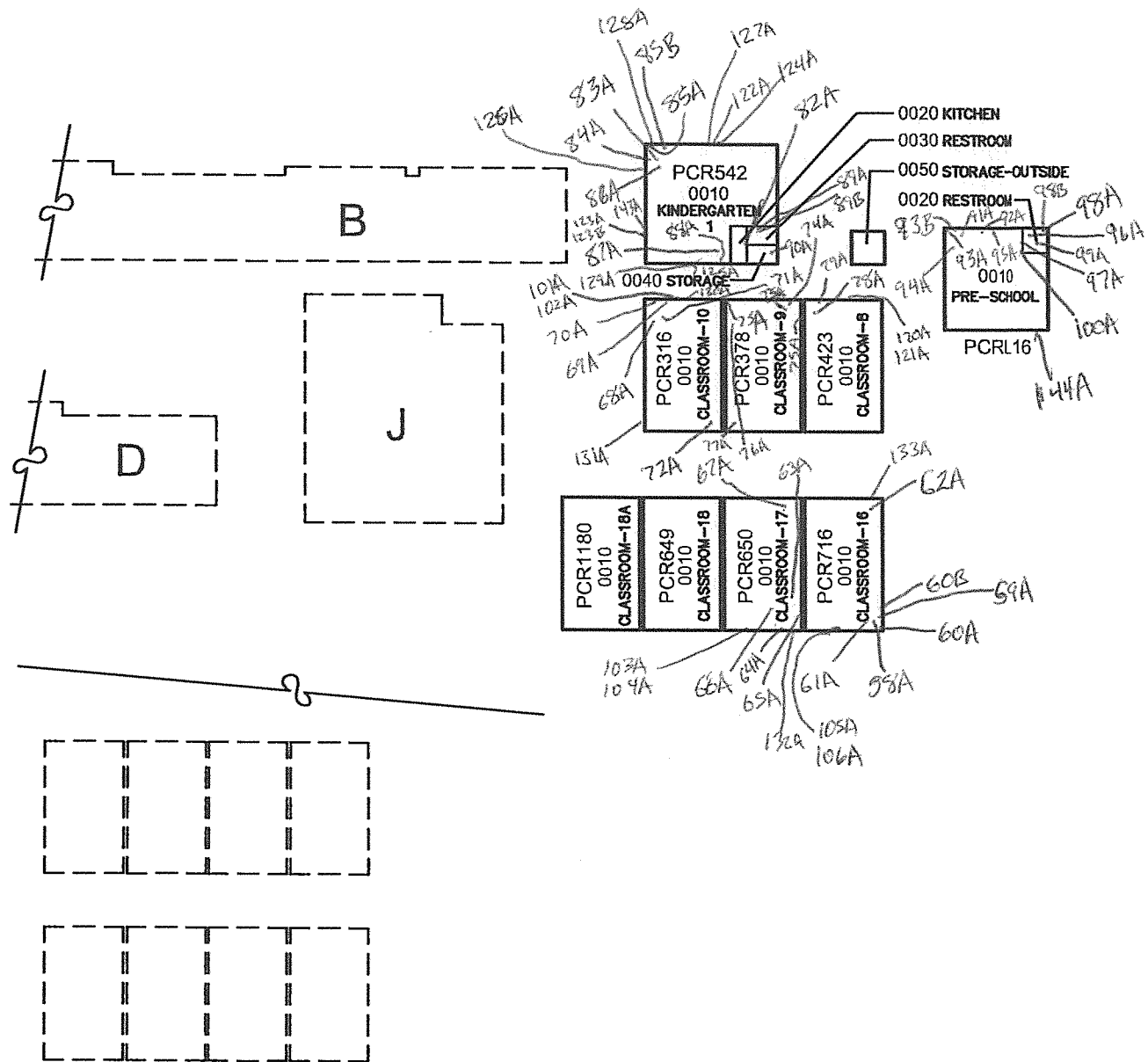
### Sample Location Drawing



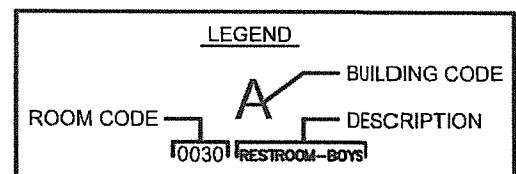


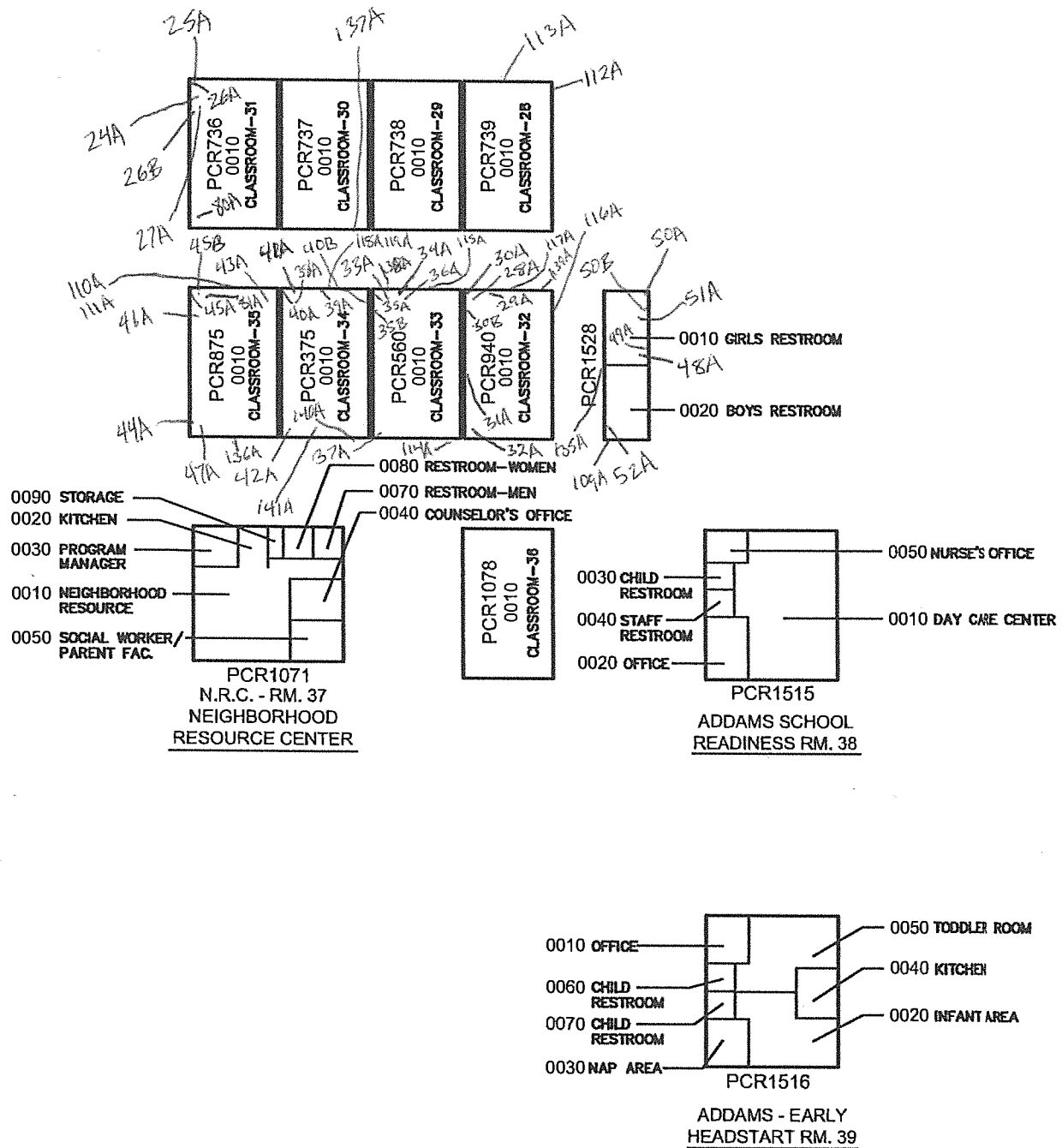
**KEY FOR BUILDINGS E, F, G, H & K**  
**ROOM IDENTIFICATION**



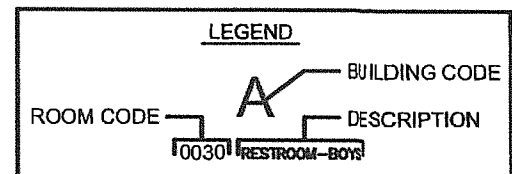


## KEY FOR PORTABLES ROOM IDENTIFICATION





## KEY FOR PORTABLES ROOM IDENTIFICATION



ADDAMS ELEMENTARY SCHOOL

2117 W. MCKINLEY

FRESNO, CALIFORNIA 93728

PAGE 5 OF 6

REVISION DATE: 06-28-07

PROPERTY # 005

## Appendix D

### Certifications of Personnel and Laboratories

# *Hazard Management Services, Inc.*

*This is to confirm that*

**Fred Tarazon**

*Has attended the four-hour*

**AHERA Refresher Course for Asbestos Inspectors**

*And has completed the requisite training and passed the exam for*

*asbestos accreditation under TSCA Title II*

**September 11, 2018**

Certificate Number: HMSBIR473

Valid Until: September 11, 2019

Cal/OSHA Approval Number: CA-025-06



A handwritten signature in black ink, appearing to read "Michael C. Sharp".

Michael C. Sharp - AHERA Training Director  
Hazard Management Services, Inc.  
207 McHenry Ave. Modesto, CA 95354  
(209) 551-2000

## STATE OF CALIFORNIA

Edmund G. Brown, Jr. Governor

## DEPARTMENT OF INDUSTRIAL RELATIONS

Division of Occupational Safety and Health

Asbestos Unit

2424 Arden Way, Suite 495

Sacramento, CA 95825-2417

(916) 574-2993 Office (916) 483-0572 Fax

<http://www.dir.ca.gov/dirdatabases.html> [actu@dir.ca.gov](mailto:actu@dir.ca.gov)

607225738T

413

**Hazard Management Services, Inc.**  
**Fadrique Tarazon**  
**371 E. Bullard Ave., #109**  
**Fresno CA 93710**

July 09, 2018

Dear Certified Asbestos Consultant or Technician:

Enclosed is your certification card. **To maintain your certification, you must abide by the rules printed on the back of the certification card.**

Your certification is valid for a period of one year. If you wish to renew your certification, you must apply for renewal at least 60 days before the expiration date shown on your card. [8 CCR 341.15(h)(1)].

Please hold and do not send copies of your required AHERA refresher renewal certificates to our office until you apply for renewal of your certification.

Certificates must be kept current if you are actively working as a CAC or CSST. The grace period is only for those who are not actively working as an asbestos consultant or site surveillance technician.

Please contact our office at the above address, fax number or email; of any changes in your contact/mailling information within 15 days of the change.

Sincerely,

Jeff Ferrell  
 Senior Safety Engineer

Attachment: Certification Card

cc: File





# *Hazard Management Services, Inc.*

*This is to confirm that*

**Jacob Sharp**

*Has attended the four-hour*

**AHERA Refresher Course for Asbestos Inspectors**

*And has completed the requisite training and passed the exam for*

*asbestos accreditation under TSCA Title II*

**September 11, 2018**

Certificate Number: HMSBIR471

Valid Until: September 11, 2019

Cal/OSHA Approval Number: CA-025-06



A handwritten signature in black ink, appearing to read "Michael C. Sharp".

Michael C. Sharp - AHERA Training Director  
Hazard Management Services, Inc.  
207 McHenry Ave. Modesto, CA 95354  
(209) 551-2000

## STATE OF CALIFORNIA

Edmund G. Brown, Jr. Governor

## DEPARTMENT OF INDUSTRIAL RELATIONS

Division of Occupational Safety and Health

Asbestos Unit

2424 Arden Way, Suite 495

Sacramento, CA 95825-2417

(916) 574-2993 Office (916) 483-0572 Fax

<http://www.dir.ca.gov/dirdatabases.html> [actu@dir.ca.gov](mailto:actu@dir.ca.gov)

611025815T

416

Hazard Management Services, Inc.  
 Jacob M Sharp  
 207 McHenry Ave  
 Modesto CA 95354

September 11, 2018

Dear Certified Asbestos Consultant or Technician:

Enclosed is your certification card. **To maintain your certification, you must abide by the rules printed on the back of the certification card.**

Your certification is valid for a period of one year. If you wish to renew your certification, you must apply for renewal at least 60 days before the expiration date shown on your card. [8 CCR 341.15(h)(1)].

Please hold and do not send copies of your required AHERA refresher renewal certificates to our office until you apply for renewal of your certification.

Certificates must be kept current if you are actively working as a CAC or CSST. The grace period is only for those who are not actively working as an asbestos consultant or site surveillance technician.

Please contact our office at the above address, fax number or email; of any changes in your contact/mailling information within 15 days of the change.

Sincerely,

A handwritten signature in black ink, appearing to read "Jeff Ferrell".

Jeff Ferrell  
 Senior Safety Engineer

Attachment: Certification Card

cc: File

State of California  
 Division of Occupational Safety and Health  
**Certified Site Surveillance Technician**

**Jacob M Sharp**

Name

Certification No. 16-5815Expires on 11/16/19

This certification was issued by the Division of Occupational Safety and Health as authorized by Sections 7180 et seq. of the Business and Professions Code.



# *Hazard Management Services, Inc.*

*This is to confirm that*

**Joe Vuglia**

*Has attended the four-hour*

**AHERA Refresher Course for Asbestos Inspectors**

*And has completed the requisite training and passed the exam for*

*asbestos accreditation under TSCA Title II*

**September 11, 2018**

Certificate Number: HMSBIR474

Valid Until: September 11, 2019

Cal/OSHA Approval Number: CA-025-06



A handwritten signature in black ink, appearing to read "Michael C. Sharp".

Michael C. Sharp - AHERA Training Director  
Hazard Management Services, Inc.  
207 McHenry Ave. Modesto, CA 95354  
(209) 551-2000

## STATE OF CALIFORNIA

Edmund G. Brown, Jr. Governor

## DEPARTMENT OF INDUSTRIAL RELATIONS

Division of Occupational Safety and Health

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2424 Arden Way, Suite 495

Sacramento, CA 95825-2417

(916) 574-2993 Office (916) 483-0572 Fax

<http://www.dir.ca.gov/dirdatabases.html> [actu@dir.ca.gov](mailto:actu@dir.ca.gov)

302255005C

372

**Hazard Management Services Inc.****Joseph M Vuglia****371 E. Bullard Ave. #109****Fresno CA 93710****January 19, 2018**

Dear Certified Asbestos Consultant or Technician:

Enclosed is your certification card. **To maintain your certification, you must abide by the rules printed on the back of the certification card.**

Your certification is valid for a period of one year. If you wish to renew your certification, you must apply for renewal at least 60 days before the expiration date shown on your card. [8 CCR 341.15(h)(1)].

Please hold and do not send copies of your required AHERA refresher renewal certificates to our office until you apply for renewal of your certification.

Certificates must be kept current if you are actively working as a CAC or CSST. The grace period is only for those who are not actively working as an asbestos consultant or site surveillance technician.

Please contact our office at the above address, fax number or email; of any changes in your contact/mailling information within 15 days of the change.

Sincerely,

Jeff Ferrell

Senior Safety Engineer

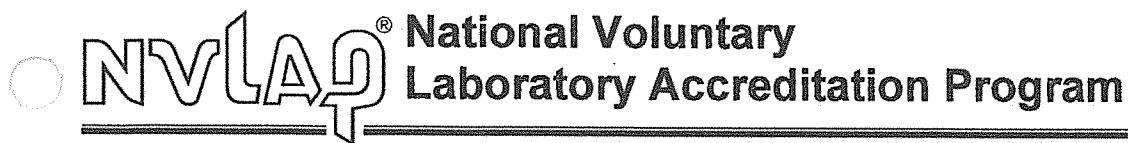
Attachment: Certification Card

cc: File

Renewal – Card Attached (Revised 10/24/2012)







## SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

### Forensic Analytical Laboratories, Inc.

3777 Depot Road, Suite 409

Hayward, CA 94545-2761

Mr. Steven Takahashi

Phone: 310-294-4365 Fax: 310-764-1136

Email: [stakahashi@falaboratories.com](mailto:stakahashi@falaboratories.com)

<http://www.falaboratories.com>

## ASBESTOS FIBER ANALYSIS

NVLAP LAB CODE 101459-0

### Bulk Asbestos Analysis

#### Code

#### Description

18/A01

EPA -- Appendix E to Subpart E of Part 763 -- Interim Method of the Determination of Asbestos in Bulk Insulation Samples

18/A03

EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

### Airborne Asbestos Analysis

#### Code

#### Description

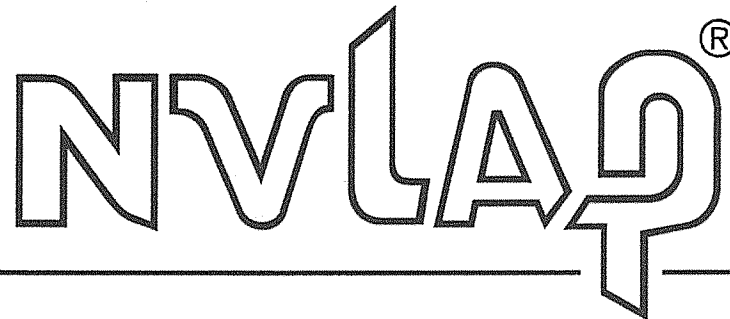
18/A02

U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

A handwritten signature in cursive script, reading 'Dana S. Laman', is written over a horizontal line.

For the National Voluntary Laboratory Accreditation Program

United States Department of Commerce  
National Institute of Standards and Technology



---

## Certificate of Accreditation to ISO/IEC 17025:2005

---

NVLAP LAB CODE: 101459-0

**Forensic Analytical Laboratories, Inc.**  
Hayward, CA

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services,  
listed on the Scope of Accreditation, for:*

### **Asbestos Fiber Analysis**

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.  
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality  
management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).*

---

2017-07-01 through 2018-06-30

Effective Dates



  
For the National Voluntary Laboratory Accreditation Program



October 31, 2016

Laboratory ID: 101762

Steve Takahashi  
Forensic Analytical Laboratories, Inc.  
3777 Depot Road, Suite 409  
Hayward, CA 94545

Dear Mr. Takahashi:

Congratulations! The AIHA Laboratory Accreditation Programs (AIHA-LAP), LLC's Analytical Accreditation Board (AAB) has approved Forensic Analytical Laboratories, Inc. as an accredited Industrial Hygiene, Environmental Lead, Environmental Microbiology and Unique Scopes laboratory.

Accreditation documentation includes the IHLAP, ELLAP, EMLAP and Unique Scope accreditation certificate, scope of accreditation document and a copy of the current AIHA-LAP, LLC license agreement (if your completed agreement is not on file at AIHA-LAP, LLC). The accreditation symbol has been designed for use by all AIHA-LAP, LLC accredited laboratories. If your laboratory chooses to use the symbol in its advertising the laboratory's accreditation, you must complete and return the AIHA-LAP, LLC license agreement to a Laboratory Accreditation Specialist. Once submitted, an electronic copy of the accreditation symbol will be sent to you. Please inform us if your laboratory does not wish to use the symbol in advertising.

Laboratory accreditation shall be maintained by continued compliance with IHLAP, ELLAP, EMLAP and Unique Scope requirements (*see Policy Modules 2B, 2C, 2D, 2E and 6*), which includes proficient participation in AIHA-LAP, LLC approved proficiency testing, demonstration of competency, or round robin program as indicated on the AIHA-LAP "Approved PT and Round Robin" webpage, its associated Scope/PT table, and as required in Policy Module 6, for all Fields of Testing (FoTs) for which the laboratory is accredited. An accredited laboratory that wishes to expand into a new FoT must submit an updated accreditation application to AIHA-LAP, LLC for review by the AAB.

Any changes in ownership, laboratory location, personnel, FoTs/Methods, or significant procedural changes shall be reported to AIHA-LAP, LLC in writing within twenty (20) business days of the change.

The accreditation certificate is the property of AIHA-LAP, LLC and must be returned to us should your laboratory withdraw or be removed from the IHLAP, ELLAP, EMLAP and Unique Scope.

Again, congratulations. If you have any questions, please contact Lauren Schnack, Senior Specialist, Quality and Accreditation, at (703) 846-0716.

Sincerely,

Cheryl O. Morton  
Managing Director  
AIHA Laboratory Accreditation Programs, LLC



## AIHA Laboratory Accreditation Programs, LLC

*acknowledges that*

### **Forensic Analytical Laboratories, Inc.**

3777 Depot Road, Suite 409, Hayward, CA 94545

Laboratory ID: 101762

along with all premises from which key activities are performed, as listed above, has fulfilled the requirements of the AIHA Laboratory Accreditation Programs (AIHA-LAP), LLC accreditation to the ISO/IEC 17025:2005 international standard, *General Requirements for the Competence of Testing and Calibration Laboratories* in the following:

#### **LABORATORY ACCREDITATION PROGRAMS**

- |                                      |   |
|--------------------------------------|---|
| ✓ <b>INDUSTRIAL HYGIENE</b>          | Accreditation Expires: October 01, 2018 |
| ✓ <b>ENVIRONMENTAL LEAD</b>          | Accreditation Expires: October 01, 2018 |
| ✓ <b>ENVIRONMENTAL MICROBIOLOGY</b>  | Accreditation Expires: October 01, 2018 |
| <input type="checkbox"/> <b>FOOD</b> | Accreditation Expires:                  |
| ✓ <b>UNIQUE SCOPES</b>               | Accreditation Expires: October 01, 2018 |

Specific Field(s) of Testing (FoT)/Method(s) within each Accreditation Program for which the above named laboratory maintains accreditation is outlined on the attached **Scope of Accreditation**. Continued accreditation is contingent upon successful on-going compliance with ISO/IEC 17025:2005 and AIHA-LAP, LLC requirements. This certificate is not valid without the attached **Scope of Accreditation**. Please review the AIHA-LAP, LLC website ([www.aihaaccreditedlabs.org](http://www.aihaaccreditedlabs.org)) for the most current Scope.

William Walsh, CIH  
Chairperson, Analytical Accreditation Board

Cheryl O. Morton  
Managing Director, AIHA Laboratory Accreditation Programs, LLC



## AIHA Laboratory Accreditation Programs, LLC

### SCOPE OF ACCREDITATION

#### Forensic Analytical Laboratories, Inc.

3777 Depot Road, Suite 409, Hayward, CA 94545

Laboratory ID: **101762**

Issue Date: 10/31/2016

The laboratory is approved for those specific field(s) of testing/methods listed in the table below. Clients are urged to verify the laboratory's current accreditation status for the particular field(s) of testing/Methods, since these can change due to proficiency status, suspension and/or withdrawal of accreditation.

#### Industrial Hygiene Laboratory Accreditation Program (IHLAP)

**Initial Accreditation Date: 03/01/1990**

<b>IHLAP Scope Category</b>	<b>Field of Testing (FoT)</b> (FoTs cover all relevant IH matrices)	<b>Technology sub-type/ Detector</b>	<b>Published Reference Method/Title of In-house Method</b>	<b>Method Description or Analyte</b> <i>(for internal methods only)</i>
<b>Chromatography Core</b>	Ion Chromatography (IC)		NIOSH 7903	
			OSHA ID 215	
<b>Spectrometry Core</b>	Atomic Absorption	CVAA	NIOSH 6009	
			OSHA ID-140	
			OSHA ID-145	
			NIOSH 7082	
		FAA	OSHA ID-121	
			NIOSH 7105	
	Inductively-Coupled Plasma	ICP/AES	NIOSH 7303	
			OSHA ID 125G (Modified)	
	UV/VIS (Colorimetric)		NIOSH 7600	
	Infrared		ASTM D7948	
			NIOSH 7603	
<b>Asbestos/Fiber Microscopy Core</b>	Polarized Light Microscopy (PLM)		EPA/600/M4-82-020, 1982	
			EPA/600/R-93/116, July 1993	
	Phase Contrast Microscopy (PCM)		NIOSH 7400	E-700
	Transmission Electron Microscopy (TEM)		EPA 600/R-93/116	SOP TEM 301
			EPA 600/R-93/116	SOP TEM 300
			EPA 600/R-93/116	SOP TEM 302
			EPA 600/R-93/116	SOP TEM 303
			EPA AHERA - 40 CFR Part 763	EPA AHERA Method (40 CFR 763, Subpart E, Appendix A, Mandatory Method)

Effective: 04/10/2015

101762\_Scope\_IHLAP\_2016\_10\_31

Page 1 of 2



<b>IHLAP Scope Category</b>	<b>Field of Testing (FoT)</b> (FoTs cover all relevant IH matrices)	<b>Technology sub-type/ Detector</b>	<b>Published Reference Method/Title of In-house Method</b>	<b>Method Description or Analyte</b> <i>(for internal methods only)</i>
<b>Asbestos/Fiber Microscopy Core</b>	Transmission Electron Microscopy (TEM)		NIOSH 7402	
			Yamate Level 1	
			Yamate Level 2	
<b>Miscellaneous Core</b>	Gravimetric		NIOSH 0500 (Modified)	
			NIOSH 0600 (Modified)	

A complete listing of currently accredited Industrial Hygiene laboratories is available on the AIHA-LAP, LLC website at: <http://www.aihaaccreditedlabs.org>



STATE WATER RESOURCES CONTROL BOARD  
REGIONAL WATER QUALITY CONTROL BOARDS

CALIFORNIA STATE



ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

**CERTIFICATE OF ENVIRONMENTAL ACCREDITATION**

Is hereby granted to

**Forensic Analytical Laboratories, Inc.**

**Hayward Laboratory**

3777 Depot Road, Suite 409

Hayward, CA 94545

Scope of the certificate is limited to the  
"Fields of Testing"  
which accompany this Certificate.

Continued accredited status depends on successful completion of on-site inspection,  
proficiency testing studies, and payment of applicable fees.

This Certificate is granted in accordance with provisions of  
Section 100825, et seq. of the Health and Safety Code.

Certificate No.: **1202**

Expiration Date: **5/31/2019**

Effective Date: **6/1/2017**

Sacramento, California  
subject to forfeiture or revocation

Christine Sotelo, Chief  
Environmental Laboratory Accreditation Program



**CALIFORNIA STATE  
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM  
Accredited Fields of Testing**



**Forensic Analytical Laboratories, Inc.**

Hayward Laboratory  
3777 Depot Road, Suite 409  
Hayward, CA 94545  
Phone: (510) 887-8828

**Certificate No. 1202**  
**Expiration Date 5/31/2019**

**Field of Testing: 101 - Microbiology of Drinking Water**

101.050	001	Total Coliform P/A	SM9223B (Colilert)
101.050	002	E. coli P/A	SM9223B (Colilert)

**Field of Testing: 103 - Toxic Chemical Elements of Drinking Water**

103.040	010	Lead	SM3113B
103.130	001	Aluminum	EPA 200.7
103.130	003	Barium	EPA 200.7
103.130	004	Beryllium	EPA 200.7
103.130	005	Cadmium	EPA 200.7
103.130	007	Chromium	EPA 200.7
103.130	008	Copper	EPA 200.7
103.130	009	Iron	EPA 200.7
103.130	011	Manganese	EPA 200.7
103.130	012	Nickel	EPA 200.7
103.130	015	Silver	EPA 200.7
103.130	017	Zinc	EPA 200.7
103.160	001	Mercury	EPA 245.1
103.300	001	Asbestos	EPA 100.1
103.301	001	Asbestos	EPA 100.2

**Field of Testing: 107 - Microbiology of Wastewater**

107.242	001	Enterococci	Enterolert
107.245	001	E. coli (Enumeration)	SM9223B (Colilert 18)

**Field of Testing: 109 - Toxic Chemical Elements of Wastewater**

109.010	001	Aluminum	EPA 200.7
109.010	002	Antimony	EPA 200.7
109.010	003	Arsenic	EPA 200.7
109.010	004	Barium	EPA 200.7
109.010	005	Beryllium	EPA 200.7
109.010	007	Cadmium	EPA 200.7
109.010	009	Chromium	EPA 200.7
109.010	010	Cobalt	EPA 200.7
109.010	011	Copper	EPA 200.7
109.010	012	Iron	EPA 200.7
109.010	013	Lead	EPA 200.7
109.010	015	Manganese	EPA 200.7
109.010	016	Molybdenum	EPA 200.7
109.010	017	Nickel	EPA 200.7
109.010	019	Selenium	EPA 200.7

## Forensic Analytical Laboratories, Inc.

Certificate No. 1202

Expiration Date 5/31/2019

109.010	021	Silver	EPA 200.7
109.010	024	Tin	EPA 200.7
109.010	026	Vanadium	EPA 200.7
109.010	027	Zinc	EPA 200.7
109.190	001	Mercury	EPA 245.1
109.370	010	Lead	SM3111B-1999

**Field of Testing: 114 - Inorganic Chemistry of Hazardous Waste**

114.010	001	Antimony	EPA 6010B
114.010	002	Arsenic	EPA 6010B
114.010	003	Barium	EPA 6010B
114.010	004	Beryllium	EPA 6010B
114.010	005	Cadmium	EPA 6010B
114.010	006	Chromium	EPA 6010B
114.010	007	Cobalt	EPA 6010B
114.010	008	Copper	EPA 6010B
114.010	009	Lead	EPA 6010B
114.010	010	Molybdenum	EPA 6010B
114.010	011	Nickel	EPA 6010B
114.010	012	Selenium	EPA 6010B
114.010	013	Silver	EPA 6010B
114.010	014	Thallium	EPA 6010B
114.010	015	Vanadium	EPA 6010B
114.010	016	Zinc	EPA 6010B
114.130	001	Lead	EPA 7420
114.141	001	Mercury	EPA 7471A
114.240	001	Corrosivity - pH Determination	EPA 9040B
114.241	001	Corrosivity - pH Determination	EPA 9045C

**Field of Testing: 115 - Extraction Test of Hazardous Waste**

115.021	001	TCLP Inorganics	EPA 1311
115.030	001	Waste Extraction Test (WET)	CCR Chapter 11, Article 5, Appendix II

**Field of Testing: 121 - Bulk Asbestos Analysis of Hazardous Waste**

121.010	001	Bulk Asbestos	EPA 600/M4-82-020
---------	-----	---------------	-------------------

**Field of Testing: 126 - Microbiology of Recreational Water**

126.050	001	Total Coliform (Enumeration)	SM9223B (Colilert/Quanti-Tray)
126.080	001	Enterococci	Enterolert



## AIHA Laboratory Accreditation Programs, LLC

### SCOPE OF ACCREDITATION

#### Forensic Analytical Laboratories, Inc.

3777 Depot Road, Suite 409, Hayward, CA 94545

Laboratory ID: **101762**

Issue Date: 10/31/2016

The laboratory is approved for those specific field(s) of testing/methods listed in the table below. Clients are urged to verify the laboratory's current accreditation status for the particular field(s) of testing/Methods, since these can change due to proficiency status, suspension and/or withdrawal of accreditation.

The EPA recognizes the AIHA-LAP, LLC ELLAP program as meeting the requirements of the National Lead Laboratory Accreditation Program (NLLAP) established under Title X of the Residential Lead-Based Paint Hazard Reduction Act of 1992 and includes paint, soil and dust wipe analysis. Air and composited wipes analyses are not included as part of the NLLAP.

#### Environmental Lead Laboratory Accreditation Program (ELLAP)

**Initial Accreditation Date: 06/26/1995**

Field of Testing (FoT)	Technology sub-type/ Detector	Method	Method Description (for internal methods only)
Paint		EPA SW-846 3050B	
		EPA SW-846 7000B	
Soil		EPA SW-846 3050B	
		EPA SW-846 7000B	
Settled Dust by Wipe		NIOSH 7082	
		NIOSH 9100	
		OSHA ID-105 Modified	
Airborne Dust		NIOSH 7082	
		NIOSH 7105	
		NIOSH 7303	

A complete listing of currently accredited Environmental Lead laboratories is available on the AIHA-LAP, LLC website at: <http://www.aihaaccreditedlabs.org>



## AIHA Laboratory Accreditation Programs, LLC

### SCOPE OF ACCREDITATION

#### Forensic Analytical Laboratories, Inc.

3777 Depot Road, Suite 409, Hayward, CA 94545

Laboratory ID: **101762**

Issue Date: 10/31/2016

The laboratory is approved for those specific field(s) of testing/methods listed in the table below. Clients are urged to verify the laboratory's current accreditation status for the particular field(s) of testing/Methods, since these can change due to proficiency status, suspension and/or withdrawal of accreditation.

#### Environmental Microbiology Laboratory Accreditation Program (EMLAP)

**Initial Accreditation Date: 11/01/2003**

<b>EMLAP Category</b>	<b>Field of Testing (FoT)</b>	<b>Method</b>	<b>Method Description</b> <i>(for internal methods only)</i>
<b>Fungal</b>	Air - Culturable	SOP IAQ 100	Analysis of Viable Air Samples for Identification of Fungal Mycota
	Bulk - Culturable	SOP IAQ 103	Analysis of Viable Bulk Samples for Identification of Fungal Mycota
	Surface - Culturable	SOP IAQ 103	Analysis of Viable Bulk Samples for Identification of Fungal Mycota
	Air - Direct Examination	SOP IAQ 101	Analysis of Non-Viable Air Samples for Identification of Fungal Mycota
	Bulk - Direct Examination	SOP IAQ 102	Analysis of Non-Viable Bulk Samples for Identification of Fungal Mycota
	Surface - Direct Examination	SOP IAQ 102	Analysis of Non-Viable Bulk Samples for Identification of Fungal Mycota
<b>Bacterial</b>	Legionella	SOP IAQ 214	Recovery of Legionellae from Swab Samples

A complete listing of currently accredited Environmental Microbiology laboratories is available on the AIHA-LAP, LLC website at: <http://www.aihaaccreditedlabs.org>



## AIHA Laboratory Accreditation Programs, LLC

### SCOPE OF ACCREDITATION

#### **Forensic Analytical Laboratories, Inc.**

3777 Depot Road, Suite 409, Hayward, CA 94545

Laboratory ID: **101762**

Issue Date: 10/31/2016

The laboratory is approved for those specific field(s) of testing/methods listed in the table below. Clients are urged to verify the laboratory's current accreditation status for the particular field(s) of testing/Methods, since these can change due to proficiency status, suspension and/or withdrawal of accreditation.

#### **Unique Scopes Laboratory Accreditation Program (Unique Scopes)**

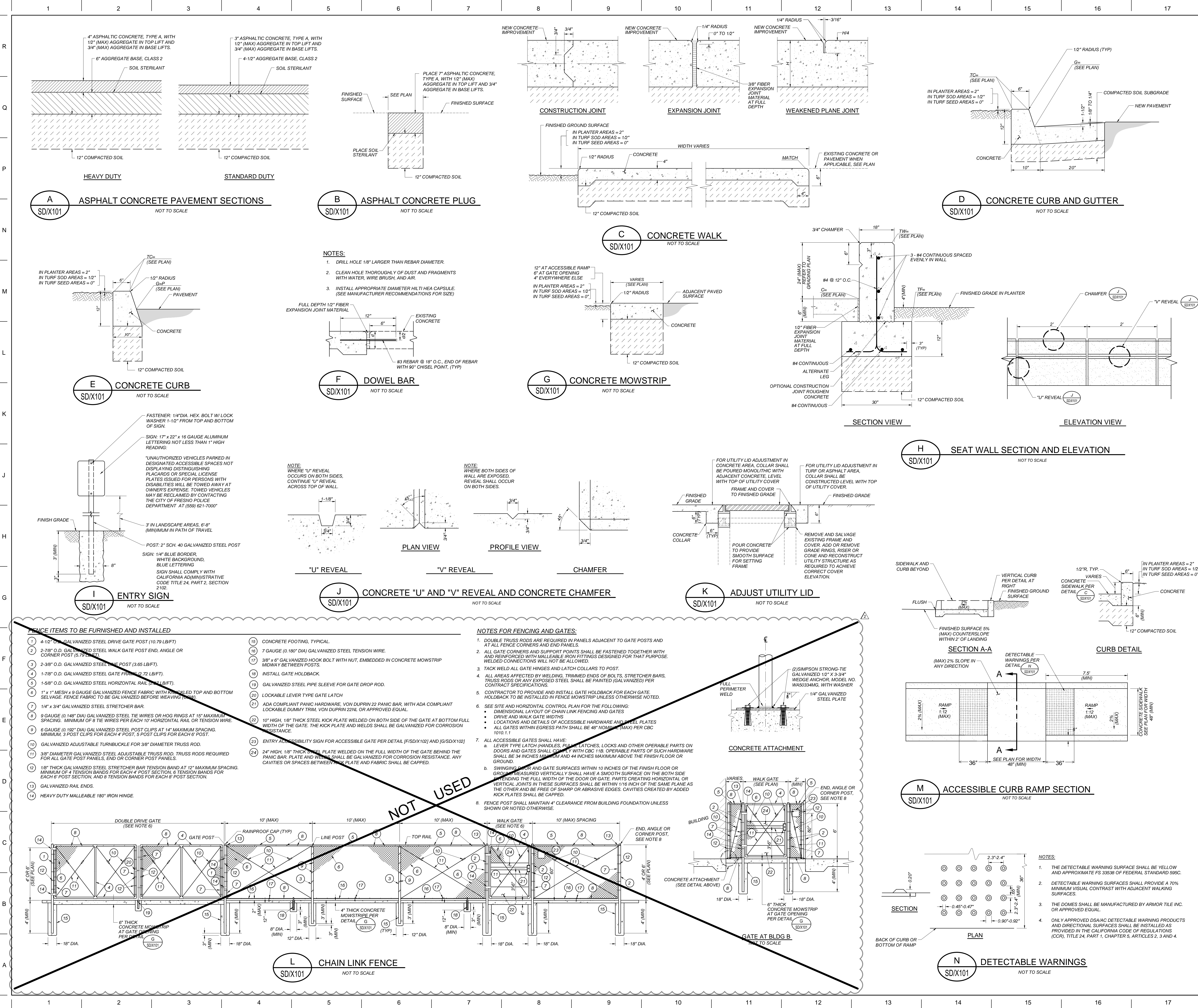
**Initial Accreditation Date: 05/01/2014**

<b>Unique Scope Category</b>	<b>Field of Testing (FoT)</b>	<b>Method</b>	<b>Method Description</b> <i>(for internal methods only)</i>
<b>Consumer Product Testing</b>	Lead in Paint and Other Similar Surface Coatings	16 C.F.R 1303 CPSC-CH- E1001.08.1	MET 214
		16 C.F.R 1303 CPSC-CH- E1002.08.1	MET 215
		16 C.F.R 1303 CPSC-CH- E1003-09	MET 213

A complete listing of currently accredited Unique Scope laboratories is available on the AIHA-LAP, LLC website at: <http://www.aihaaccreditedlabs.org>

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DSA File No.:  
10-48

DSA Application No.:  
02-117220

Agency Approval

General Notes

Blair Church & Flynn

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REGISTERED PROFESSIONAL  
ENGINEER  
No. 57,053  
EXPIRATION DATE 12/31/2021  
Date Signed

Consultant

Addams Elementary School Building Additions and Modernization

Fresno Unified School District  
2117 W McKinley Ave. Fresno, CA 93728

Project

DETAILS

Drawing

ARCHITECTURE  
PLANNING  
INTERIORS  
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ARCHITECT

No.	Revision/Submission	Date
1	ADDENDUM 02	06/01/2021

Revision	
Designed By:	BAA
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Scale: AS NOTED  
Project Number: 1725  
Date: 6/01/2021

Drawn By: SD/MJA  
Checked By: LRB  
Reviewed By: JDB

SD/X101  
Sheet: \_\_\_\_\_ of: \_\_\_\_\_

DSA File No.: 10-48  
DSA Application No.: 02-117220  
Agency Approval  
General Notes  
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ARCHITECT  
Revision  
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Scale: AS NOTED  
Project Number: 1725  
Date: 6/01/2021  
Drawn By: SD/MJA  
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Reviewed By: JDB  
SD/X101  
Sheet: \_\_\_\_\_ of: \_\_\_\_\_

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Checked By: LRB  
Reviewed By: JDB  
SD/X101  
Sheet: \_\_\_\_\_ of: \_\_\_\_\_



### DOUBLE AND SINGLE MAINTENANCE GATES

## ACCESSIBLE PEDESTRIAN GATE

A 6' HIGH CHAIN LINK FENCE  
SD/X106 NOT TO SCALE

B ACCESSIBLE LATCH  
SD/X106 NOT TO SCALE

CHAIN LINK FENCE AND GATE LEGEND:

- 1 1/4" X 3/4" GALVANIZED STEEL STRETCHER BAR.
- 2 9 GAUGE (0.148" DIA) GALVANIZED STEEL TIRES OR
- 3 400 LBS AT 12" MAXIMUM SPACING. MINIMUM OF 8 TIE
- 4 WIRES PER EACH 10' HORIZONTAL RAIL.
- 5 6 GAUGE (0.192" DIA) GALVANIZED STEEL POST CLIPS AT
- 6 14" MAXIMUM SPACING. MINIMUM 5 POST CLIPS FOR
- 7 EACH 6' POST.
- 8 GALVANIZED ADJUSTABLE TURNBUCKLE FOR 3/8" DIA
- 9 DIAMETER TRUSS ROD.
- 10 3/8" DIAMETER GALVANIZED STEEL ADJUSTABLE TRUSS
- 11 ROD. TRUSS RODS REQUIRED FOR ALL GATE POST
- 12 PANELS. END OF CORNER POST PANELS.
- 13 1/8" THICK GALVANIZED STEEL STRETCHER BAR TENSION
- 14 BAND AT 12" MAXIMUM SPACING.
- 15 GALVANIZED RAIL ENDS.
- 16 ACCESSIBLE GATE SIGN PER DETAIL, (G/SDD/102)
- 17 LOCKING MAMMOTH 180 SELF CLOSING HINGE, SILVER
- 18 COAT TO MATCH GATE PIPE END FINISH.
- 19 CONCRETE FOOTING, TYPICAL.
- 20 ALL WALK GATES SHALL HAVE ADA/CBC COMPLIANT
- 21 ACCESSIBLE HARMWARE WHEN LOCATED WITHIN
- 22 1/4" OF THE PATH OF TRAVEL. ACCESSIBLE GATE LATCH
- 23 SHALL REQUIRE A MAXIMUM OF 5 LBS OF PRESSURE TO
- 24 OPERATE. PROVIDE GATE HARMWARE PER
- 25 SPECIFICATIONS. SEE NOTE 7.
- 26 1/2" HIGH, 1/4" THICK STEEL PLATES WELDED ON THE
- 27 BOTH SIDE OF THE GATE AT BOTTOM FULL WIDTH OF THE
- 28 GATE. THE KICK PLATE AND WELDS SHALL BE
- 29 GALVANIZED FOR CORROSION RESISTANCE.
- 30 INSTALL GATE HOLDBACK FOR ALL GATES.
- 31 GALVANIZED STEEL PIPE SLEEVE FOR GATE DROP ROD.
- 32 CENTER GATE DROP POST AND LOCKABLE FORK LATCH
- 33 24" HIGH, CENTER ON LATCH, 1/4" THICK STEEL PLATES
- 34 WELDED ON BOTH SIDES. THE FULL WIDTH OF THE GATE.
- 35 PROVIDE A WELDED CAP TOP AND BOTTOM TO CLOSE
- 36 THE CAVITY. THE CAP PLATE AND WELDS SHALL BE
- 37 GALVANIZED FOR CORROSION RESISTANCE.
- 38 LOCKABLE FORK LATCH PER SPECIFICATIONS.
- 39 7 GAUGE (0.180" DIA) GALVANIZED STEEL TENSION WIRE.
- 40 3/8" X 6" GALVANIZED HOOK BOLT WITH NUT, EMBEDDED
- 41 IN CONCRETE MOWSTRIP MIDWAY BETWEEN POSTS.

### CHAIN LINK FENCE SIZING SCHEDULE

<u>FENCE HEIGHT</u>	<u>END, ANGLE, CORNER AND WALK GATE POST</u>	<u>LINE POST</u>	<u>MAINTENANCE DOUBLE GATE POST</u>
	2-7/8" O.D. (5.79 LB/FT)	2-3/8" O.D. (3.65 LB/FT)	4-1/2" O.D. (10.80 LB/FT)
4 & 6	18" FOOTING DIAMETER	12" FOOTING DIAMETER	18" FOOTING DIAMETER
	48" FOOTING EMBEDMENT	36" FOOTING EMBEDMENT	48" FOOTING EMBEDMENT
	<u>SINGLE AND DOUBLE GATE FRAME</u>	<u>HORIZONTAL RAIL</u>	
	1 - 7/8" (2.72 LB/FT)	1 - 5/8" (2.27 LB/FT)	

CHAIN LINK FENCE AND GATE NOTES:

1. DOUBLE TRUSS ROSS ARE REQUIRED IN PANELS ADJACENT TO GATE POSTS AND AT ALL FENCE CORNERS AND END PANELS.
2. ALL GATE CORNERS AND SUPPORT POINTS SHALL BE FASTENED TOGETHER WITH AND REINFORCED WITH MALLEABLE IRON POSTION 12 OZED FOR THAT PANEL. WELDED CONNECTIONS WILL NOT BE ALLOWED.
3. TACK WELD ALL GATE HINGES AND LATCH COLLARS TO POSTS.
4. ALL AREAS AFFECTED BY WELDING, TRIMMED ENDS OF BOLTS, STRETCHER BARS, TRUSS ROSS OR ANY EXPOSED STEEL SHALL BE PAINTED (GALVANIZED) PER CONTRACT SPECIFICATIONS.
5. ALL AREAS AFFECTED BY WELDING, TRIMMED ENDS OF BOLTS, STRETCHER BARS, TRUSS ROSS OR ANY EXPOSED STEEL SHALL BE PAINTED (GALVANIZED) PER CONTRACT SPECIFICATIONS.
6. CONTRACTOR TO PROVIDE AND INSTALL GATE HOLDBACK FOR EACH GATE. HOLDBACK TO BE INSTALLED IN FENCE MOWSTRIP UNLESS OTHERWISE NOTED.
7. ALL ACCESSIBLE GATES SHALL HAVE
- A. A. HANDLES, PULLS, LATCHES, LOCKS AND OTHER OPERABLE PARTS ON DOORS AND GATES SHALL COMPLY CBC SECTION 11B-404.2.7. OPERABLE PARTS OF SUCH HARDWARE SHALL BE 34 INCHES MINIMUM AND 44 INCHES MAXIMUM ABOVE THE FINISH FLOOR OR GROUND. THE MAXIMUM FORCE TO ACTIVATE OPERABLE PARTS SHALL BE SLBS PER 11B-300.4.4.
- B. B. SWINGING DOOR AND GATE SURFACES WITHIN 10 INCHES OF THE FINISH FLOOR OR GROUND MEASURED VERTICALLY SHALL HAVE A SMOOTH SURFACE ON BOTH SIDE EXTENDING THE FULL WIDTH OF THE DOOR OR GATE. PARTS CREATING HORIZONTAL OR VERTICAL JOINTS IN THESE SURFACES SHALL BE WITHIN 1/16 INCH OF THE SAME PLANE AS THE OTHER AND BE FREE OF SHARP OR ABRASIVE EDGES. CAVITIES CREATED BY ADDED KICK PLATES SHALL BE CAPPED.
- C. USE FITTINGS FOR ALL GATE JOINTS AND TRUSS ROSS CONNECTIONS. NO WELDING PERMITTED.
- D. CLOSERS SHALL BE ADJUSTED SO THAT FROM AN OPEN POSITION OF 90 DEGREES, THE TIME REQUIRED TO MOVE THE DOOR TO A POSITION 12 OZED FOR THE LATCH IS 6 SECONDS MINIMUM PER CBC 11B-404.8.1
- E. GATE SPRING HINGES SHALL BE ADJUSTED SO THAT FROM AN OPEN POSITION OF 70 DEGREES, THE TIME REQUIRED TO MOVE THE DOOR TO THE CLOSED POSITION 1.5 SECONDS MINIMUM PER CBC 11B-404.8.2.

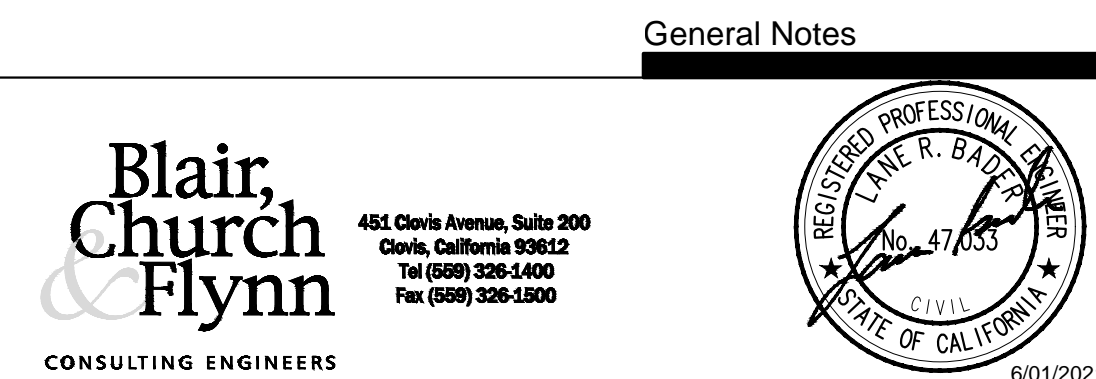
CONCRETE ATTACHMENT

C GATE AT BLDG. G  
SD/X106 NOT TO SCALE

DSA File No.:  
10-48

DSA Application No.:  
02-117220

Agency Approval



**Addams Elementary School Building Additions  
and Modernization**  
Fresno Unified School District  
2117 W McKinley Ave. Fresno, Ca 93728

## DETAILS

### Drawing



Architect

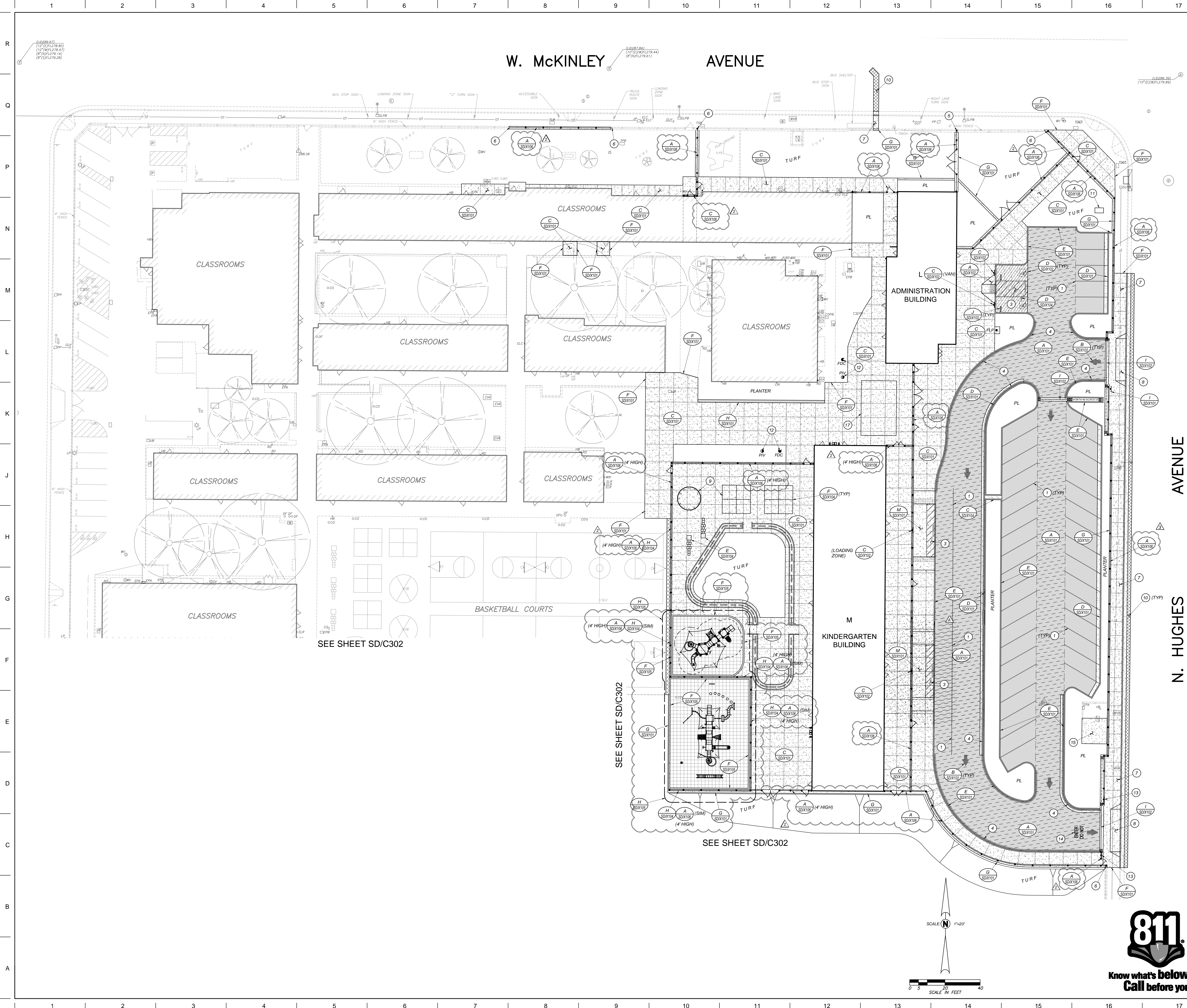
No.	Revision/Submission	Date
2	ADDENDUM 02	06/01/2021

Revision

	Designed By: BAA	Copyright	Darden Architects
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Scale: AS NOTED	Drawn By: SD/MJA	<i>SD/X106</i>
Project Number: 1725	Checked By: LBB	

Project Number: 1723	Checked By: LRB	Sheet: _____ of: _____
Date: 6/01/2021	Reviewed By: JDB	



DSA File No.:  
10-48

DSA Application No.:  
02-117220

Agency Approval

**SITE LEGEND:**

LIMITS OF CONCRETE IMPROVEMENTS

LIMITS OF HEAVY DUTY CONCRETE PAVEMENT STRUCTURAL SECTION PER DETAIL [CSDX104]

LIMITS OF ASPHALT PLUG IMPROVEMENTS PER DETAIL [B/SDX101]

LIMITS OF STANDARD DUTY ASPHALTIC CONCRETE PAVEMENT STRUCTURAL SECTION PER DETAIL [A/SDX101]

LIMITS OF HEAVY DUTY ASPHALTIC CONCRETE PAVEMENT STRUCTURAL SECTION PER DETAIL [A/SDX101]

DETECTABLE WARNINGS PER DETAIL [N/SDX101]

RESILIENT TILE SURFACING PER DETAIL [F/SDX105]

LIMITS OF PAINTED CURB

PL

PLANTER

• FLP

EDER FLAG POLE MODEL ECKA300H OR APPROVED EQUAL. FOOTING PER MANUFACTURERS STANDARDS.

1

PAINT 4" WIDE WHITE STRIPE

2

PAINT 4" WIDE WHITE DIAGONAL LINES AT 3' ON-CENTER

3

PAINT ACCESS AREA WITH 4" WIDE BLUE BORDER, PAINT INSIDE ACCESS AREA WITH 4" WIDE WHITE DIAGONAL LINES AT 36" O.C., WITH 12" HIGH WHITE "NO PARKING" WORDING

4

PAINT TOP AND FACE OF CURB RED WITH 4" HIGH WHITE LETTERING, "NO PARKING - FIRE LANE", AT 30' ON CENTER. WHERE NO CURB EXISTS, PAINT ASPHALT

5

INSTALL NEW FENCE POST ADJACENT TO EXISTING FENCE

6

CONNECT TO EXISTING CHAIN LINK FENCE

7

CONCRETE CURB, GUTTER AND SIDEWALK PER CITY OF FRESNO STANDARD P-5

8

DRIVE APPROACH PER CITY OF FRESNO STANDARD P-2

9

PLAYCOURT STRIPING, SEE ARCHITECTURAL PLAN

10

FULL DEPTH ASPHALT PLUG PER CITY OF FRESNO STANDARD P-48

11

INSTALL SALVAGED MARQUEE SIGN, FOOTING PER MANUFACTURERS STANDARDS.

12

SEE FIRE PROTECTION PLANS

13

"DO NOT ENTER" (R5-1) SIGN, INSTALL POST AND FOOTING PER [C/SDX102]

14

PAINT 24" HIGH "DO NOT ENTER" WORDING

15

CONCRETE SLAB, SEE IRRIGATION PLANS

16

MATCH EXISTING PLAYCOURT STRIPING COLOR AND WIDTH

17

SHADE STRUCTURE, SEE ARCHITECTURAL PLANS

**NOTES:**

- ALL CONCRETE MOWSTRIPS, RAMP AND SIDEWALKS SHALL HAVE WEAKENED PLANE JOINTS AT 10 FEET MAXIMUM ON CENTER AND ONE HALF INCH EXPANSION JOINTS AT 30 FEET MAXIMUM ON CENTER PER [CSDX101]
- NO CONCRETE MAY BE POURED UNTIL THE FORMS HAVE BEEN REVIEWED AND APPROVED BY THE PROJECT INSPECTOR
- ALL BURIED METALLIC OBJECTS SHALL HAVE A PROTECTIVE COATING OR BE WRAPPED WITH APPROVED PROTECTIVE WRAP.
- ADJUST EXISTING SPRINKLER HEADS AND LATERAL LINES AS REQUIRED FOR NEW IMPROVEMENTS.
- ANY SURVEY MONUMENTS WITHIN THE AREA OF CONSTRUCTION SHALL BE PRESERVED OR RESET BY A PERSON LICENSED TO PRACTICE LAND SURVEYING IN THE STATE OF CALIFORNIA.
- A PERMIT IS REQUIRED FROM THE CITY OF FRESNO FOR ANY WORK WITHIN THE PUBLIC RIGHT-OF-WAY. CONTRACTOR SHALL NULL THE PERMIT. DISTRICT WILL PAY PERMIT FEE.
- CHAIN LINK FENCE SHALL BE 6' HIGH, UNLESS NOTED OTHERWISE.
- INSTALL DOWELED CONNECTION AT JOINT OF NEW CONCRETE TO EXISTING CONCRETE PER DETAIL [M/SDX102]
- PLAY EQUIPMENT SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR.
- PLAY STRUCTURES SHALL COMPLY WITH CBC SECTION 11B-240.2 & TABLE 11B-240.2.1.2.

**General Notes**

Blair Church & Flynn

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REGISTERED PROFESSIONAL  
ENGINEER  
No. 51,553  
EXPIRATION DATE 12/31/2021  
STATE OF CALIFORNIA

6/01/2021  
Date Signed

Consultant

Addams Elementary School Building Additions and Modernization

Fresno Unified School District

2117 W McKinley Ave. Fresno, Ca 93728

Project

SITE PLAN

Drawing

darden architects

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REGISTERED ARCHITECT  
No. C2255  
EXPIRATION DATE 10-31-2025  
STATE OF CALIFORNIA

Architect

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Project Number: 1725

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SD/C301

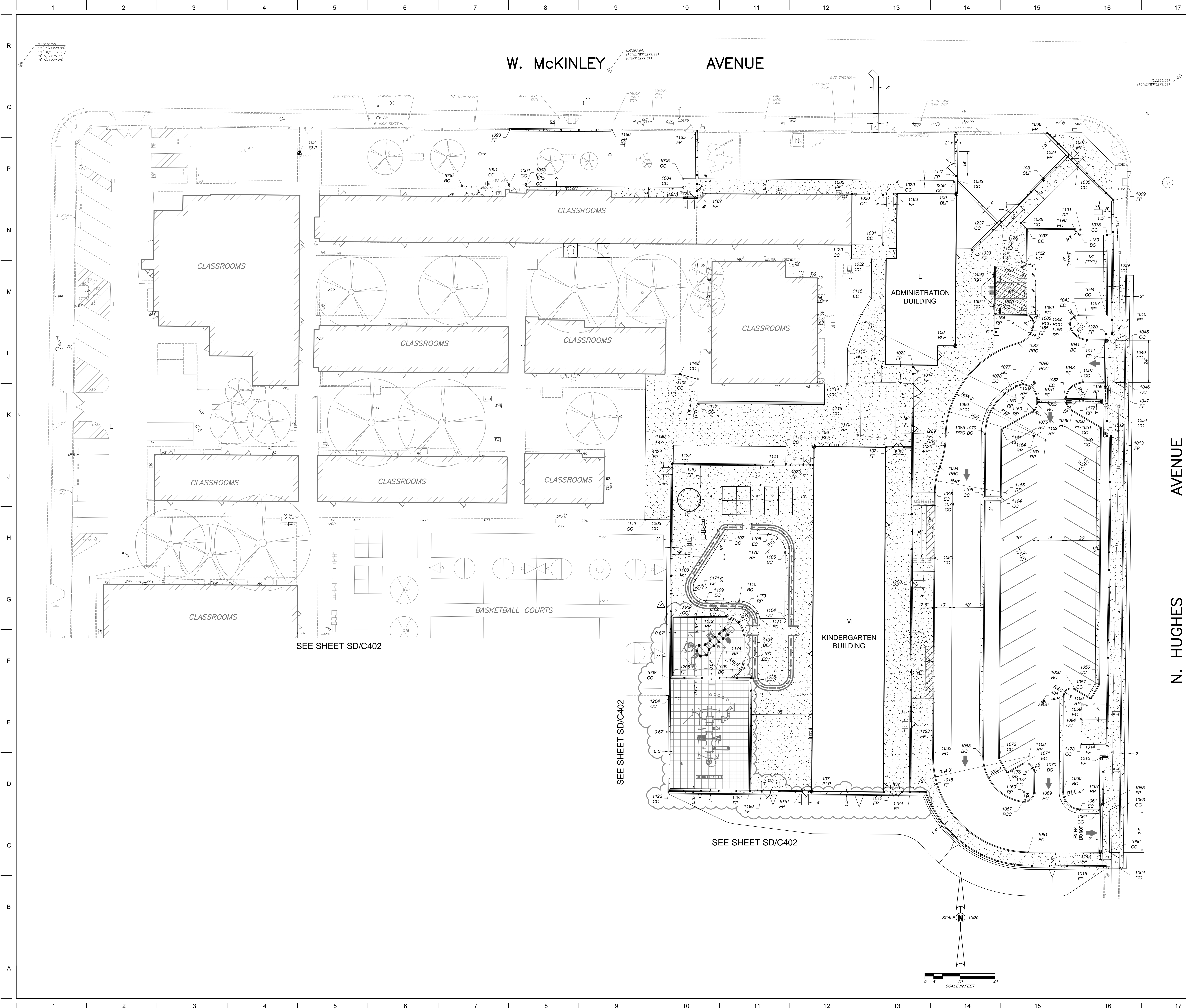
811

Know what's below.  
Call before you dig.

SCALE: 1"=20'

SCALE: 1/4"=10 FEET

AD2-CX04



DSA File No.:  
10-48

DSA Application No.:  
02-117220

### Agency Approval

HORIZONTAL CONTROL LEGEND:

1000 JODK	LAYOUT COORDINATE POINT
101 SLP	SITE LAYOUT POINT
103 BLP	BUILDING LAYOUT POINT
AC	CORNER OF ASPHALT
BC	BEGIN CURVE
CC	CORNER CONCRETE
EC	END CURVE
FL	FLOW LINE
FP	FENCE POST
PCC	POINT OF COMPOUND CURVE
PRC	POINT OF REVERSE CURVE
RP	RADIUS POINT

GENERAL HORIZONTAL CONTROL NOTES:

1. SITE LAYOUT POINT 100 IS A SURVEY CONTROL POINT ON TOP OF EXISTING CURB LOCATED AT THE SOUTHERLY CURB AT THE INTERSECTION OF LAFAYETTE AVENUE AND SOUTHERLY CURB. SURVEY CONTROL POINT ON EXISTING CURB RAMP IN THE SOUTHERN PARKING LOT LOCATED 121.5' EAST OF LAFAYETTE AVENUE. SITE LAYOUT POINT 101 IS A SURVEY CONTROL POINT ON EXISTING SIDEWALK LOCATED 244' NORTH OF NORTHEAST CORNER OF MILL AVENUE FROM THE SOUTHERLY CURB. SURVEY CONTROL POINT LOCATED 39.5' SOUTHWEST OF THE WEST END OF CURB RETURN AT THE SOUTH WEST CORNER OF MCKINLEY AND HUGHES AVENUES. SURVEY POINT 104 IS A SURVEY CONTROL POINT ON THE WEST SIDE OF THE HIGHWAY RIGHT OF WAY LOCATED 213' EAST OF THE SOUTHEAST CORNER OF THE METEOROLOGICAL COURTS. SITE LAYOUT POINT 105 IS A SURVEY CONTROL POINT LOCATED 100' WEST OF THE SOUTHWEST CORNER OF THE METEOROLOGICAL COURTS LOCATED 192.5' NORTH OF SITE LAYOUT POINT 101.
2. DIMENSIONS AND POINTS ARE TO CENTER OF FENCE POSTS, FACE OF BUILDING OR FACE OF CURB, OR EDGE OF CONCRETE, UNLESS SHOWN OTHERWISE.

### General Notes



Consultant

**Addams Elementary School Building Additions  
and Modernization**  
Fresno Unified School District  
2117 W McKinley Ave. Fresno, Ca 93728

### HORIZONTAL CONTROL

### Drawing



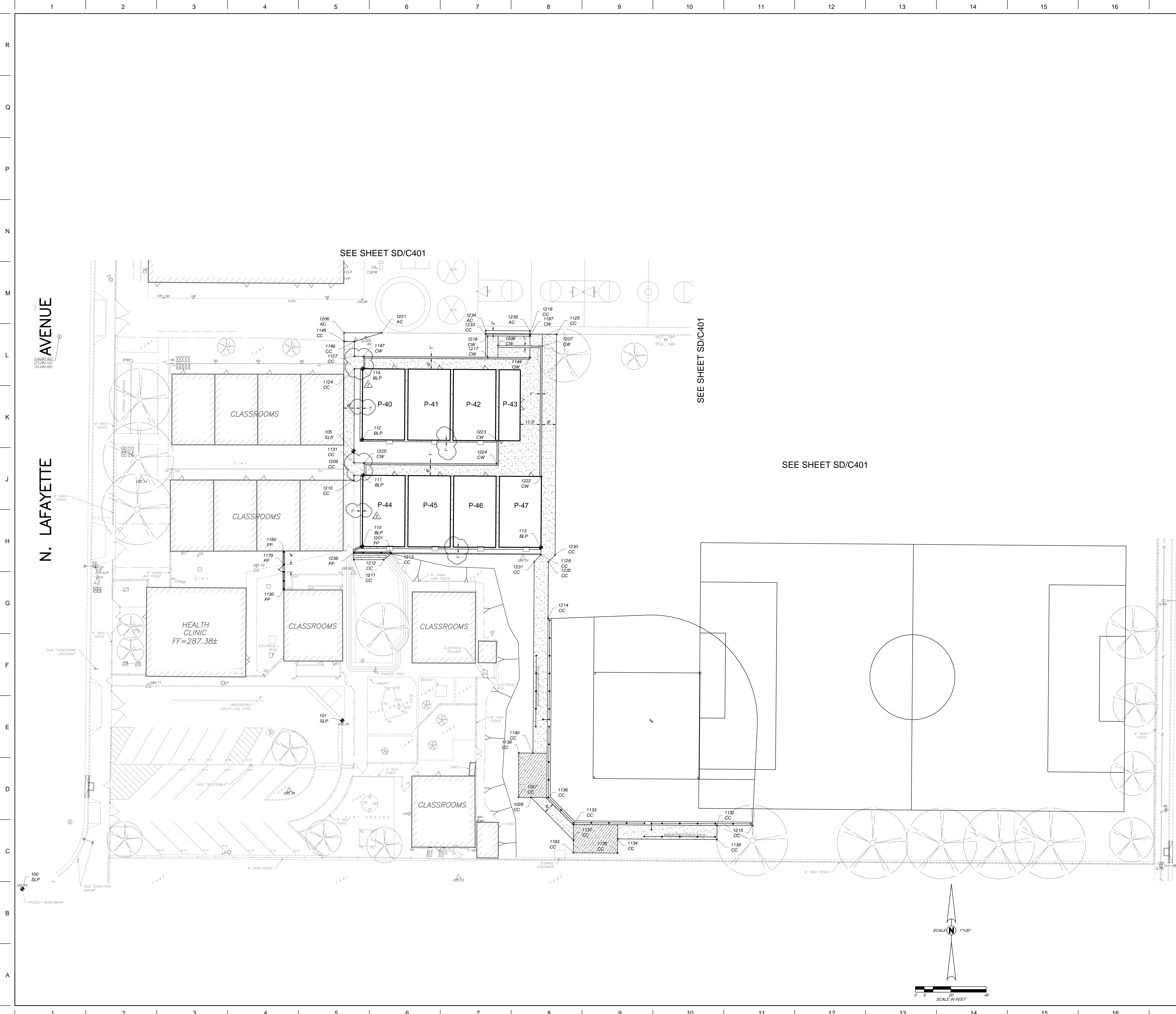
Architect

No.	Revision/Submission	Date
<u>2</u>	ADDENDUM 02	06/01/2021

## Revision

	Designed By: BAA	Copyright	Darden Architects
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Project Number: 1725	Checked By: LRB		
Date: 6/01/2021	Reviewed By: JDB		
		Sheet: _____	of: _____

AD2-CX05



DSA File No.:  
10-48

DSA Application No.:  
02-117220

Agency Approval

1000

XXXX

LAYOUT COORDINATE POINT

100

SLP

SITE LAYOUT POINT

103

BLP

BUILDING LAYOUT POINT

AC

CORNER OF ASPHALT

BC

BEGIN CURVE

CC

CORNER CONCRETE

EC

END CURVE

FL

FLOW LINE

FP

FENCE POST

PCC

POINT OF COMPOUND CURVE

PRC

POINT OF REVERSE CURVE

RP

RADIUS POINT

GENERAL HORIZONTAL CONTROL NOTES:

1. SITE LAYOUT POINT 100 IS A SURVEY CONTROL POINT ON TOP OF EXISTING CURB LOCATED AT THE SOUTHERLY CURB AT THE INTERSECTION OF LAFAYETTE AVENUE AND HOME AVENUE. SITE LAYOUT POINT 101 IS A SURVEY CONTROL POINT ON EXISTING CURB RAMP IN THE SOUTHERN PARKING LOT LOCATED 121'± EAST OF LAFAYETTE AVENUE. SITE LAYOUT POINT 102 IS A SURVEY CONTROL POINT ON EXISTING CONCRETE SIDEWALK LOCATED 24'± NORTH OF NORTHEAST CORNER OF MULTIPURPOSE ROOM. SITE LAYOUT POINT 103 IS A SURVEY CONTROL POINT LOCATED 39.5'± SOUTHWEST OF THE WEST END OF CURB RETURN AT THE SOUTH WEST CORNER OF MCKINLEY AND HUGHES AVENUES. SITE LAYOUT POINT 104 IS A SURVEY CONTROL POINT CHISELED "X" ON TOP OF MOWSTRIP LOCATED 213'± EAST OF THE SOUTHEAST CORNER OF THE BASKETBALL COURTS. SITE LAYOUT POINT 105 IS A SURVEY CONTROL POINT CHISELED "X" IN CONCRETE LOCATED 152'± NORTH OF SITE LAYOUT POINT 101.

2. DIMENSIONS AND POINTS ARE TO CENTER OF FENCE POSTS, FACE OF BUILDINGS, TOP FACE OF CURB, OR EDGE OF CONCRETE, UNLESS SHOWN OTHERWISE.

General Notes

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6/01/2021  
Date Signed

Consultant

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Project

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REGISTERED PROFESSIONAL  
ARCHITECT  
No. C20235  
STATE OF CALIFORNIA  
10-31-21

Architect

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Revision

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SD/C402

Sheet: of:

Drawing: MacR000/Project/21-02-01/SD/Revised Project/SD/

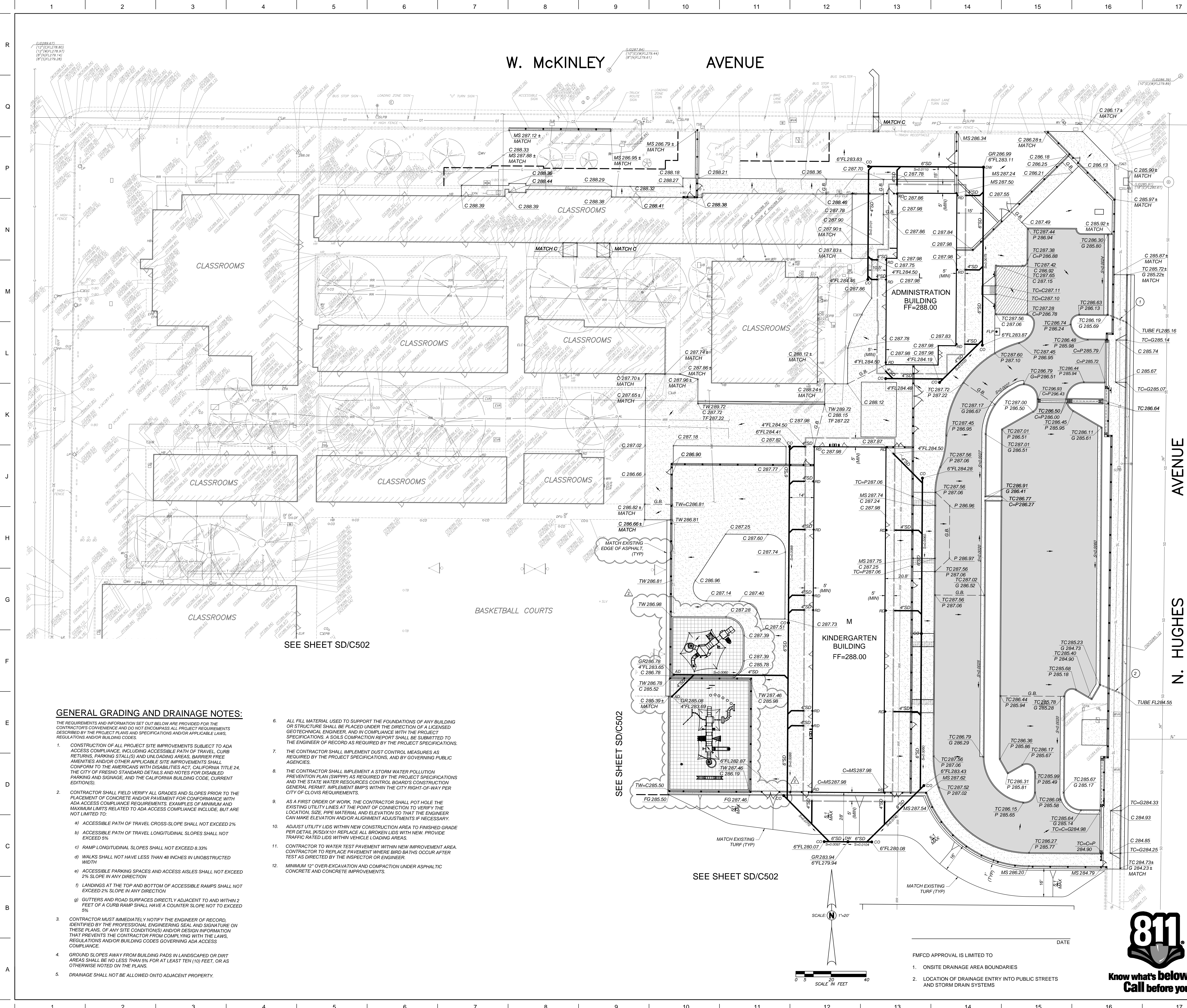
AD2-CX06

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R																		DSA File No.: 10-48			
Q																		DSA Application No.: 02-117220			
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D																					
C																					
B																					
A																					

NORTHING EASTING TABLE				
POINT	NORTHING	EASTING	ABV	DESCRIPTION
100	2161980.75	6316245.89	SLP	SITE LAYOUT POINT
101	2161985.80	6316426.42	SLP	SITE LAYOUT POINT
102	2162512.18	6316428.56	SLP	SITE LAYOUT POINT
103	2162497.24	6316851.73	SLP	SITE LAYOUT POINT
104	2162199.82	6316851.64	SLP	SITE LAYOUT POINT
105	2162137.39	6316432.77	SLP	SITE LAYOUT POINT
106	2162345.04	6316721.23	BLP	BUILDING LAYOUT POINT
107	2162148.81	6316719.91	BLP	BUILDING LAYOUT POINT
108	2162402.36	6316801.62	BLP	BUILDING LAYOUT POINT
109	2162488.83	6316802.20	BLP	BUILDING LAYOUT POINT
110	2162004.05	6316437.73	BLP	BUILDING LAYOUT POINT
111	2162124.24	6316438.13	BLP	BUILDING LAYOUT POINT
112	2162144.37	6316437.67	BLP	BUILDING LAYOUT POINT
113	2162063.50	6316538.52	BLP	BUILDING LAYOUT POINT
114	2162184.37	6316437.94	BLP	BUILDING LAYOUT POINT
1000	2162493.47	6316521.00	BC	BEGIN CURVE
1001	2162493.29	6316547.90	CC	CORNER CONCRETE
1002	2162494.46	6316547.91	CC	CORNER CONCRETE
1003	2162494.39	6316557.51	CC	CORNER CONCRETE
1004	2162492.83	6316546.54	CC	CORNER CONCRETE
1005	2162497.54	6316646.67	CC	CORNER CONCRETE
1006	2162488.90	6316742.89	FP	FENCE POST
1007	2162508.92	6316868.05	FP	FENCE POST
1008	2162523.31	6316853.88	FP	FENCE POST
1009	2162485.20	6316891.46	FP	FENCE POST
1010	2162409.15	6316890.59	FP	FENCE POST
1011	2162405.89	6316887.32	FP	FENCE POST
1012	2162351.15	6316887.80	FP	FENCE POST
1013	2162351.13	6316889.90	FP	FENCE POST
1014	2162168.69	6316887.80	FP	FENCE POST
1015	2162168.71	6316885.70	FP	FENCE POST
1016	2162106.22	6316883.90	FP	FENCE POST
1017	2162380.96	6316777.47	FP	FENCE POST
1018	2162148.37	6316784.60	FP	FENCE POST
1019	2162148.51	6316764.73	FP	FENCE POST
1020	2162344.66	6316777.23	FP	FENCE POST
1021	2162344.74	6316765.04	FP	FENCE POST
1022	2162390.49	6316777.54	FP	FENCE POST
1023	2162334.54	6316719.16	FP	FENCE POST
1024	2162335.06	6316640.41	FP	FENCE POST
1025	2162213.27	6316685.34	FP	FENCE POST
1026	2162148.85	6316714.08	FP	FENCE POST
1027	2161942.49	6316525.83	CC	CORNER CONCRETE
1028	2161942.44	6316532.93	CC	CORNER CONCRETE
1029	2162495.76	6316769.02	CC	CORNER CONCRETE
1030	2162488.28	6316760.50	CC	CORNER CONCRETE
1031	2162459.86	6316760.31	CC	CORNER CONCRETE
1032	2162451.89	6316753.95	CC	CORNER CONCRETE
1033	2162456.82	6316811.21	FP	FENCE POST
1034	2162511.00	6316866.01	FP	FENCE POST
1035	2162504.24	6316871.27	CC	CORNER CONCRETE
1036	2162472.39	6316838.99	CC	CORNER CONCRETE
1037	2162468.77	6316842.56	CC	CORNER CONCRETE
1038	2162465.46	6316887.88	CC	CORNER CONCRETE
1039	2162442.72	6316891.47	CC	CORNER CONCRETE
1040	2162405.62	6316888.54	CC	CORNER CONCRETE
1041	2162405.70	6316876.45	BC	BEGIN CURVE
1042	2162414.43	6316866.05	PCC	POINT OF COMPOUND CURVE
1043	2162420.07	6316871.61	EC	END CURVE
1044	2162419.96	6316887.57	CC	CORNER CONCRETE
1045	2162405.55	6316898.54	CC	CORNER CONCRETE
1046	2162381.56	6316898.27	CC	CORNER CONCRETE
1047	2162378.12	6316888.12	FP	FENCE POST
1048	2162351.72	6316874.23	BC	BEGIN CURVE
1049	2162369.47	6316848.15	EC	END CURVE
1050	2162355.17	6316868.12	EC	END CURVE
1051	2162355.77	6316884.14	CC	CORNER CONCRETE
1052	2162371.99	6316864.17	EC	END CURVE
1053	2162350.64	6316885.91	CC	CORNER CONCRETE
1054	2162369.75	6316884.73	CC	CORNER CONCRETE

POINT	NORTHING	EASTING	ABV	DESCRIPTION
1055	2162369.99	6316864.44	BC	BEGIN CURVE
1056	2162209.71	6316863.16	CC	CORNER CONCRETE
1057	2162201.94	6316878.61	CC	CORNER CONCRETE
1058	2162207.10	6316869.81	BC	BEGIN CURVE
1059	2162203.25	6316863.03	EC	END CURVE
1060	2162148.53	6316882.67	BC	BEGIN CURVE
1061	2162136.46	6316872.80	EC	END CURVE
1062	2162136.39	6316863.45	CC	CORNER CONCRETE
1063	2162136.31	6316895.45	CC	CORNER CONCRETE
1064	2162105.16	6316895.07	CC	CORNER CONCRETE
1065	2162141.45	6316885.39	FP	FENCE POST
1066	2162113.71	6316885.17	CC	CORNER CONCRETE
1067	2162142.74	6316839.67	PCC	POINT OF COMPOUND CURVE
1068	2162169.00	6316817.15	BC	BEGIN CURVE
1069	2162148.65	6316846.67	EC	END CURVE
1070	2162160.07	6316846.74	BC	BEGIN CURVE
1071	2162164.45	6316839.27	EC	END CURVE
1072	2162159.83	6316831.15	CC	CORNER CONCRETE
1073	2162167.66	6316826.70	CC	CORNER CONCRETE
1074	2162311.60	6316790.12	CC	CORNER CONCRETE
1075	2162384.75	6316845.62	BC	BEGIN CURVE
1076	2162377.57	6316848.17	EC	END CURVE
1077	2162379.57	6316836.22	BC	BEGIN CURVE
1078	2162378.06	6316833.56	EC	END CURVE
1079	2162352.18	6316818.38	BC	BEGIN CURVE
1080	2162281.60	6316789.91	CC	CORNER CONCRETE
1081	2162114.49	6316843.12	BC	BEGIN CURVE
1082	2162169.19	6316789.15	EC	END CURVE
1083	2162406.54	6316802.87	CC	CORNER CONCRETE
1084	2162331.41	6316792.93	PCC	POINT OF REVERSE CURVE
1085	2162351.32	6316796.38	PCC	POINT OF REVERSE CURVE
1086	2162366.66	6316798.84	PCC	POINT OF COMPOUND CURVE
1087	2162403.74	6316837.51	PCC	POINT OF REVERSE CURVE
1088	2162416.25	6316846.26	PCC	POINT OF COMPOUND CURVE
1089	2162420.27	6316841.30	BC	BEGIN CURVE
1090	2162420.38	6316824.23	CC	CORNER CONCRETE
1091	2162431.38	6316824.31	CC	CORNER CONCRETE
1092	2162436.38	6316824.34	CC	CORNER CONCRETE
1093	2162525.51	6316548.33	FP	FENCE POST
1094	2162190.04	6316873.20	CC	CORNER CONCRETE
1095	2162319.10	6316790.17	EC	END CURVE
1096	2162380.62	6316840.17	PCC	POINT OF COMPOUND CURVE
1097	2162381.64	6316886.27	CC	CORNER CONCRETE
1098	2162213.07	6316839.01	CC	CORNER CONCRETE
1099	2162213.84	6316875.31	BC	BEGIN CURVE
1100	2162223.30	6316881.41	EC	END CURVE
1101	2162237.62	6316881.51	BC	BEGIN CURVE
1102	2162246.39	6316871.06	EC	END CURVE
1103	2162246.59	6316840.25	CC	CORNER CONCRETE
1104	2162247.15	6316704.57	CC	CORNER CONCRETE
1105	2162285.14	6316704.83	BC	BEGIN CURVE
1106	2162295.21	6316694.90	EC	END CURVE
1107	2162295.37	6316670.86	CC	CORNER CONCRETE
1108	2162268.99	6316653.71	BC	BEGIN CURVE
1109	2162257.40	6316659.95	EC	END CURVE
1110	2162257.26	6316678.69	BC	BEGIN CURVE
1111	2162247.24	6316690.41	EC	END CURVE
1112	2162488.95	6316801.95	FP	FENCE POST
1113	2162303.56	6316624.95	CC	CORNER CONCRETE
1114	2162380.68	6316740.11	CC	CORNER CONCRETE
1115	2162400.91	6316740.23	BC	BEGIN CURVE
1116	2162429.27	6316753.80	EC	END CURVE
1117	2162389.45	6316655.14	CC	CORNER CONCRETE
1118	2162388.98	6316727.14	CC	CORNER CONCRETE
1119	2162345.13	6316705.23	CC	CORNER CONCRETE
1120	2162345.57	6316641.23	CC	CORNER CONCRETE
1121	2162335.14	6316705.16	CC	CORNER CONCRETE
1122	2162335.57	6316641.16	CC	CORNER CONCRETE
1123	2162148.67	6316638.58	CC	CORNER CONCRETE
1124	2162184.40	6316433.25	CC	CORNER CONCRETE

POINT	NORTHING	EASTING	ABV	DESCRIPTION
1125	2162203.82	6316547.33	CC	CORNER CONCRETE
1126	2162473.07	6316827.57	FP	FENCE POST
1127	2162191.42	6316433.28	CC	CORNER CONCRETE
1128	2162079.25	6316538.49	CC	CORNER CONCRETE
1129	2162451.94	6316740.47	CC	CORNER CONCRETE
1130	2162059.91	6316393.44	FP	FENCE POST
1131	2162131.28	6316433.01	CC	CORNER CONCRETE
1132	2161926.59	6316637.66	CC	CORNER CONCRETE
1133	2161927.14	6316556.87	CC	CORNER CONCRETE
1134	2161918.97	6316581.81	CC	CORNER CONCRETE
1135	2161910.97	6316581.76	CC	CORNER CONCRETE
1136	2161841.96	6316541.82	CC	CORNER CONCRETE
1137	2161918.24	6316556.81	CC	CORNER CONCRETE
1138	2161918.59	6316637.81	CC	CORNER CONCRETE
1139	2161967.49	6316525.99	CC	CORNER CONCRETE
1140	2161967.43	6316533.99	CC	CORNER CONCRETE
1141	2162354.72	6316827.96	CC	CORNER CONCRETE
1142	2162386.43	6316645.05	CC	CORNER CONCRETE
1143	2162113.97	6316883.86	FP	FENCE POST
1144	2162190.76	6316532.24	CW	CORNER OF WALL
1145	2162196.92	6316427.39	CC	CORNER CONCRETE
1146	2162199.76	6316433.30	CC	CORNER CONCRETE
1147	2162191.39	6316438.53	CW	CORNER OF WALL
1150	2162447.38	6316824.42	CC	CORNER CONCRETE
1151	2162447.28	6316839.42	BC	BEGIN CURVE
1152	2162450.94	6316842.44	EC	END CURVE
1153	2162450.28	6316839.44	RP	RADIUS POINT
1154	2162415.30	6316834.26	RP	RADIUS POINT
1155	2162415.27	6316841.26	RP	RADIUS POINT
1156	2162415.07	6316871.61	RP	RADIUS POINT
1157	2162415.70	6316876.57	RP	RADIUS POINT
1158	2162371.72	6316874.16	RP	RADIUS POINT
1159	2162372.62	6316840.17	RP	RADIUS POINT
1160	2162369.10	6316843.14	RP	RADIUS POINT
1161	2162372.49	6316836.11	RP	RADIUS POINT
1162	2162351.98	6316848.38	RP	RADIUS POINT
1163	2162349.03	6316852.87	RP	RADIUS POINT
1164	2162351.15	6316846.38	RP	RADIUS POINT
1165	2162318.81	6316830.17	RP	RADIUS POINT
1166	2162203.22	6316867.53	RP	RADIUS POINT
1167	2162148.46	6316872.67	RP	RADIUS POINT
1168	2162168.63	6316843.49	RP	RADIUS POINT
1169	2162146.69	6316840.67	RP	RADIUS POINT
1170	2162282.91	6316904.83	RP	RADIUS POINT
1171	2162294.90	6316860.00	RP	RADIUS POINT
1172	2162273.75	6316870.98	RP	RADIUS POINT
1173	2162245.26	6316878.58	RP	RADIUS POINT
1174	2162233.37	6316876.91	RP	RADIUS POINT
1175	2162351.66	6316831.36	RP	RADIUS POINT
1176	2162160.10	6316841.74	RP	RADIUS POINT
1177	2162337.07	6316922.17	RP	RADIUS POINT
1178	2162175.61	6316937.04	CC	CORNER CONCRETE
1179	2162078.76	6316932.42	FP	FENCE POST
1180	2162081.05	6316933.39	FP	FENCE POST
1181	2162333.18	6316640.32	FP	FENCE POST
1182	2162149.05	6316804.92	FP	FENCE POST
1183	2162184.61	6316776.16	FP	FENCE POST
1184	2162148.43	6316775.91	FP	FENCE POST
1185	2162524.89	6316604.86	RP	CORNER CONCRETE
1186	2162525.52	6316606.51	RP	CORNER CONCRETE
1187	2162404.40	6316584.63	RP	CORNER CONCRETE
1188	2162408.75	6316766.47	FP	FENCE POST
1189	2162405.57	6316872.71	BC	BEGIN CURVE
1190	2162405.59	6316869.73	EC	END CURVE
1191	2162405.57	6316872.73	RP	RADIUS POINT
1192	2162336.37	6316605.24	CC	CORNER CONCRETE
1193	2161911.14	6316506.76	CC	CORNER CONCRETE
1194	2161563.53	6316627.70	CC	CORNER CONCRETE
1195	2161516.86	6316618.14	CC	CORNER CONCRETE
1197	2162260.76	6316532.32	CW	CORNER OF WALL



DSA File No.:  
10-48

DSA Application No.:  
02-117220

Agency Approval

GRADING LEGEND:

BST

BOTTOM OF STEP

C

CONCRETE

D

DIRT

FF

FINISHED FLOOR

FG

FINISHED GRADE

FL

FLOWLINE

G

GUTTER

GR

STORM DRAIN GRATE

MS

MAINTENANCE STRIP

P

PAVEMENT

TC

TOP OF CURB

TST

TOP OF STEP

TW

TOP OF WALL

VG

VALLEY GUTTER

EXISTING ELEVATION

(344.9)

NEW FINISHED GRADE

DIRECTION OF DRAINAGE

BUILDING OVER-EXCAVATION LIMITS; SEE DETAIL (H/SDX102)

G.B.

GRADE BREAK

LIMITS OF GRADING

PIPE SLOPE AND DIRECTION OF FLOW

SWALE

V12 STORM DRAIN INLET PER DETAIL (E/SDX105)

AD

NDS SPEED-BASIN PER DETAIL (G/SDX105)

CO

SURFACE CLEANOUT PER DETAIL (D/SDX105)

6"SD

STORM DRAIN PIPELINE; SIZE AS NOTED

TRENCH AND BACKFILL PER DETAIL (A/SDX105)

S=0.0020

FLOWLINE SLOPE AND DIRECTION OF FLOW

OW

DRY WELL PER DETAIL (G/SDX104)

1

3"x3" RECTANGULAR TUBE PER CITY OF FRESNO STD. DETAIL P-23

2

TWO 3"x3" RECTANGULAR TUBES PER CITY OF FRESNO STD. DETAIL P-23

General Notes

Blair, Church & Flynn

CONSULTING ENGINEERS

455 Civic Avenue, Suite 200  
Clovis, California 93612  
(559) 326-5400  
Fax: (559) 326-1500

6/01/2021  
Date

Consultant

Addams Elementary School Building Additions and Modernization

Fresno Unified School District

2117 W McKinley Ave., Fresno, Ca 93728

Project

GRADING AND DRAINAGE PLAN

Drawing

arden

ARCHITECTURE  
PLANNING  
INTERIORS  
architects

6790 N. West Ave. • Fresno, CA 93711 • T. 559.448.8051

ARCHITECT

6/01/2021  
Date

Architect

No.	Revision/Submission	Date
2	ADDENDUM 02	06/01/2021

Revision

Designed By: BAA

Copyright: Darden Architects

Scale: AS NOTED

Drawn By: SD/MJA

Project Number: 1725

Checked By: LRB

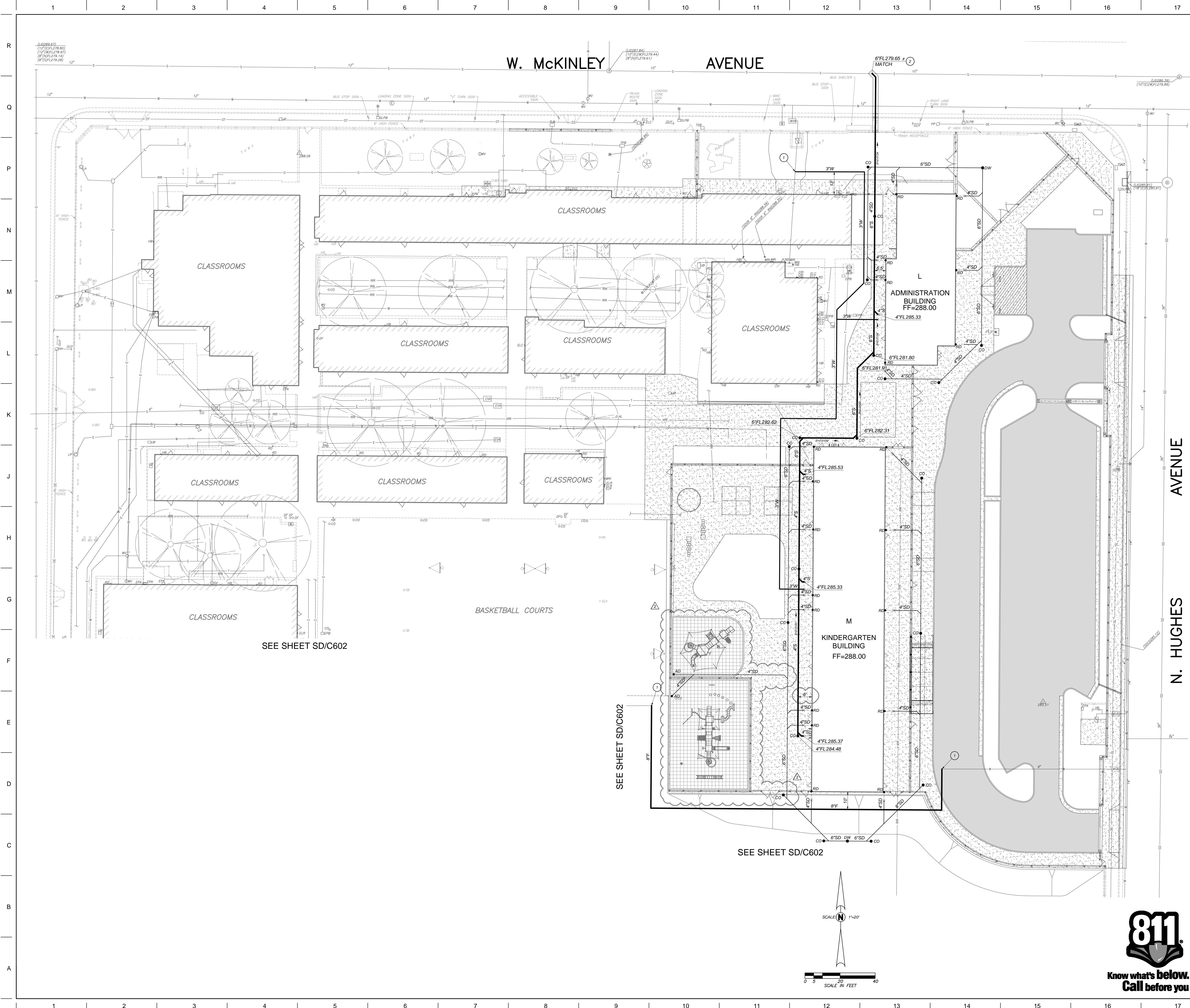
Date: 6/01/2021

Reviewed By: JDB

Sheet: of:

SD/C501

AD2-CX08



DSA File No.: 10-48

DSA Application No.: 02-117220

Agency Approval

UTILITY LEGEND:

6" SDR-35 PVC SEWER MAIN, SIZE AS NOTED ON PLANS. PIPE BEDDING AND BACKFILL PER DETAIL [A/SDX105]

6" W PVC WATER MAIN, SIZE AS NOTED ON PLAN, MIN. 30" COVER. THRUST BLOCKS PER DETAIL [B/SDX105]. PIPE BEDDING AND BACKFILL PER DETAIL [A/SDX105]

6" W PVC FIRE MAIN, SIZE AS NOTED ON PLANS, MIN. 42" COVER. THRUST BLOCKS PER DETAIL [B/SDX105]. PIPE BEDDING AND BACKFILL PER [A/SDX105]

6" SD STORM DRAIN PIPE, SEE GRADING PLAN

FF FINISH FLOOR

FL FLOWLINE

CO SEWER CLEANOUT PER DETAIL [D/SDX105]

RD ROOF DRAIN, SEE PLUMBING PLANS

WV WATER VALVE PER [C/SDX105]

X- POINT OF CONNECTION TO PROPOSED UTILITY, COORDINATE WITH PLANS PRIOR TO CONNECTION

S=0.0020 FLOWLINE SLOPE AND DIRECTION OF FLOW

1 CONNECT TO EXISTING WATER LINE WITH WATER TIGHT CONNECTION. VERIFY SIZE, DEPTH AND LOCATION.

2 CONNECT TO EXISTING SEWER LINE WITH WATER TIGHT CONNECTION PER CITY OF FRESNO STANDARDS. VERIFY SIZE, DEPTH AND LOCATION.

3 CONNECT TO EXISTING SEWER LINE WITH WATER TIGHT CONNECTION. VERIFY SIZE, DEPTH AND LOCATION.

GENERAL SITE UTILITY NOTES:

1. THE CONTRACTOR SHALL FIELD VERIFY THE EXACT LOCATION, SIZE, DEPTH, AND TYPE OF ALL EXISTING UTILITIES AND INTERFERENCES SITUATED ALONG THE ROUTE OF THE PROPOSED CONSTRUCTION PRIOR TO COMMENCEMENT OF EXCAVATION, FABRICATION, AND INSTALLATION. THE CONTRACTOR SHALL CONSTRUCT ALL IMPROVEMENTS IN SUCH A MANNER AS WILL PROTECT ALL EXISTING UNDERGROUND UTILITIES AND, IN THE EVENT OF ANY CONFLICTS, SHALL NOTIFY THE ENGINEER BEFORE PROCEEDING.

2. SEE IRRIGATION PLANS FOR PROPOSED IRRIGATION PIPE ALIGNMENT.

3. COORDINATE EXACT PLUMBING LOCATIONS OF BUILDINGS AND NOTIFY THE ENGINEER OF ANY CONFLICT SO THAT ADJUSTMENTS CAN BE MADE IF NEEDED.

4. SAWCUT EXISTING CONCRETE IMPROVEMENTS AS NECESSARY TO INSTALL NEW WATER OR SEWER IMPROVEMENTS. CONSTRUCT NEW CONCRETE IMPROVEMENTS TO MATCH ADJACENT CONCRETE IMPROVEMENTS.

5. INSTALLATION, TYPE, AND MANUFACTURERS MODELS OF DOMESTIC WATER METERS, DRAIN INLETS/OUTLETS AND OTHER APPURTENANCES OF SITE UTILITY SYSTEMS SHALL BE DONE IN STRICT ACCORDANCE WITH GOVERNING AUTHORITY REQUIREMENTS.

6. LAYOUT OF MATERIALS, EQUIPMENT AND SYSTEMS IS GENERALLY DIAGRAMMATIC UNLESS SPECIFICALLY DIMENSIONED. SOME WORK MAY BE SHOWN OFFSET FOR CLARITY. THE ACTUAL LOCATIONS OF ALL MATERIALS, PIPING, FIXTURES, EQUIPMENT, SUPPORTS, ETC. SHALL BE CAREFULLY PLANNED PRIOR TO INSTALLATION OF ANY WORK TO AVOID ALL INTERFERENCES WITH EACH OTHER OR WITH STRUCTURAL, ELECTRICAL, PLUMBING AND MECHANICAL, ARCHITECTURAL OR ANY OTHER ELEMENTS. ALL CONFLICTS SHALL BE CALLED TO THE ATTENTION OF THE ARCHITECT AND THE ENGINEER PRIOR TO THE INSTALLATION OF ANY WORK OR THE ORDERING OF ANY EQUIPMENT.

7. ANY INSPECTION TO BE MADE BY THE CITY OF FRESNO SHALL REQUIRE A MINIMUM OF 24 HOUR NOTICE.

8. PURITY TESTS ARE REQUIRED ON ALL WATER SYSTEM INSTALLATIONS. CONTRACTOR TO COORDINATE WITH CITY INSPECTOR.

9. IF THE TOP OF THE STEM OF ANY WATER GATE VALVE IS DEEPER THAN 4' BELOW FINISHED PAVEMENT GRADE, THE CONTRACTOR SHALL INSTALL A STEM EXTENSION SO THAT THE TOP OF THE STEM, WITH EXTENSION, SHALL BE NO DEEPER THAN 4' NOR SHALLOWER THAN 2' FROM FINISHED GRADE.

10. BACKFILL UTILITY TRENCHES PER DETAIL [A/SDX105]

11. ADJUST EXISTING UTILITY LIDS TO FINISHED GRADE PER UTILITY COMPANY STANDARDS OR PER DETAIL [K/SDX101] AND INSTALL TRAFFIC RATED LIDS WHERE LOCATED IN A TRAFFIC AREA.

12. AS FIRST ORDER OF WORK, CONTRACTOR SHALL POTHOLE EXISTING UTILITIES AND NOTIFY ENGINEER IMMEDIATELY OF LOCATIONS, SIZE AND DEPTH.

13. SEWER LATERALS FROM BUILDING P.O.C. SHALL HAVE A MINIMUM SLOPE OF 2% TO THE MAIN LINE CONNECTION, UNLESS NOTED OTHERWISE.

General Notes

Blair, Church & Flynn

455 Centre Avenue, Suite 200

Clark, California 93612

TEL (559) 326-5400

FAX (559) 326-1500

CONSULTING ENGINEERS

Consultant

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Fresno Unified School District

2117 W McKinley Ave. Fresno, Ca 93728

Project

UTILITY PLAN

Drawing

arden architects

ARCHITECTURE PLANNING INTERIORS

www.ardenarchitects.com

6790 N. West Ave. • Fresno, CA 93711 • T. 559.448.8051

DESIGNED ARCHITECT

PRESTON J. APPEL

No. C-2235

Ren. 10-31-15

STATE OF CALIFORNIA

Architect

No.	Revision/Submission	Date
2	ADDENDUM 02	06/01/2021

Revision

Designed By: BAA

Copyright: Darden Architects

Scale: AS NOTED

Drawn By: SD/MJA

Project Number: 1725

Checked By: LRB

Date: 6/01/2021

Reviewed By: JDB

Sheet: SD/C601

of:

811

Know what's below.

Call before you dig.

AD2-CX09

6/3/2021 2:53:30 PM  
C:\Users\andrew\Documents\1725\_Addams\_ES\_Building  
B\_and\_Site\_BIDDING\_V18\_andrew@dardenarchitects.com.rvt

A1

Demolition Site Plan

1" = 30'-0"

A

B

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D

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A1

Overall Site Plan

DSA File No.:  
10-H8

DSA Application No.:  
02-117220

Agency Approval

#### SYMBOLS

	ASPHALT PAVING, Asphalt Concrete Over Aggregate Base. See CIVIL
	CAST-IN-PLACE CONCRETE, Site Walk. See CIVIL
	LANDSCAPE PLANTING, Turf, for additional information See LANDSCAPE
	CAST-IN-PLACE CONCRETE, 6" Concrete Walk over 12" 90% Compacted Fill
	Building Outline
	Property Line
	Limits of Construction (Project Area)
	(E) CHAIN-LINK, Fence
	CHAIN-LINK, Fence
	Pipe/Utility
	Covered Area
	PVC Irrigation Sleeve
	Grade Break
	Existing
	Drainage Swale
	General Direction of Slope
	ELECTRICAL, Existing Light Pole
	Opening Group No. Refer to Door or Window Opening Schedules
	Reference Point
	Finish Grade Contour
	STORM DRAINAGE, Catch Basin or Drain Box
	STORM DRAINAGE, Drain Box
	STORM DRAINAGE, Drain Inlet
	STORM DRAINAGE, Trench Drain
	FIRE PROTECTION, Fire Hydrant
	FIRE PROTECTION, Fire Department Connection (Siamese)
	FIRE PROTECTION, Post Indicator Valve
	PLUMBING, Clean Out
	CIVIL, Sewer Clean Out
	PLUMBING, Shut Off Valve
	ELECTRICAL, Pole Light Fixture
	ELECTRICAL, Boltard Light Fixture
	ELECTRICAL, Light Fixture, Directional
	ELECTRICAL & MECHANICAL, Utility Box

#### ABBREVIATIONS

(E) Existing	FF Finish Floor	PL Planter
AC Air Conditioning System	FG Finish Grade	R Radius
AD Area Drain, (See Plumbing)	FL Flow Line	RWL Rain Water Leader
BW Back of Walk	FMFCD Fresno Metropolitan Flood Control District	SD Storm Drain
C Concrete	FS Floor Sink	SL Site Lighting
CB Catch Basin	G Gas	SS Sanitary Sewer
CJ Control Joint	GT Gutter	SB Top of Bench
CM Communications	HL Hydronics Line	TC Top of Curb
COB Clean Out Box	HPG High Pressure Gas	TD Trench Drain
CW Cold Water	INV N Invert North	TG Top of Grade
DB Drain Box	INV NE Invert Northeast	TL Top of Lid
DS Drainage Swale	MH Manhole	TLB Top of Light Base
EMS Energy Management System	MS Mow Strip	TW Top of Wall
E Electrical Power	OC On Center	Typ Typical
EL Expansion Joint, 1/2"	P Pavement	UNO Unless Noted
F Fire Protection	P1-P4 Electrical Utility Box	VG Valley Gutter
FD Floor Drain	PIV Post Indicator Valve	W Waste
FDC Fire Dept Connection		

#### NOTES

- 1) CAST-IN-PLACE CONCRETE, All Concrete Walk Joints Shall Be Control Joints unless otherwise noted. Provide Expansion Joints where walk abuts other site elements
- 2) STORM DRAINAGE, PVC IRRIGATION SLEEVE Schedule, See CIVIL
- 3) PLUMBING, See Plumbing Drawings
- 4) ELECTRICAL, See Electrical Drawings
- 5) LANDSCAPING, See Landscape and Irrigation Drawings
- 6) Refer to CIVIL for Vertical Controls and Grading

G18

No Scale

Site Plan Legend

#### General Notes

**Addams Elementary School Building Additions and Modernization**  
Fresno Unified School District  
2117 W McKinley Ave, Fresno, CA 93726

Site Development  
Overall Site Plan

Drawing

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Architect

No.	Revision/Submission	Date
2	Addendum #2	05/21/21
Revision		
Designed By/TA/AC	Copyright © 2021 Darden Architects	
Scale: 1" = 30'-0"	Drawn By: BY	SD/A101
Project Number: 1725	Checked By: AC	
Date: 04/22/21	Reviewed By: TA	Sheet: _____ of: _____

Building	Room Number	Room Name	Floor Finishes										Base Finishes				Wall Finishes				Ceiling Finishes				Miscellaneous Finishes				Remarks
			CAST-IN-PLACE CONCRETE, Concrete Slab.	CARPET Broadloom	CARPET Walk-off	RESINOUS FLOORING.	RESILIENT SHEET, Vinyl Sheet	POLISHED CONCRETE	RESILIENT BASE AND ACCESSORIES, Rubber Wall Base, 4"	RESILIENT BASE AND ACCESSORIES, Rubber Wall Base, 6"	RESINOUS FLOORING, Base,	RESILIENT SHEET, Integral Base	GYPSUM BOARD, Wallboard, (Texture GB-2)	GYPSUM BOARD, Water Resistant, (Texture GB-2)	WALL COVERINGS, Vinyl Covered Teakboard over Gypsum Board (GB-3)	FRP Panels over Gypsum Board, Water Resistant (GB-3)	ROUGH CARPENTRY, 3/4" Plywood over Gypsum Board	ACOUSTICAL CEILINGS, Tile (Glue on over Gyp. Bd.	ACOUSTICAL CEILINGS, Suspension System,	ACOUSTICAL CEILINGS, Tile (Glue On over Gyp Bd)	GYPSUM BOARD, Wallboard (Texture GB-2),	STEEL AND FABRICATIONS, (Exposed to View)	SHEET METAL, All Items Exposed to View,	METAL DOORS AND FRAMES, Doors, Panels and Frames	WOOD DOORS,	MECHANICAL, All Items Exposed to View (Grilles, Ducts Etc.),	PLUMBING, Piping Exposed to View, etc.	ELECTRICAL, All Items Exposed to View, Conduits, etc.	
B	03	Classroom	-	FF	FF	-	-	-	FF	-	-	-	-	-	FF	-	-	-	ACT1	-	-	-	-	M2	-	-	-	-	
B	04	Classroom	-	FF	FF	-	-	-	FF	-	-	-	-	-	FF	-	-	-	ACT1	-	-	-	-	M2	-	-	-	-	
L	101	Lobby	-	-	FF	-	-	GL-5/GGL-II	FF	-	-	-	DW2	-	FF	-	-	ACTIII	-	ACTIII	DW2	-	M2	-	FF	-	-	-	
L	102	Nurse	-	-	-	-	-	GL-5/GGL-II	FF	-	-	-	-	-	FF	-	-	ACT1	-	DW2	-	-	M2	FF	-	-	-	-	
L	102a	Nurse Toilet	-	-	-	FF	-	-	-	FF	-	-	-	-	FF	-	-	-	-	-	-	-	M2	FF	-	-	-	-	
L	103	Conference Room	-	FF	-	-	-	-	FF	-	-	-	-	-	FF	-	-	ACT1	-	-	-	-	M2	FF	-	-	-	-	
L	103a	Restroom	-	FF	-	FF	-	-	-	FF	-	-	-	-	FF	-	-	-	-	DW2	-	-	M2	FF	-	-	-	-	
L	104	Work Room	-	FF	FF	-	-	-	FF	-	-	-	-	-	ACT1	-	-	ACT1	-	-	-	-	M2	FF	-	-	-	-	
L	105	Office	-	FF	-	-	-	-	FF	-	-	-	-	-	FF	-	-	ACT1	-	-	-	-	M2	FF	-	-	-	-	
L	106	Office	-	FF	-	-	-	-	FF	-	-	-	-	-	FF	-	-	ACT1	-	-	-	-	M2	FF	-	-	-	-	
L	107	Office	-	FF	-	-	-	-	FF	-	-	-	-	-	FF	-	-	ACT1	-	-	-	-	M2	FF	-	-	-	-	
L	108	Office	-	FF	FF	-	-	-	FF	-	-	-	-	-	FF	-	-	ACT1	-	-	-	-	M2	FF	-	-	-	-	
L	109	Office	-	FF	-	-	-	-	FF	-	-	-	-	-	FF	-	-	ACT1	-	-	-	-	M2	FF	-	-	-	-	
L	110	Office	-	FF	-	-	-	-	FF	-	-	-	-	-	FF	-	-	ACT1	-	-	-	-	M2	FF	-	-	-	-	
L	111	Staff Toilet	-	-	-	FF	-	-	-	FF	-	-	-	-	FF	-	-	-	DW2	-	FF	-	M2	FF	-	-	-	-	
L	112	Custodian	-	-	-	-	FF	-	-	-	FF	-	-	-	DW2	-	-	-	-	-	FF	-	M2	FF	-	-	-	-	
L	113	Staff Toilet	-	-	-	FF	-	-	-	-	FF	-	-	-	-	FF	-	-	-	DW2	-	-	M2	FF	-	-	-	-	
L	114	Storage	CFS	-	-	-	-	-	FF	-	-	-	DW2	-	-	-	-	-	-	DW2	-	-	M2	-	-	-	-	-	
L	115	Electrical	CFS	-	-	-	-	-	FF	-	-	-	DW2	-	-	W2	-	-	-	-	-	-	M2	-	-	-	-	-	1
L	116	Hallway	-	-	FF	-	-	GL-5/GGL-II	FF	-	-	-	DW2	-	FF	-	-	ACTIII	ACT1	ACTIII	DW2	-	M2	-	-	-	-	-	
M	101	Kindergarten	-	FF	FF	-	-	GL-5/ GGL-II	FF	-	-	-	-	-	FF	-	-	ACT1	-	-	-	-	M2	-	-	-	-	-	
M	102	Staff Workroom	-	FF	-	-	-	-	FF	-	-	-	-	-	FF	-	-	ACT1	-	-	-	-	M2	FF	-	-	-	-	
M	102a	Staff Toilet	-	-	-	-	-	-	-	FF	-	-	-	-	FF	-	-	-	-	DW2	-	-	-	-	FF	-	-	-	
M	102b	Electrical	CFS	-	-	-	-	-	FF	-	-	-	DW2	-	-	-	W2	-	-	-	-	-	-	FF	-	-	-	-	1
M	103	Toilet	-	-	-	FF	-	-	-	FF	-	-	-	-	FF	-	-	-	-	DW2	-	-	M2	FF	-	-	-	-	
M	103a	Toilet	-	-	-	FF	-	-	-	FF	-	-	-	-	FF	-	-	-	-	DW2	-	-	-	FF	-	-	-	-	
M	103b	Toilet	-	-	-	FF	-	-	-	FF	-	-	-	-	FF	-	-	-	-	DW2	-	-	-	FF	-	-	-	-	
M	104	Kindergarten	-	FF	FF	-	-	GL-5/ GGL-II	FF	-	-	-	-	-	FF	-	-	ACT1	-	-	-	-	M2	-	-	-	-	-	
M	105	Kindergarten	-	FF	FF	-	-	GL-5/ GGL-II	FF	-	-	-	-	-	FF	-	-	ACT1	-	-	-	-	M2	-	-	-	-	-	
M	106	Staff Workroom	-	FF	-	-	-	-	FF	-	-	-	-	-	FF	-	-	ACT1	-	-	-	-	M2	FF	-	-	-	-	
M	106a	Staff Toilet	-	-	-	FF	-	-	-	FF	-	-	-	-	-	FF	-	-	-	DW2	-	-	M2	FF	-	-	-	-	
M	106b	Custodian	-	-	-	-	FF	-	-	-	FF	-	-	-	-	FF	-	-	-	-	FF	-	M2	FF	-	-	-	-	1
M	107	Toilet	-	-	-	FF	-	-	-	-	FF	-	-	-	-	FF	-	-	-	DW2	-	-	M2	FF	-	-	-	-	
M	107a	Toilet	-	-	-	FF	-	-	-	-	FF	-	-	-	-	FF	-	-	-	DW2	-	-	M2	FF	-	-	-	-	
M	107b	Toilet	-	-	-	FF	-	-	-	-	FF	-	-	-	-	FF	-	-	-	DW2	-	-	M2	FF	-	-	-	-	
M	108	Kindergarten	-	FF	FF	-	-	GL-5/ GGL-II	FF	-	-	-	-	-	FF	-	-	ACT1	-	-	-	-	M2	-	-	-	-	-	
M	109	Kindergarten	-	FF	FF	-	-	GL-5/ GGL-II	FF	-	-	-	-	-	FF	-	-	ACT1	-	-	-	-	M2	-	-	-	-	-	
M	110	Staff Workroom	-	FF	-	-	-	-	FF	-	-	-	-	-	FF	-	-	ACT1	-	-	-	-	M2	FF	-	-	-	-	
M	110a	Storage	-	FF	-	-	-	-	FF	-	-	-	DW2	-	-	FF	-	-	-	-	-	M2	FF	-	-	-	-	-	1
M	111	Toilet	-	-	-	FF	-	-	-	FF	-	-	-	-	FF	-	-	-	-	DW2	-	-	M2	FF	-	-	-	-	
M	111a	Toilet	-	-	-	FF	-	-	-	FF	-	-	-	-	FF	-	-	-	-	DW2	-	-	M2	FF	-	-	-	-	
M	111b	Toilet	-	-	-	FF	-	-	-	FF	-	-	-	-	FF	-	-	-	-	DW2	-	-	M2	FF	-	-	-	-	
M	112	Toilet	-	-	-	FF	-	-	-	FF	-	-	-	-	FF	-	-	-	-	DW2	-	-	M2	-	-	-	-	-	
M	113	Toilet	-	-	-	FF	-	-	-	FF	-	-	-	-	FF	-	-	-	-	DW2	-	-	M2	-	-	-	-	-	
P	P34	Classroom	-	FF	FF	-	-	-	FF	-	-	-	-	-	FF/DW2	-	-	ACT1	-	-	-	-	M2	-	-	-	-	-	
P	P40	Classroom	-	FF	FF	-	-	-	FF	-	-	-	-	-	FF/DW2	-	-	ACT1	-	-	-	-	M2	-	-	-	-	-	
P	P41	Classroom	-	FF	FF	-	-	-	FF	-	-	-	-	-	FF/DW2	-	-	ACT1	-	-	-	-	M2	-	-	-	-	-	
P	P42	Classroom	-	FF	FF	-	-	-	FF	-	-	-	-	-	FF/DW2	-	-	ACT1	-	-	-	-	M2	-	-	-	-	-	
P	P43a	Girls Restroom	-	-	-	FF	-	-	-	-	FF	-	-	-	DW2	-	FF	-	-	-	-	-	M2	-	-	-	-	-	3
P	P43b	Boys Restroom	-	-	-	FF	-	-	-	-	FF	-	-	-	DW2	-	FF	-	-	-	-	-	M2	-	-	-	-	-	3
P	P44	Classroom	-	FF	FF	-	-	-	FF	-	-	-	-	-	FF/DW2	-	-	ACT1	-	-	-	-	M2	-	-	-	-	-	
P	P45	Classroom	-	FF	FF	-	-	-	FF	-	-	-	-	-	FF/DW2	-	-	ACT1	-	-	-	-	M2	-	-	-	-	-	
P	P46	Classroom	-	FF	FF	-	-	-	FF	-	-	-	-	-	FF/DW2	-	-	ACT1	-	-	-	-	M2	-	-	-	-	-	
P	P47	Classroom	-	FF	FF	-	-	-	FF	-	-	-	-	-	FF/DW2	-	-	ACT1	-	-	-	-	M2	-	-	-	-	-	

DSA File No.:  
10-H8

DSA Application No.:  
02-117220

Agency Approval

#### ABBREVIATIONS

AESS = Architectural Exposed Structural Steel  
AFP = Acrylic Floor Finish  
CCC = Clear Curing Compound  
CFS = Clear Floor Sealer  
CFH = Clear Floor Hardener  
CWR = Colored Water Resistant Finish  
CT# = Ceramic Tile Type  
FF = Factory Finish  
GL = Gloss Level  
GGL = Grind Grade Level  
GS = Grout Sealer  
PC = Polished Concrete  
ACT# = Acoustic Ceiling Tile Type  
RWF = Resilient Wood Floor  
RF# = Resinous Floor Type  
\* = Refer To Remarks

#### Interior Paint Finishes:

Refer To Specification Section - PAINTING

CB# = Concrete or Concrete Masonry Units  
DW# = Gypsum Board Finish  
P# = Cement Plaster, Veneer Plaster or Gypsum Plaster Finish  
M# = Metal Finish  
W# = Woodwork Finish  
X# = Special Finishes

#### NOTES

- Refer to appropriate Specification Sections for Materials, Systems and Types.
- All Details, Materials and Finishes shall be considered "Typical" for all similar conditions, Unless Otherwise Noted.
- Do not paint Fire Rated Door and Frame Rating Plates.
- Refer to Interior Elevations for additional information.
- This Schedule is provided for the convenience of the Contractor. Field verify all conditions and dimensions prior to fabrication, installation or application.
- See Interior Color Schedule for Finish / Material Colors.
- Gypsum Board Textures indicated are for areas exposed to view. Areas above ceilings shall be GB5, Unless Otherwise Noted. Refer to Specifications for appropriate locations of other textures.
- VAPOR-ALKALINITY CONTROL: Apply Vapor-Alkalinity Control Membrane System at all concrete slab areas scheduled to receive applied floor covering that are sensitive to and have requirements for limits of vapor transmission and pH levels."

#### REMARKS

- Open to ceiling above.
- Now and existing tackboard to be painted.
- Existing ceiling to remain.

J18

Interior Finish Schedule Legend

No Scale

#### General Notes

Consultant

**Addams Elementary School Building Additions and Modernization**  
Fresno Unified School District  
2117 W McKinley Ave, Fresno, CA 93726  
Project

Typical Information  
Interior Finish Schedule

Drawing



Architect

No.	Revision/Submission	Date
2	Addendum #2	05/21/21

#### Revision

Designed Designer Copyright 2021 Darden Architects

Scale: As indicated Drawn By: Author

Project Number: 1725 Checked IChecker

Date: 04/22/21 Reviewer Approver Sheet: \_\_\_\_\_ of: \_\_\_\_\_

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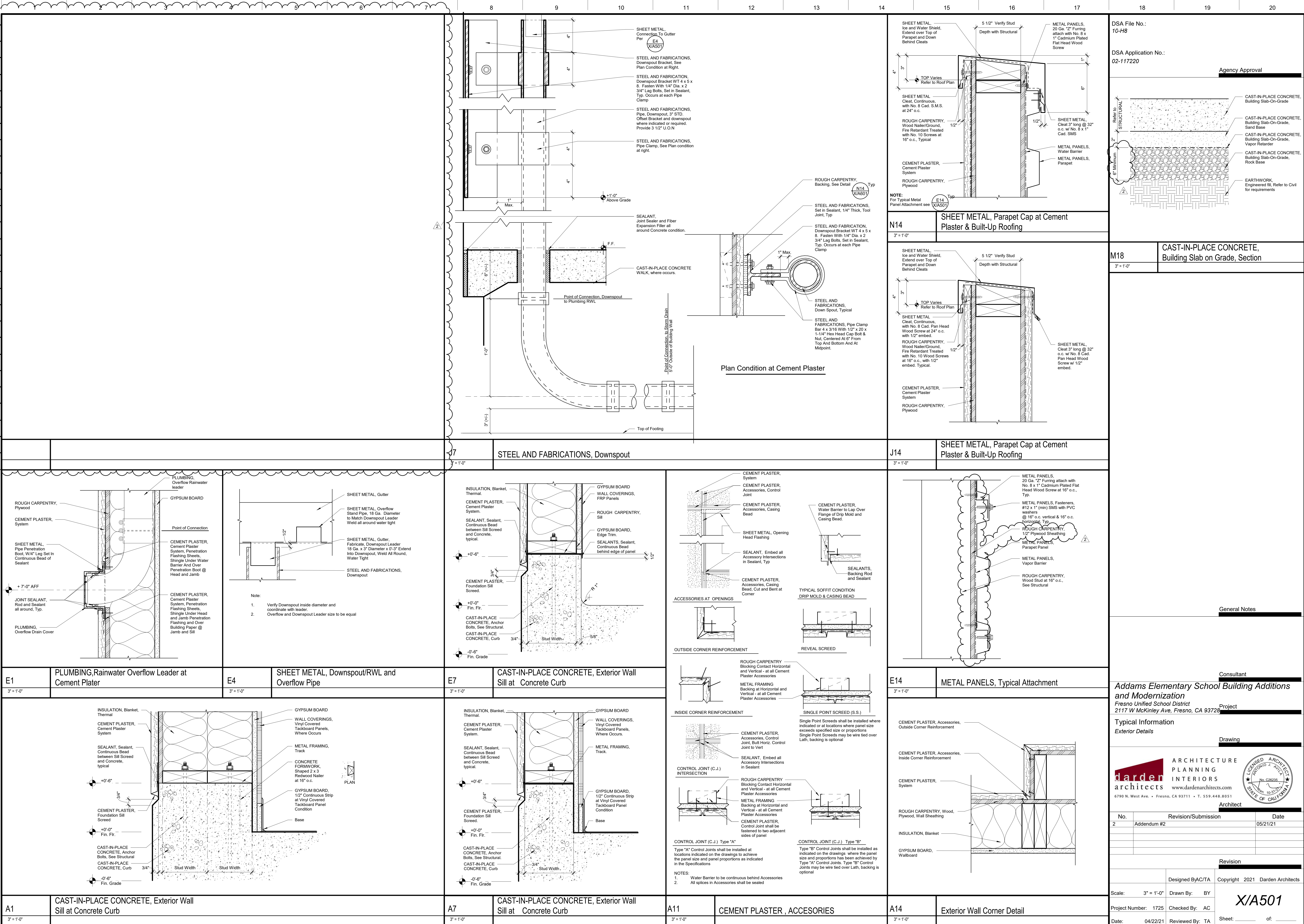
Casework Schedule										
Building	Room No	Group No.	Description	Catalog No.	No Req'd	Length	Height	Depth	Accessories	Remarks
R	B 03	a 03	Base Cabinet w/ ADA Plumbing Cover	153M	1	3'- 0"	2'- 8 1/2"	2'- 0"	-	1
	B 03	a 03	Base Cabinet w/ Drawers	222	4	2'- 6"	2'- 8 1/2"	2'- 0"	L	-
	B 03	a 03	Tall Storage Cabinet	402	3	3'- 0"	7'- 2"	2'- 0"	L	-
	B 03	a 03	Counter Top	-	1		2'- 10"	2'- 1"	-	2
B	04	a 04	Base Cabinet w/ ADA Plumbing Cover	153M	1	3'- 0"	2'- 8 1/2"	2'- 0"	-	1
	B 04	a 04	Base Cabinet w/ Drawers	222	1	2'- 6"	2'- 8 1/2"	2'- 0"	L	-
	B 04	a 04	Base Cabinet w/ Drawers	222	1	3'- 0"	2'- 8 1/2"	2'- 0"	L	-
	B 04	a 04	Base Cabinet w/ Drawers	222	1	4'- 0"	2'- 8 1/2"	2'- 0"	L	-
Q	B 04	a 04	Tall Storage Cabinet	402	3	3'- 0"	7'- 2"	2'- 0"	L	-
	B 04	a 04	Counter Top	-	1		2'- 10"	2'- 1"	-	2
P	101	a 101	Base Cabinet w/ Drawers	222	4	3'- 0"	2'- 8 1/2"	1'- 11"	L	-
	101	a 101	Counter Top	-	1		2'- 10"	2'- 0"	-	2
	101	a 101	cOUNTERTOP	-	1		3'- 0"	8"	-	-
	101	b 101	Base Cabinet w/ Drawers	222	1	2'- 4"	2'- 8 1/2"	1'- 11"	L	-
	101	b 101	Base Cabinet w/ Drawers	222	1	2'- 6"	2'- 8 1/2"	1'- 11"	L	-
	101	b 101	Base Cabinet w/ Drawers	222	1	3'- 0"	2'- 8 1/2"	1'- 11"	L	-
	101	b 101	Counter Top	-	1		2'- 10"	2'- 1"	-	-
	101	c 101	Base Cabinet w/ Drawers	222	1	3'- 0"	2'- 8 1/2"	1'- 11"	L	-
	101	d 101	Base Cabinet w/ Drawers	222	1	3'- 0"	2'- 8 1/2"	1'- 11"	L	-
	101	e 101	Tall Storage Cabinet	407	1	3'- 0"	7'- 0"	2'- 0"	L	-
	102	a 102	Base Cabinet w/ Drawers	222	1	2'- 6"	2'- 8 1/2"	1'- 11"	L	-
N	102	a 102	Counter Top	-	1		2'- 10"	2'- 0"	-	2
	102	b 102	Base Cabinet w/ ADA Plumbing Cover	153M	1	3'- 0"	2'- 8 1/2"	2'- 0"	-	1
	102	b 102	Base Cabinet w/ Drawers	212	2	3'- 0"	2'- 8 1/2"	1'- 11"	L	-
	102	b 102	Wall Hung Cabinet	302	4	3'- 0"	2'- 2"	1'- 2"	L	-
	102	b 102	Counter Top	-	1		2'- 10"	2'- 0"	-	2
	104	a 104	Base Cabinet w/ Drawers	222	1	2'- 6"	2'- 8 1/2"	1'- 11"	L	-
	104	b 104	Base Cabinet w/ Drawers	222	1	2'- 4"	2'- 8 1/2"	1'- 11"	L	-
	104	b 104	Base Cabinet w/ Drawers	222	1	2'- 10"	2'- 8 1/2"	1'- 11"	L	-
	104	b 104	Base Cabinet w/ Drawers	222	2	3'- 0"	2'- 8 1/2"	1'- 11"	L	-
	104	b 104	Wall Hung Cabinet	302	4	2'- 6"	2'- 2"	1'- 2"	L	-
	104	b 104	Wall Hung Cabinet	302	1	3'- 0"	2'- 2"	1'- 2"	L	-
M	104	b 104	Counter Top	-	1		2'- 10"	2'- 0"	-	2
	107	a 107	Base Cabinet w/ Drawers	222	2	3'- 0"	2'- 8 1/2"	1'- 11"	L	-
	107	a 107	Wall Hung Cabinet	302	2	3'- 0"	2'- 2"	1'- 2"	L	-
	107	a 107	Counter Top	-	1		2'- 10"	2'- 0"	-	2
	108	a 108	Base Cabinet w/ Drawers	222	2	3'- 0"	2'- 8 1/2"	1'- 11"	L	-
	108	a 108	Wall Hung Cabinet	302	2	3'- 0"	2'- 2"	1'- 2"	L	-
	108	a 108	Counter Top	-	1		2'- 10"	2'- 0"	-	2
	109	a 109	Base Cabinet w/ Drawers	222	2	3'- 0"	2'- 8 1/2"	1'- 11"	L	-
	109	a 109	Wall Hung Cabinet	302	2	3'- 0"	2'- 2"	1'- 2"	L	-
	109	a 109	Counter Top	-	1		2'- 10"	2'- 0"	-	2
	116	a 116	Base Cabinet w/ Drawers	222	2	3'- 3"	2'- 8 1/2"	1'- 11"	L	-
K	116	a 116	Tall Storage Cabinet	444	2	3'- 3"	3'- 1"	2'- 0"	L	-
M	101	a 101	Base Cabinet w/ Drawers	222	2	2'- 6"	2'- 5 1/2"	1'- 11"	L	-
	101	a 101	Base Cabinet w/ Drawers	222	1	3'- 0"	2'- 5 1/2"	1'- 11"	L	-
	101	a 101	Base Cabinet w/ Drawers	270	1	3'- 2"	2'- 5 1/2"	1'- 11"	L	-
	101	a 101	Tall Storage Cabinet	402	3	3'- 6"	7'- 2"	2'- 0"	L	-
J	101	a 101	Countertop	-	1		2'- 10"	2'- 0"	-	2
	101	b 101	Base Cabinet w/o Drawers	155M	2	3'- 2"	2'- 5 1/2"	1'- 11"	-	1
	101	b 101	Base Cabinet w/ Drawers	222	3	2'- 6"	2'- 5 1/2"	1'- 11"	L	-
	101	b 101	Wall Hung Cabinet	302	4	2'- 6"	2'- 0"	1'- 2"	-	-
M	101	b 101	Countertop	-	2		2'- 10"	2'- 0"	-	2
	102	a 102	Tall Storage Cabinet	434	4	3'- 0"	7'- 0"	2'- 0"	-	-
	102	b 102	Base Cabinet w/ ADA Plumbing Cover	153M	1	3'- 0"	2'- 8 1/2"	1'- 11"	-	1
	102	b 102	Base Cabinet w/ Drawers	222	3	2'- 6"	2'- 8 1/2"	1'- 11"	-	-
H	102	b 102	Wall Hung Cabinet	302	3	2'- 6"	2'- 0"	1'- 2"	-	-
	102	b 102	Wall Hung Cabinet	302	1	3'- 0"	2'- 0"	1'- 2"	-	-
	102	b 102	Countertop	-	1		2'- 10"	2'- 0"	-	2
	104	a 104	Base Cabinet w/ Drawers	222	2	2'- 6"	2'- 5 1/2"	1'- 11"	L	-
M	104	a 104	Base Cabinet w/ Drawers	222	1	3'- 0"	2'- 5 1/2"	1'- 11"	L	-
	104	a 104	Base Cabinet w/ Drawers	270	1	3'- 2"	2'- 5 1/2"	1'- 11"	L	-
	104	a 104	Tall Storage Cabinet	402	3	3'- 6"	7'- 2"	2'- 0"	L	-
	104	a 104	Countertop	-	1		2'- 10"	2'- 0"	-	2
G	104	b 104	Base Cabinet w/o Drawers	155M	2	3'- 2"	2'- 5 1/2"	1'- 11"	-	1
	104	b 104	Base Cabinet w/ Drawers	222	3	2'- 6"	2'- 5 1/2"	1'- 11"	L	-
	104	b 104	Wall Hung Cabinet	302	4	2'- 6"	2'- 0"	1'- 2"	-	-
	104	b 104	Countertop	-	2		2'- 10"	2'- 0"	-	2
M	105	a 105	Base Cabinet w/ Drawers	222	2	2'- 6"	2'- 5 1/2"	1'- 11"	L	-
	105	a 105	Base Cabinet w/ Drawers	222	1	3'- 0"	2'- 5 1/2"	1'- 11"	L	-
	105	a 105	Base Cabinet w/ Drawers	270	1	3'- 2"	2'- 5 1/2"	1'- 11"	L	-
	105	a 105	Tall Storage Cabinet	402	3	3'- 6"	7'- 2"	2'- 0"	L	-
F	105	a 105	Countertop	-	1		2'- 10"	2'- 0"	-	2
	105	b 105	Base Cabinet w/o Drawers	155M	2	3'- 2"	2'- 5 1/2"	1'- 11"	-	1
	105	b 105	Base Cabinet w/ Drawers	222	3	2'- 6"	2'- 5 1/2"	1'- 11"	L	-
	105	b 105	Wall Hung Cabinet	302	4	2'- 6"	2'- 0"	1'- 2"	-	-
M	105	b 105	Countertop	-	2		2'- 10"	2'- 0"	-	2
	106	a 106	Tall Storage Cabinet	434	4	3'- 0"	7'- 0"	2'- 0"	-	-
	106	b 106	Base Cabinet w/ ADA Plumbing Cover	153M	1	3'- 0"	2'- 8 1/2"	1'- 11"	-	1
	106	b 106	Base Cabinet w/ Drawers	222	3	2'- 6"	2'- 8 1/2"	1'- 11"	-	-
E	106	b 106	Wall Hung Cabinet	302	3	2'- 6"	2'- 0"	1'- 2"	-	-
	106	b 106	Wall Hung Cabinet	302	1	3'- 0"	2'- 0"	1'- 2"	-	-
	106	b 106	Countertop	-	1		2'- 10"	2'- 0"	-	2
	108	a 108	Base Cabinet w/ Drawers	222	2	2'- 6"	2'- 5 1/2"	1'- 11"	L	-
M	108	a 108	Base Cabinet w/ Drawers	222	1	3'- 0"	2'- 5 1/2"	1'- 11"	L	-
	108	a 108	Base Cabinet w/ Drawers	270	1	3'- 2"	2'- 5 1/2"	1'- 11"	L	-
	108	a 108	Tall Storage Cabinet	402	3	3'- 6"	7'- 2"	2'- 0"	L	-
	108	a 108	Countertop	-	1		2'- 10"	2'- 0"	-	2
M	108	b 108	Base Cabinet w/o Drawers	155M	2	3'- 2"	2'- 5 1/2"	1'- 11"	-	1
	108	b 108	Base Cabinet w/ Drawers	222	3	2'- 6"	2'- 5 1/2"	1'- 11"	L	-
	108	b 108	Wall Hung Cabinet	302	4	2'- 6"	2'- 0"	1'- 2"	-	-
	108	b 108	Countertop	-	2		2'- 10"	2'- 0"	-	2
M	109	a 109	Base Cabinet w/ Drawers	222	2	2'- 6"	2'- 5 1/2"	1'- 11"	L	-
	109	a 109	Base Cabinet w/ Drawers	222	1	3'- 0"	2'- 5 1/2"	1'- 11"	L	-
	109	a 109	Base Cabinet w/ Drawers	270	1	3'- 2"	2'- 5 1/2"	1'- 11"	L	-
	109	a 109	Tall Storage Cabinet	402	3	3'- 6"	7'- 2"	2'- 0"	L	-
M	109	a 109	Countertop	-	1		2'- 10"	2'- 0"	-	2
	109	b 109	Base Cabinet w/o Drawers	155M	2	3'- 2"	2'- 5 1/2"	1'- 11"	-	1
	109	b 109	Base Cabinet w/ Drawers	222	3	2'- 6"	2'- 5 1/2"	1'- 11"	L	-
	109	b 109	Wall Hung Cabinet	302	4	2'- 6"	2'- 0"	1'- 2"	-	-
B	109	b 109	Countertop	-	2		2'- 10"	2'- 0"	-	2
	110	a 110	Base Cabinet w/ Drawers	222	2	2'- 6"	2'- 8 1/2"	1'- 11"	-	-
	110	a 110	Tall Storage Cabinet	434	4	3'- 0"	7'- 0"	2'- 0"	-	-
	110	b 110	Base Cabinet w/ ADA Plumbing Cover	153M	1	3'- 0"	2'- 8 1/2"	1'- 11"	-	1
M	110	b 110	Base Cabinet w/ Drawers	222	2	2'- 6"	2'- 8 1/2"	1'- 11"	-	-
	110	b 110	Wall Hung Cabinet	302	3	2'- 6"	2'- 0"	1'- 2"	-	-
	110	b 110	Wall Hung Cabinet	302	1	3'- 0"	2'- 0"	1'- 2"	-	-
	110	b 110	Wall Hung Cabinet	302	1	3'- 0"	2'- 0"	1'- 2"	-	-

A1 Modular Casework Schedule

No Scale

		10	11	12	13	14	15	16	17	
Casework Schedule										
Building	Room No	Group No.	Description	Catalog No.	No Req'd	Length	Height	Depth	Accessories	Remarks
M	110	b 110	Counter Top		1		2' - 10"	2' - 0"	-	2
P	P40	a P40	Base Cabinet w/o Drawers	120	2	3' - 0"	1' - 8"	1' - 6"	-	-
P	P40	a P40	Base Cabinet w/ ADA Plumbing Cover	153M	1	3' - 0"	2' - 8 1/2"	2' - 0"	-	1
P	P40	a P40	Base Cabinet w/ Drawers	212	3	3' - 0"	2' - 8 1/2"	2' - 0"	L	-
P	P40	a P40	Tall Storage Cabinet	402	3	3' - 6"	7' - 2"	2' - 0"	L	-
P	P40	a P40	Wardrobe Shelf and Pole	540	2	3' - 0"	1' - 3"	1' - 0"	-	-
P	P40	a P40	Counter Top	-	1		2' - 10"	2' - 1"	-	2
P	P41	a P41	Base Cabinet w/o Drawers	120	2	3' - 0"	1' - 8"	1' - 6"	-	-
P	P41	a P41	Base Cabinet w/ ADA Plumbing Cover	153M	1	3' - 0"	2' - 8 1/2"	2' - 0"	-	1
P	P41	a P41	Base Cabinet w/ Drawers	212	3	3' - 0"	2' - 8 1/2"	2' - 0"	L	-
P	P41	a P41	Tall Storage Cabinet	402	3	3' - 6"	7' - 2"	2' - 0"	L	-
P	P41	a P41	Wardrobe Shelf and Pole	540	2	3' - 0"	1' - 3"	1' - 0"	-	-
P	P41	a P41	Counter Top	-	1		2' - 10"	2' - 1"	-	2
P	P42	a P42	Base Cabinet w/o Drawers	120	2	3' - 0"	1' - 8"	1' - 6"	-	-
P	P42	a P42	Base Cabinet w/ ADA Plumbing Cover	153M	1	3' - 0"	2' - 8 1/2"	2' - 0"	-	1
P	P42	a P42	Base Cabinet w/ Drawers	212	3	3' - 0"	2' - 8 1/2"	2' - 0"	L	-
P	P42	a P42	Tall Storage Cabinet	402	3	3' - 6"	7' - 2"	2' - 0"	L	-
P	P42	a P42	Wardrobe Shelf and Pole	540	2	3' - 0"	1' - 3"	1' - 0"	-	-
P	P42	a P42	Counter Top	-	1		2' - 10"	2' - 1"	-	2
P	P44	a P44	Base Cabinet w/o Drawers	120	2	3' - 0"	1' - 8"	1' - 6"	-	-
P	P44	a P44	Base Cabinet w/ ADA Plumbing Cover	153M	1	3' - 0"	2' - 8 1/2"	2' - 0"	-	1
P	P44	a P44	Base Cabinet w/ Drawers	212	3	3' - 0"	2' - 8 1/2"	2' - 0"	L	-
P	P44	a P44	Tall Storage Cabinet	402	3	3' - 6"	7' - 2"	2' - 0"	L	-
P	P44	a P44	Wardrobe Shelf and Pole	540	2	3' - 0"	1' - 3"	1' - 0"	-	-
P	P44	a P44	Counter Top	-	1		2' - 10"	2' - 1"	-	2
P	P45	a P45	Base Cabinet w/o Drawers	120	2	3' - 0"	1' - 8"	1' - 6"	-	-
P	P45	a P45	Base Cabinet w/ ADA Plumbing Cover	153M	1	3' - 0"	2' - 8 1/2"	2' - 0"	-	1
P	P45	a P45	Base Cabinet w/ Drawers	212	3	3' - 0"	2' - 8 1/2"	2' - 0"	L	-
P	P45	a P45	Tall Storage Cabinet	402	3	3' - 6"	7' - 2"	2' - 0"	L	-
P	P45	a P45	Wardrobe Shelf and Pole	540	2	3' - 0"	1' - 3"	1' - 0"	-	-
P	P45	a P45	Counter Top	-	1		2' - 10"	2' - 1"	-	2
P	P46	a P46	Base Cabinet w/o Drawers	120	2	3' - 0"	1' - 8"	1' - 6"	-	-
P	P46	a P46	Base Cabinet w/ ADA Plumbing Cover	153M	1	3' - 0"	2' - 8 1/2"	2' - 0"	-	1
P	P46	a P46	Base Cabinet w/ Drawers	212	3	3' - 0"	2' - 8 1/2"	2' - 0"	L	-
P	P46	a P46	Tall Storage Cabinet	402	3	3' - 6"	7' - 2"	2' - 0"	L	-
P	P46	a P46	Wardrobe Shelf and Pole	540	2	3' - 0"	1' - 3"	1' - 0"	-	-
P	P46	a P46	Counter Top	-	1		2' - 10"	2' - 1"	-	2
P	P47	a P47	Base Cabinet w/o Drawers	120	2	3' - 0"	1' - 8"	1' - 6"	-	-
P	P47	a P47	Base Cabinet w/ ADA Plumbing Cover	153M	1	3' - 0"	2' - 8 1/2"	2' - 0"	-	1
P	P47	a P47	Base Cabinet w/ Drawers	212	3	3' - 0"	2' - 8 1/2"	2' - 0"	L	-
P	P47	a P47	Tall Storage Cabinet	402	3	3' - 6"	7' - 2"	2' - 0"	L	-
P	P47	a P47	Wardrobe Shelf and Pole	540	2	3' - 0"	1' - 3"	1' - 0"	-	-
P	P47	a P47	Counter Top	-	1		2' - 10"	2' - 1"	-	2

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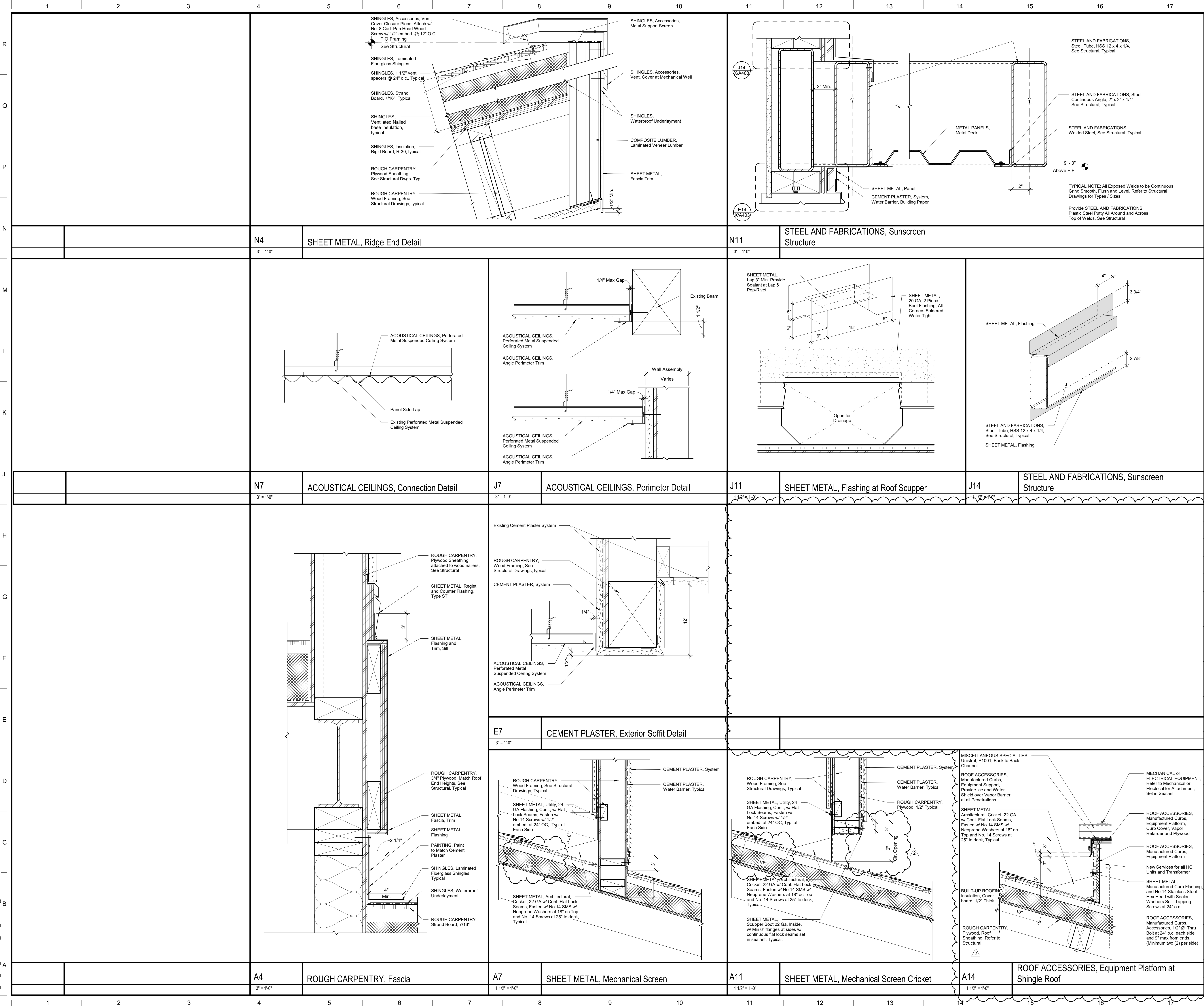
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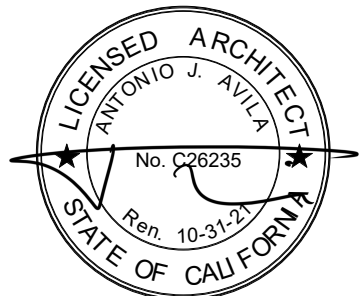
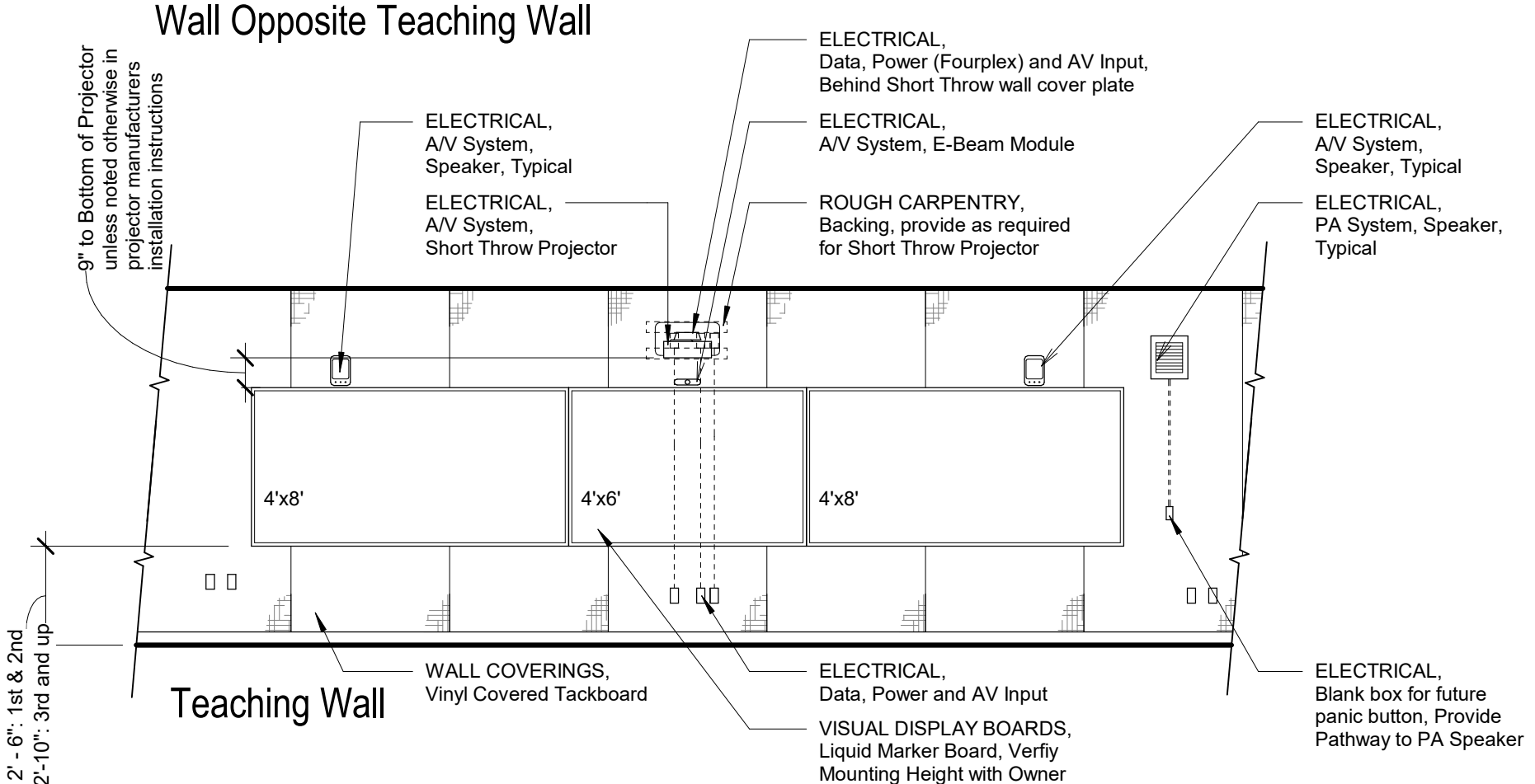
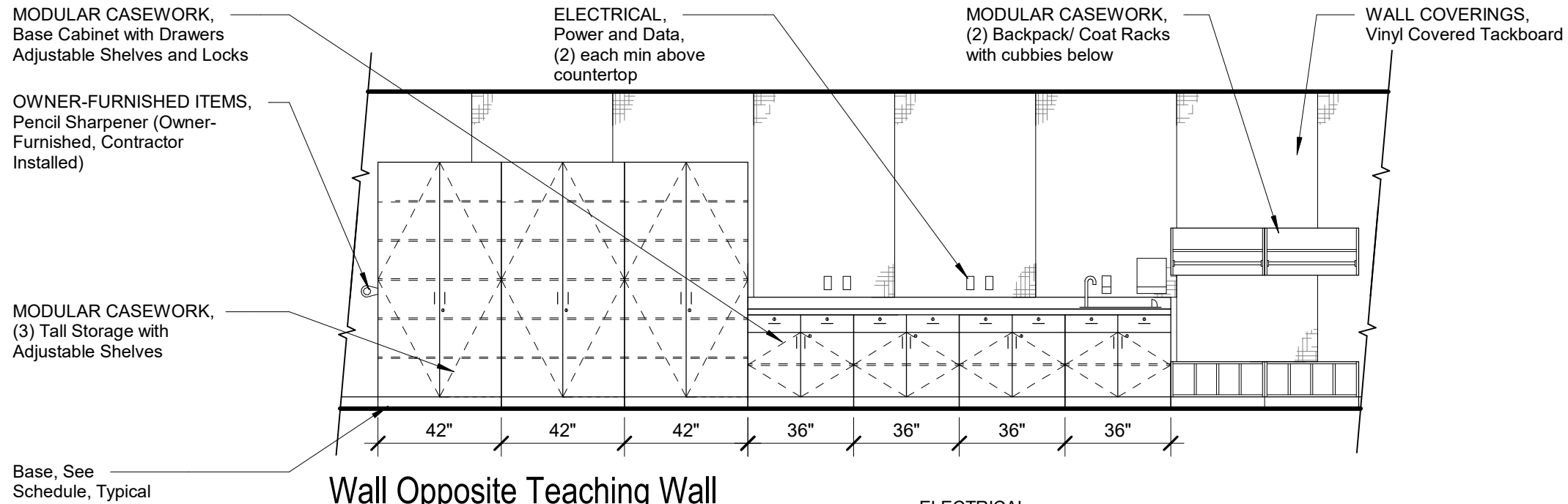


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DSA Application No.: 02-117220		
Agency Approval		
General Notes		
Consultant		
Addams Elementary School Building Additions and Modernization Fresno Unified School District 2117 W McKinley Ave, Fresno, CA 93726		
Typical Information Exterior Details		
Drawing		
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Typical Existing Portable Classroom Elevations

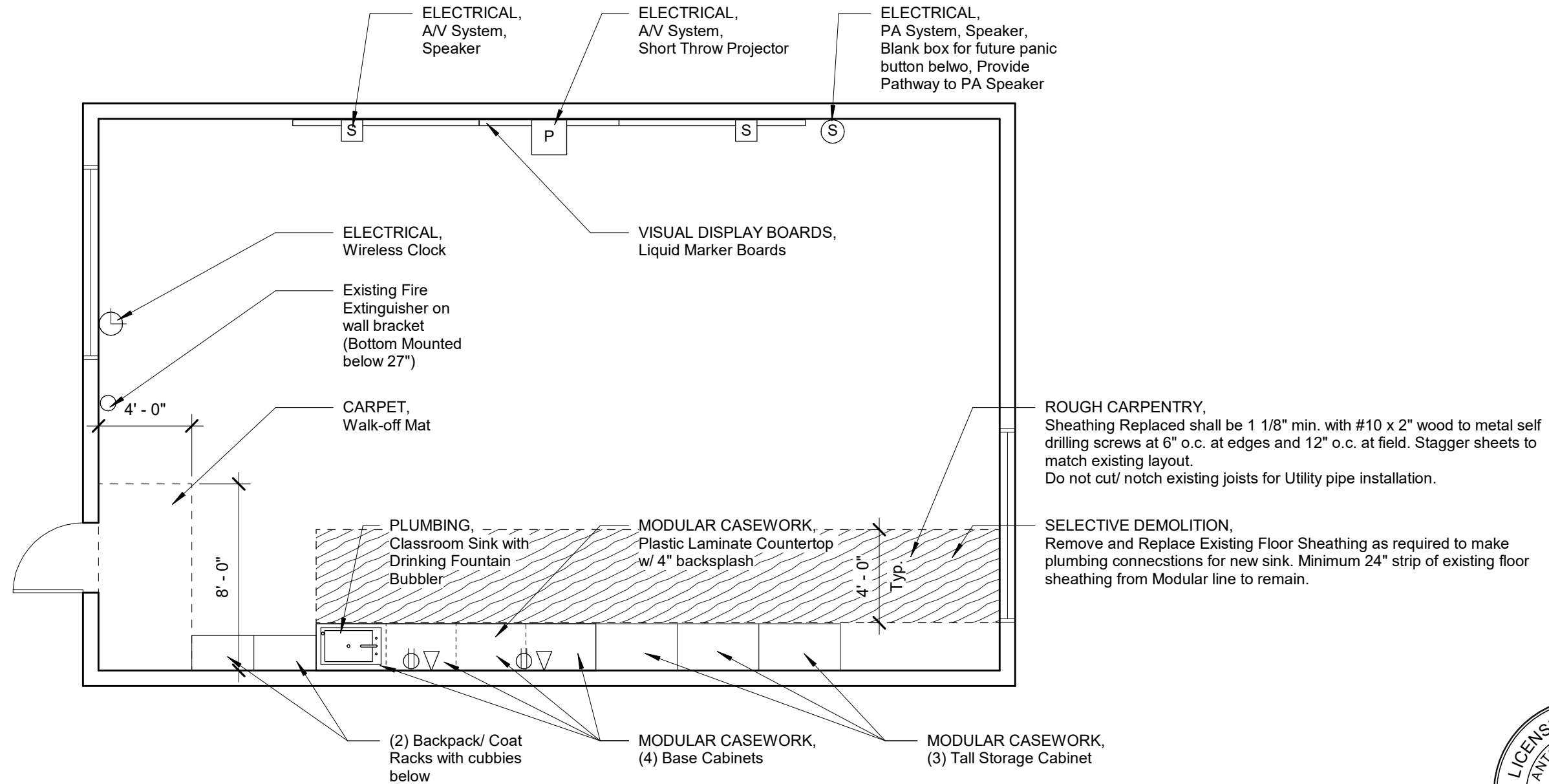
Addams Elementary School Building Additions and Modernization  
Fresno Unified School District



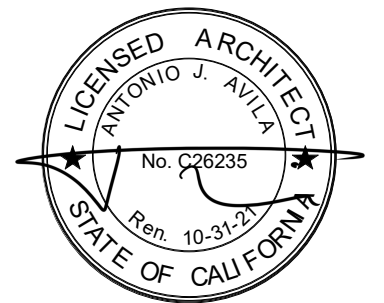
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**NOTE:**  
At all cabinet doors and drawers, provide Cabinet Locks. The locks shall be keyed all the same with one keyway



DSA File No: 10-H8  
DSA Appl No: 02-117220

Typical Existing Portable Classroom, Floor Plan

**Addams Elementary School Building Additions and Modernization**  
Fresno Unified School District



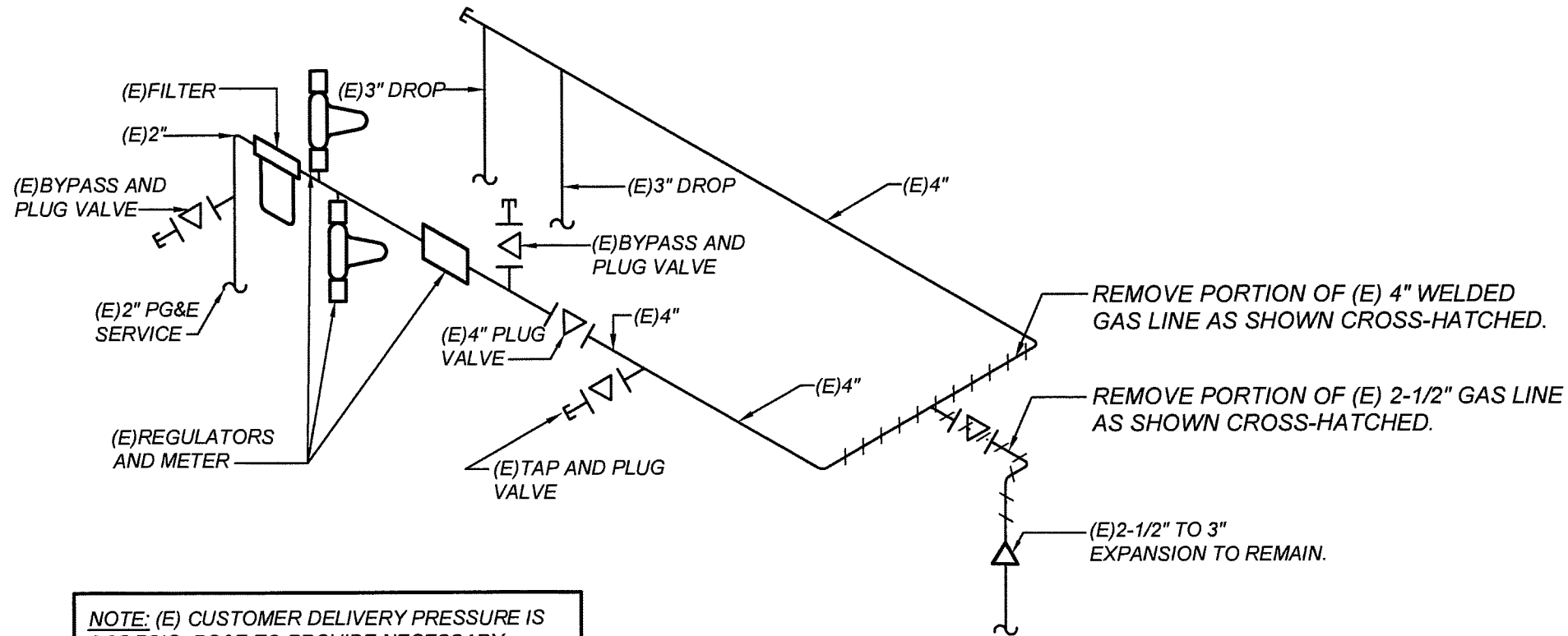
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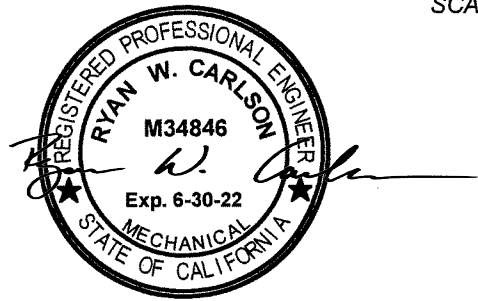
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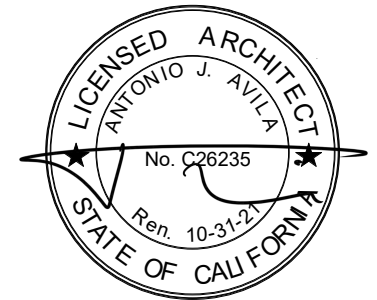
NOTE: (E) CUSTOMER DELIVERY PRESSURE IS 0.25 PSIG. PG&E TO PROVIDE NECESSARY MODIFICATIONS AS REQ'D FOR INCREASING DELIVERY PRESSURE TO 2.0 PSIG.

## DEMO WORK AT GAS METER - ISOMETRIC

SCALE: NONE



**LAWRENCE**  
ENGINEERING GROUP  
7084 N. Maple Ave., Suite 101  
(559) 431-0101 18091.3  
Fresno, CA 93720  
FAX (559) 431-1342



DSA File No:  
DSA Appl No:

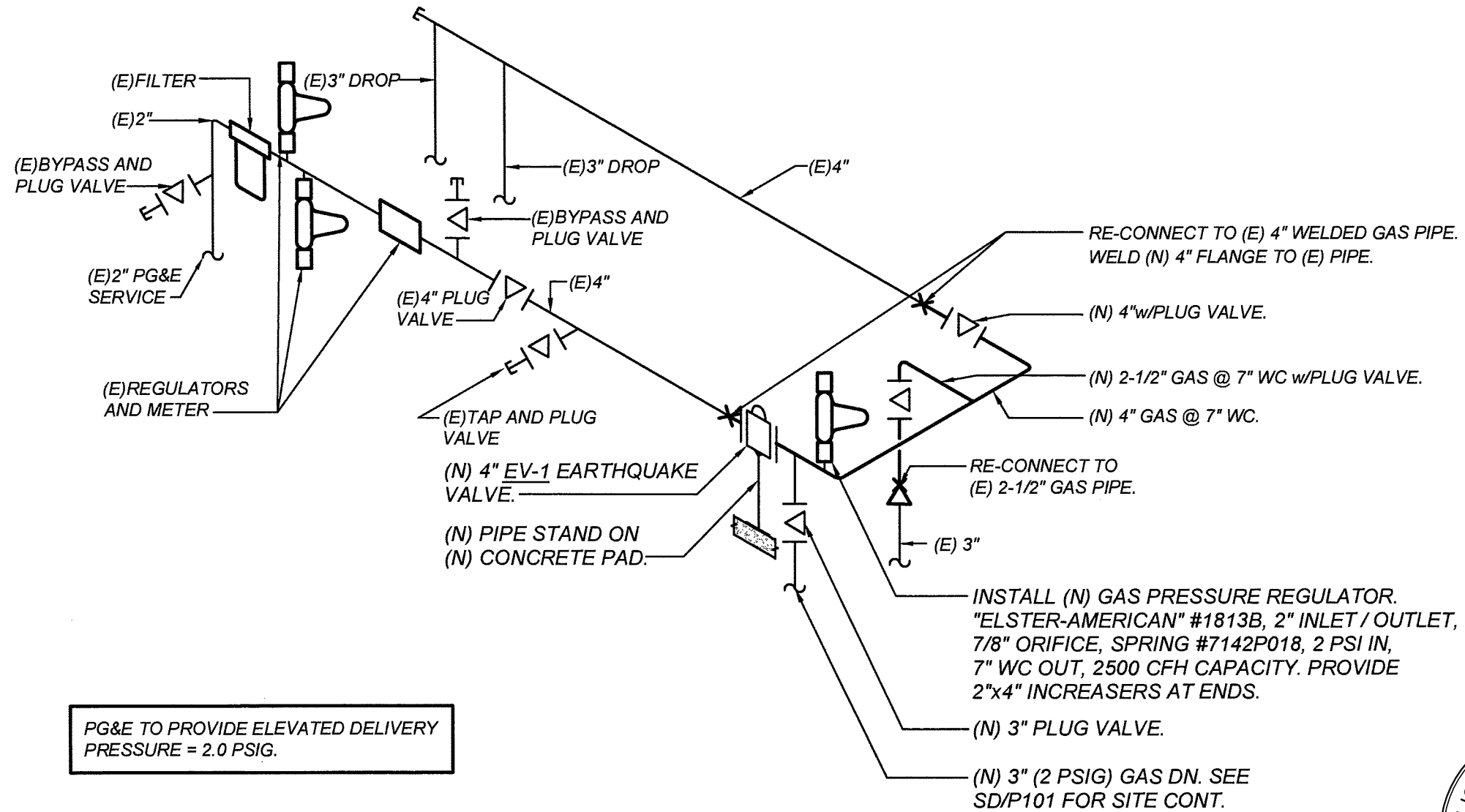
**Addams Elementary School Building Additions  
and Modernization**  
Fresno Unified School District

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architects

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Grant E. Dodson AIA • Michael K. Fennacy AIA • Andrew A. Corral AIA  
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Drawn By:	JW	Scale:	AS NOTED
Checked By:	DO	Copyright	Darden Architects
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Date:			

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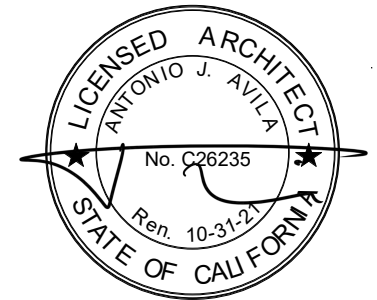
**NEW WORK AT GAS METER - ISOMETRIC**  
SCALE: NONE



**Addams Elementary School Building Additions  
and Modernization**  
Fresno Unified School District



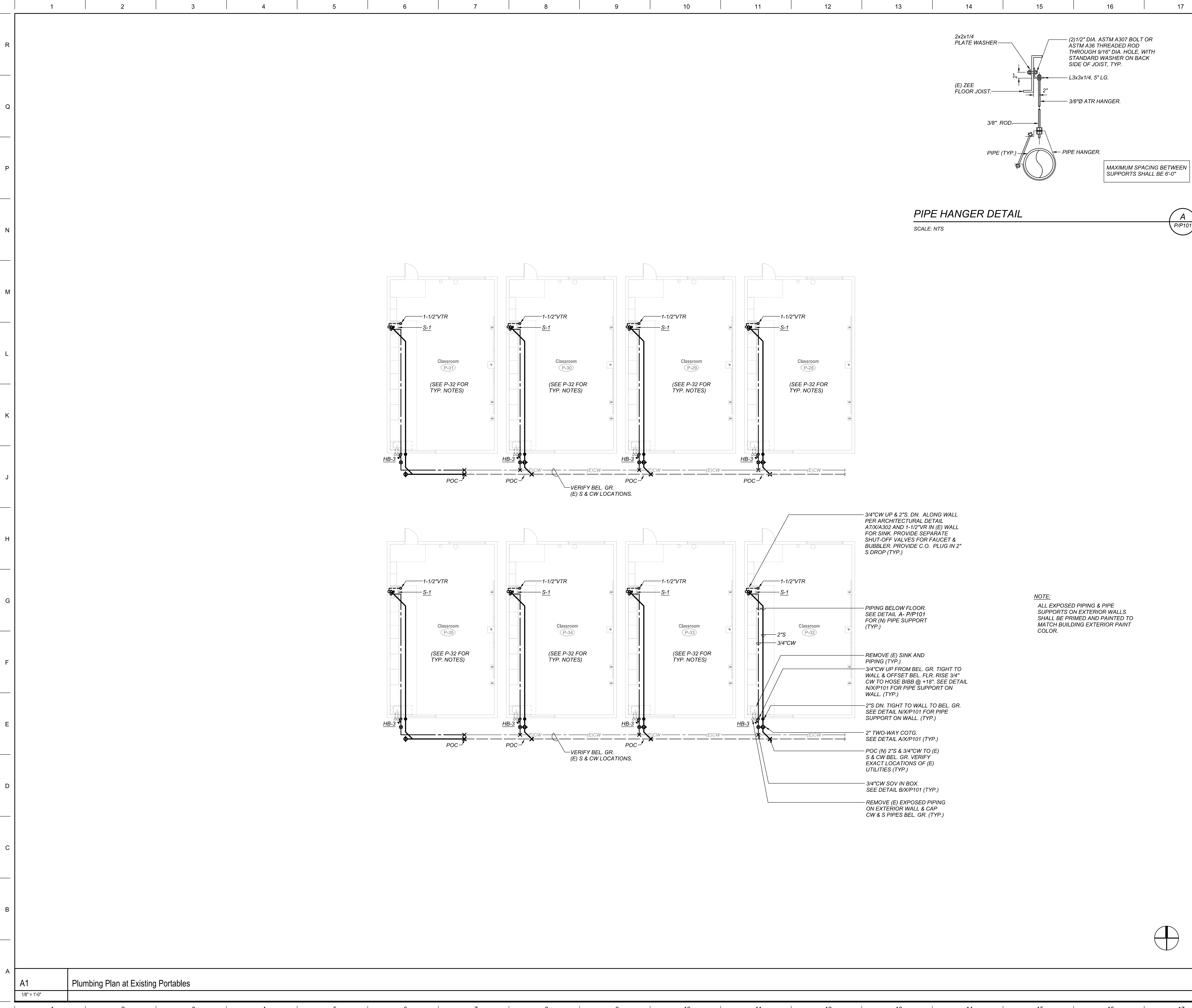
ARCHITECTURE • PLANNING • INTERIORS  
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Grant E. Dodson AIA • Michael K. Fennacy AIA • Andrew A. Corral AIA  
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Drawn By:	JW	Scale:	AS NOTED
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Date:			

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DSA File No.:  
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DSA Application No.:  
02-117220

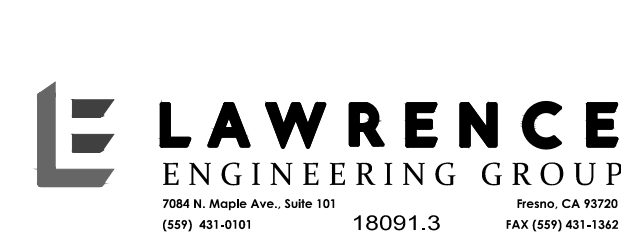
Agency Approval

### PIPE HANGER DETAIL

SCALE: NTS

A  
P/P101

### General Notes

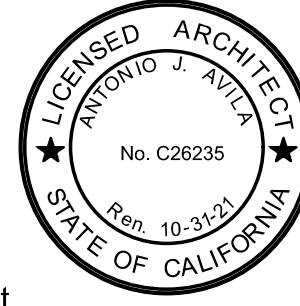


Consultant

**Addams Elementary School Building Additions and Modernization**  
Fresno Unified School District  
2117 W. McKinley Ave., Fresno, Ca 93726  
Project

PLUMBING PORTABLES

### Drawing

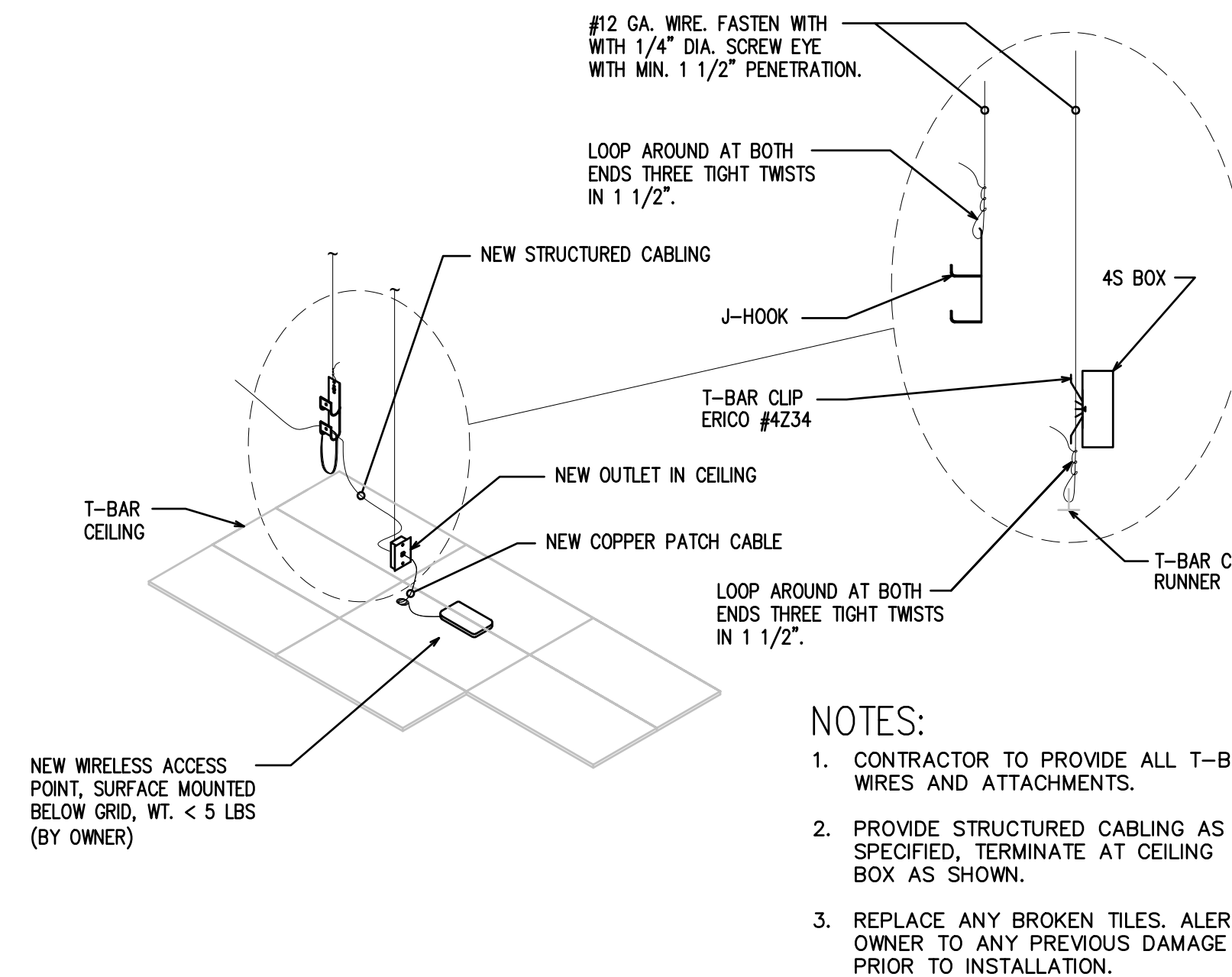
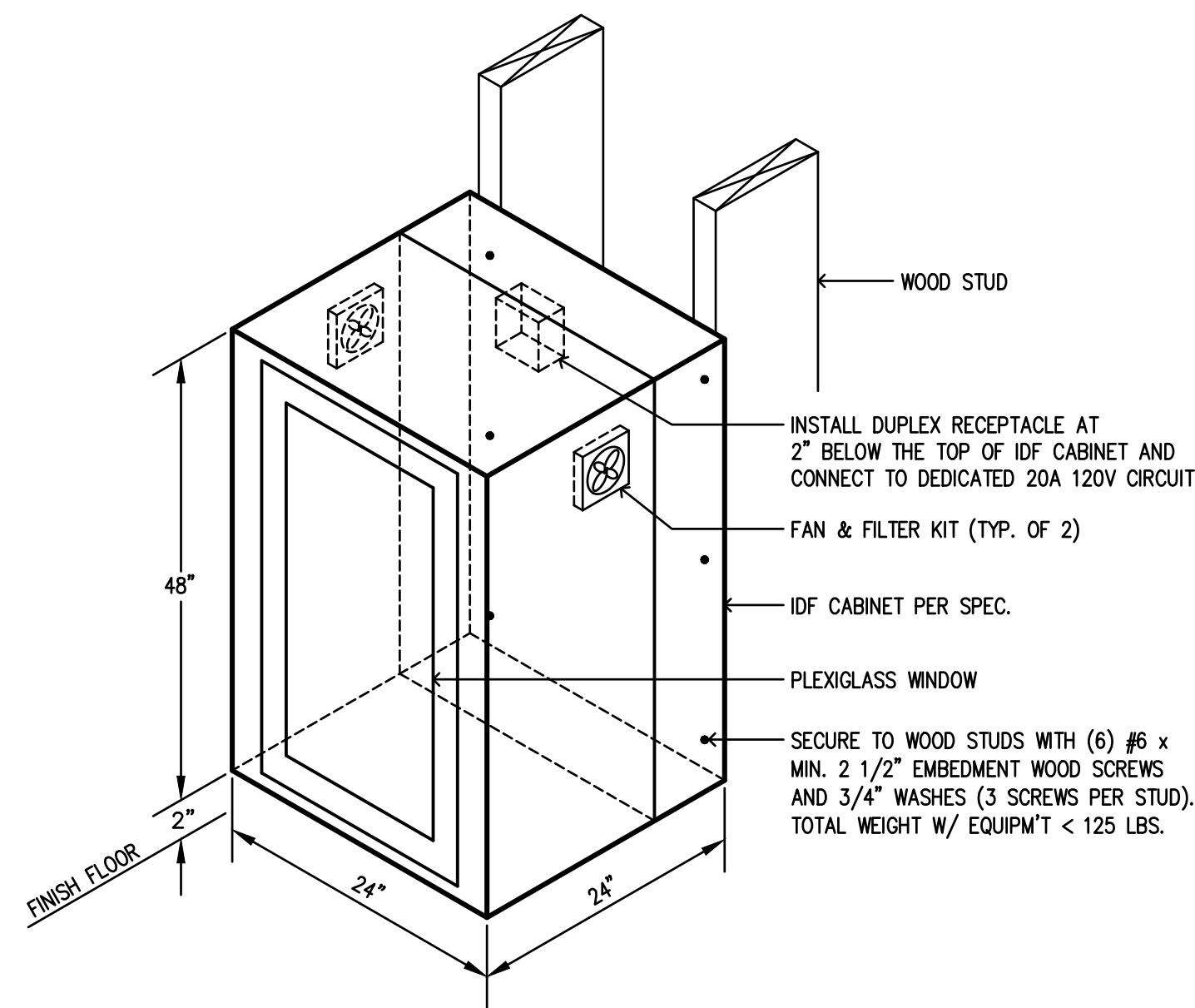
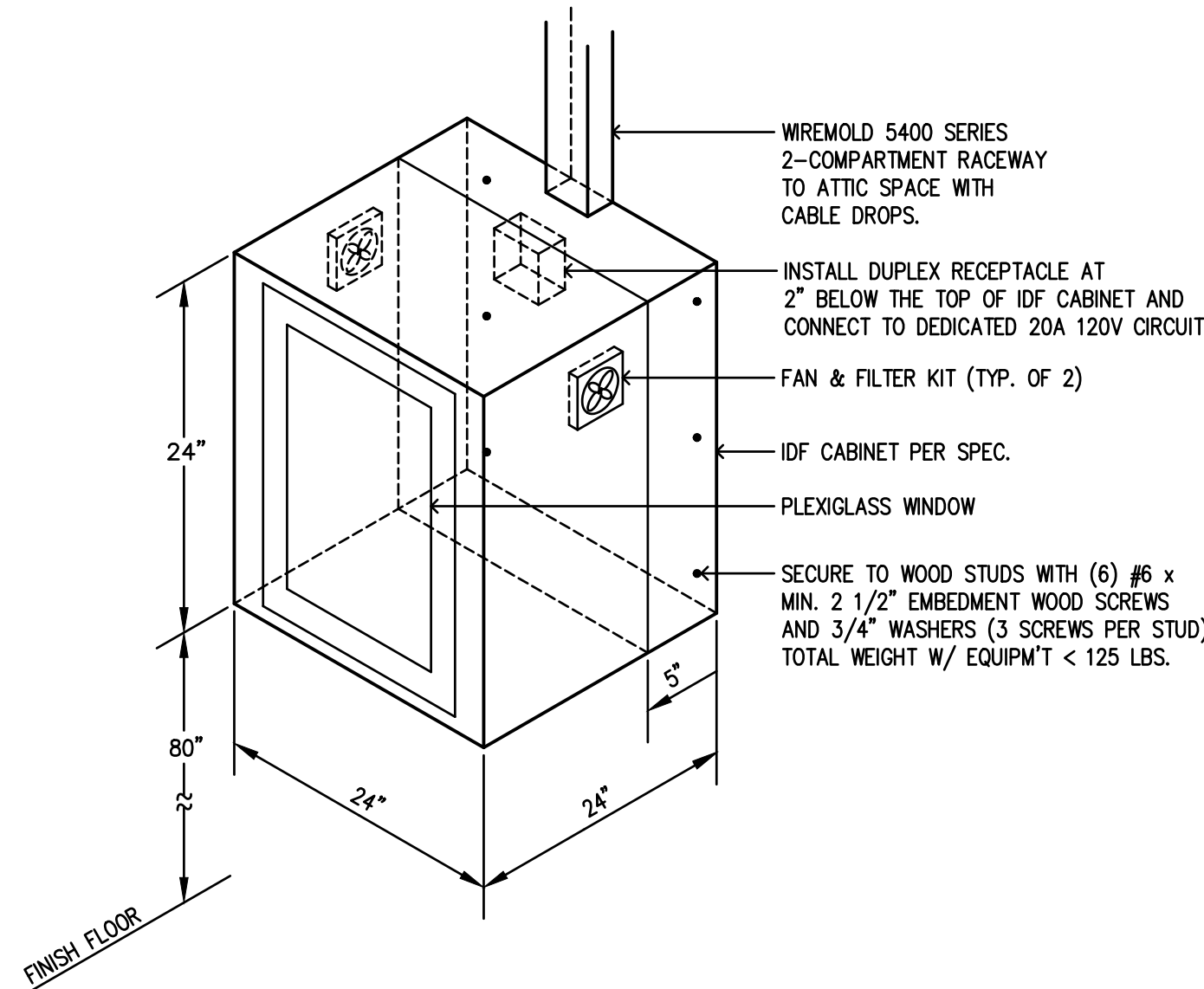
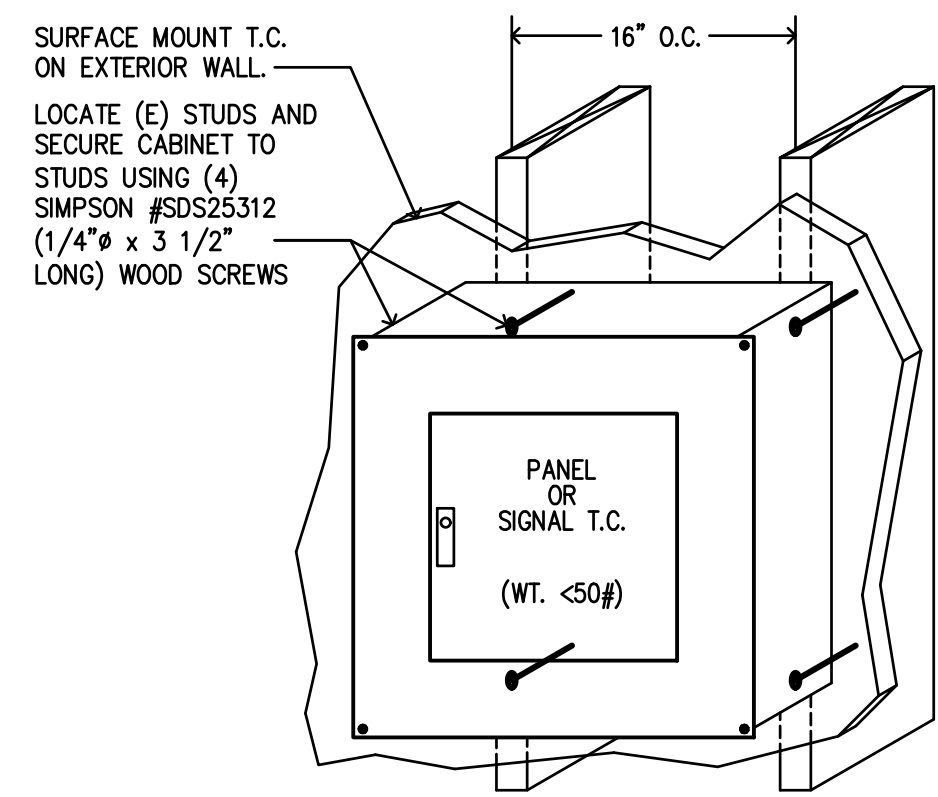


Architect

No.	Revision/Submission	Date

### Revision

Scale: As Indicated	Designed By: DO	Copyright 2020 Darden Architects	<b>P/P101</b> Sheet: _____ of: _____
Project Number: 1725	Checked By: DO		
Date: 01/08/2020	Reviewed By: RC		



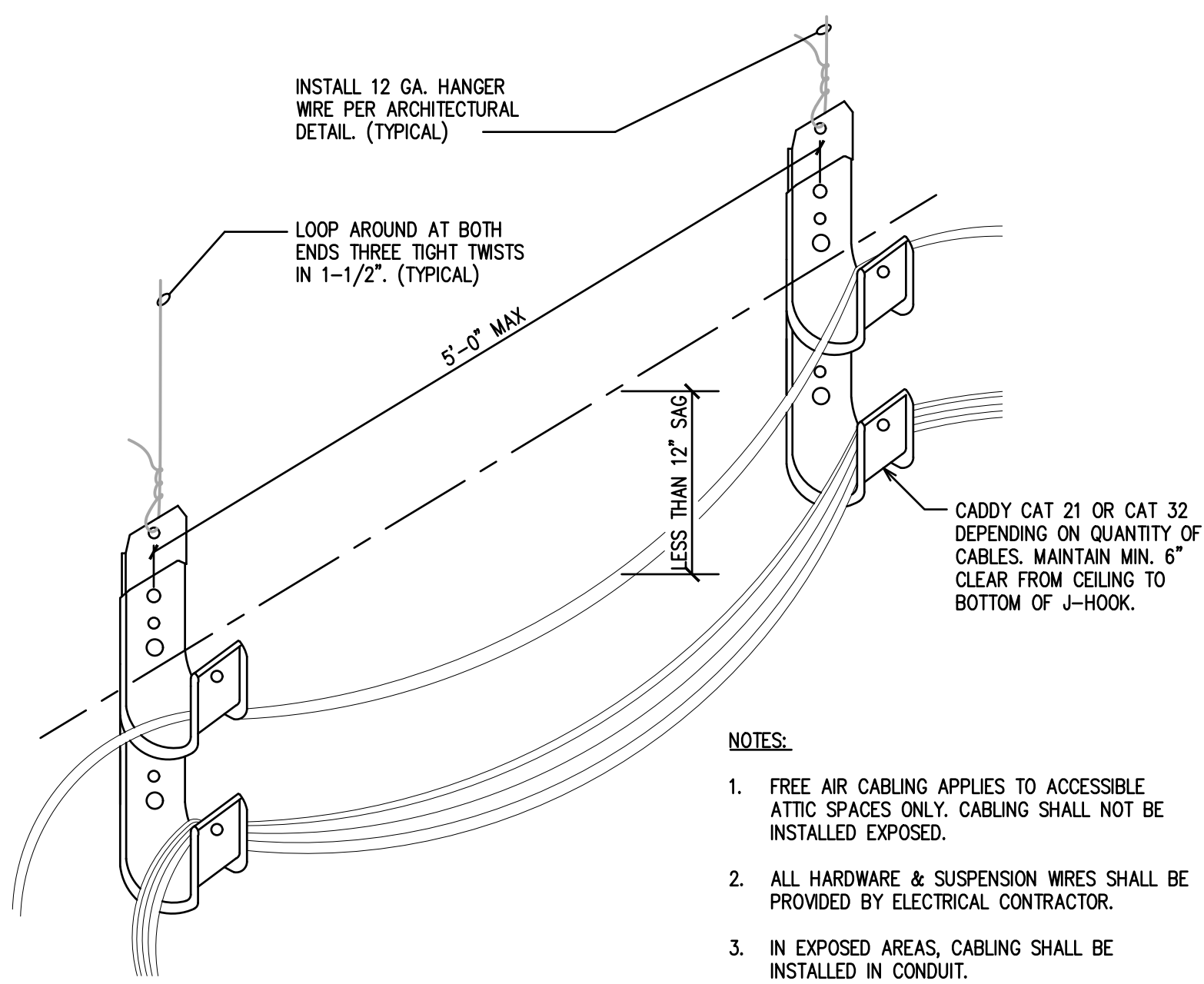
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DSA Application No.:  
02-117220

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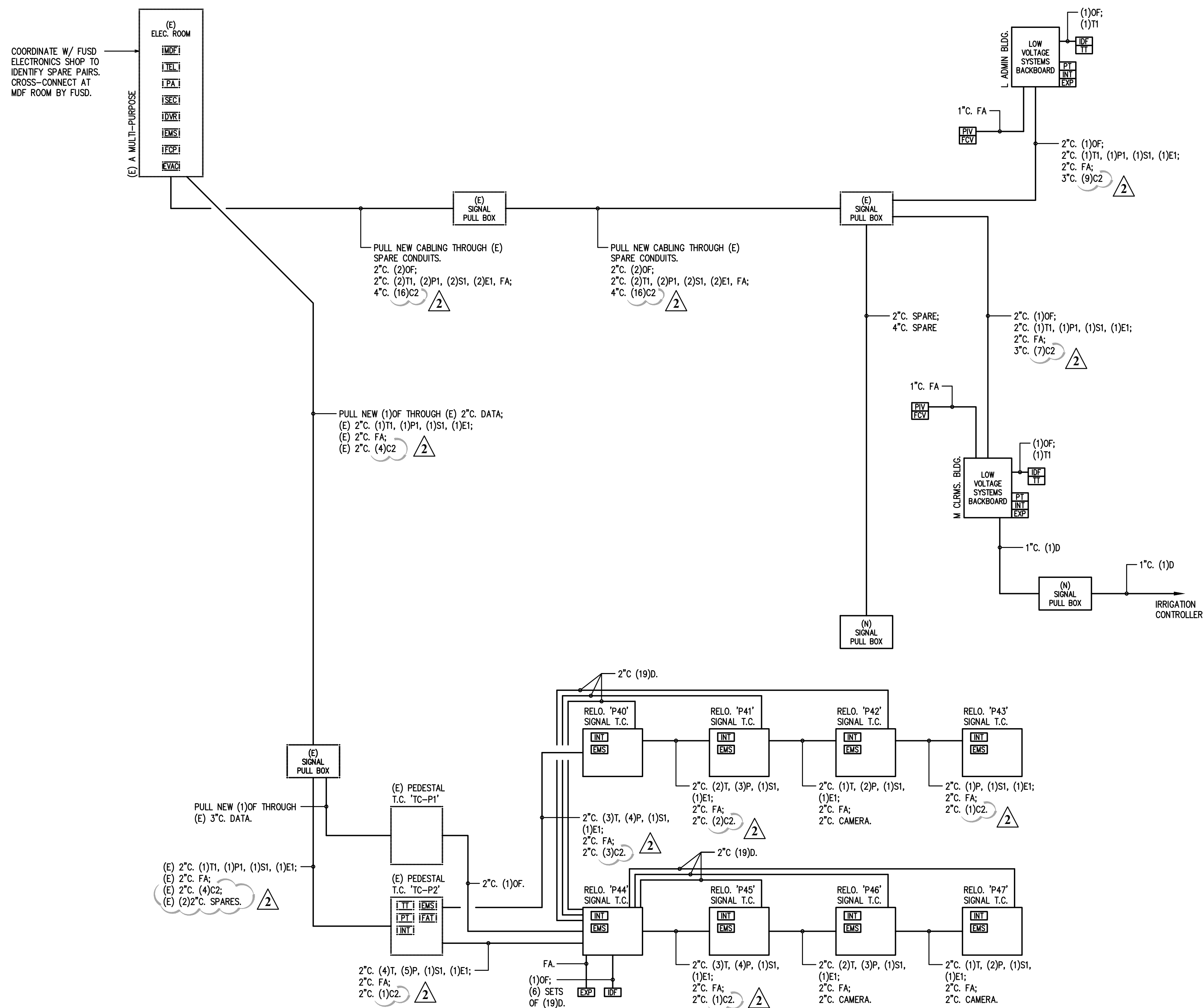
## LOW VOLTAGE SYSTEMS NOTES:

1. THE CONTRACTOR SHALL EXPAND THE EXISTING LOCAL AREA NETWORK (LAN) AND PROVIDE A COMPLETE AND OPERATIONAL DATA AND VOICE COMMUNICATIONS SYSTEM INCLUDING INTERMEDIATE DISTRIBUTION FRAMES (IDFs), STOWIE/FIBER OPTIC CABLEING, PATCH PANELS, SPEAKER CABLEING, VIDEO CABLEING, TELEPHONE CABLEING, CABLES, PATCH PANELS AND CABLES, COMBINATIONS TOWN BUS BAR AND GROUND CONNECTION, UNINTERRUPTIBLE POWER SUPPLIES, DATA AND TELEPHONE QUESTION LOGS, PORT OUTLETS, AND TESTING AND REPORTING OF TEST REPORTS FOR ALL INSTALLED CABLES, NETWORK ELECTRONICS SUCH AS GATEWAYS, SWITCHES, WIRELESS ACCESS POINTS, AND VOP GATEWAYS SHALL BE FURNISHED BY THE OWNER AND INSTALLED BY THE CONTRACTOR.
2. THE CONTRACTOR SHALL PROVIDE A COMPLETE AND OPERATIONAL DIGITAL PHONE LINE TEL CORDING WITH THE FOLLOWING REQUIREMENTS: TELEPHONE CABLEING, TELEPHONE HANDETS, TERMINATION BLOCKS SET AT THE BACK OF IDFS, TELEPHONE OUTLETS, TESTING, AND PROGRAMMING. PBX ELECTRONICS SHALL BE FURNISHED BY THE OWNER AND INSTALLED BY THE CONTRACTOR.
3. THE CONTRACTOR SHALL EXPAND THE EXISTING PUBLIC ADDRESS (PA) SYSTEM AND PROVIDE A COMPLETE AND OPERATIONAL PA SYSTEM, INCLUDING INTERIOR AND EXTERIOR SPEAKERS AND TUNINGS, TERMINATION BLOCKS, SITE DISTRIBUTION CABLEING, SPEAKER CABLEING, PROGRAMMING, TESTING, AND REPORTS. THE PA SYSTEM SHALL BE INTERFACED WITH THE VOP SYSTEM AND PBX SYSTEM AT THE HEAD END OF EACH PA AMPLIFIER. NETWORK ELECTRONICS SHALL BE FURNISHED BY THE OWNER AND INSTALLED BY THE OWNER.
4. THE CONTRACTOR SHALL PROVIDE A COMPLETE AND OPERATIONAL WIRELESS MASTER CLOCK SYSTEM, INCLUDING GATEWAY AND WIRELESS TRANSMITTERS, WALL CLOCKS, AND BATTERIES.
5. THE CONTRACTOR SHALL PROVIDE A COMPLETE AND OPERATIONAL VIDEO SURVEILLANCE SYSTEM, INCLUDING DIGITAL VIDEO RECORDERS, INTERFACE WITH THE LAN, POWER SUPPLIES, VANDA, RESISTANT MOUNTING CABINETS, CABLEING, HD, IP CAMERAS, CAMERA, REMOTE MONITORING, AND CAMERA AUDIO AND PROGRAMMING, TESTING, AND REPORTS.
6. THE CONTRACTOR SHALL PROVIDE COMPLETE AND OPERATIONAL CLASSROOM AUDIO/VIDEO SYSTEMS, INCLUDING AUDIO/VIDEO INPUTS WITH HDMI AUDIO/VIDEO VGA VIDEO, 3.5MM TRS AUDIO, AND USB, AND THE RELATED OUTPUTS LOCATED IN EACH ROOM AT THE FRONT OF THE CLASSROOM. AUDIO, VIDEO, AND ACTIVE VIDEO CABLES, WIRELESS MEDIA CONVERTER, INSTALLATION OF ALL COMPONENTS, SETUP PROGRAMMING, TESTING, AND REPORTS, PROJECTORS, WIRELESS MEDIA CONVERTERS, AND AUDIO AND VIDEO CABLES SHALL BE FURNISHED BY THE OWNER AND INSTALLED BY THE CONTRACTOR.



F5	J-HOOK CABLE SUPPORT DETAIL (CONCEALED ATTIC SPACES ONLY)
----	---

No Scale



A6	LOW VOLTAGE SINGLE LINE DIAGRAM
----	---------------------------------

No Scale

LOW VOLTAGE CABLE SCHEDULE:

SECURITY	
S1	18/4 DIGITAL LOOP CABLE (PANEL - ZAM)
S2	22/4 ANALOG (ZAM - MOTION / GLASS BREAK)
S3	22/2 ANALOG (ZAM - CONTACTS)

DATA		
OF	12-STR MM/ 12-STR SM FIBER	(MDF - IDF)
OF1	6-STR MM/ 6-STR SM FIBER	(MDF - IDF)
D	CAT6	(IDF - JACK)

<u>TELECOM</u>		
T2	AT&T 12-PAIR CAT3	(TEL SYSTEM - TC)
T1	AT&T 25-PAIR CAT3	(TEL SYSTEM - TC)
T	CAT6	(TC - JACK)

PUBLIC ADDRESS		
P2	AT&T 12-PAIR CAT3	(PA SYSTEM - TC)
P1	AT&T 25-PAIR CAT3	(PA SYSTEM - TC)
P	BELDEN #8723	(TC - SPEAKER)

TV VIDEO		
V	WEST PENN #1523A (RG11U)	(TC - TC)
X	WEST PENN #9116 (RG6U)	(TC - JACK)

CAMERA	
C1	CAT6 (DVR - IDF)
C2	RG6/U-18/2 SIAMESE CABLE (DVR - CAMERA)
C3	6-STR SM FIBER (XCVR - XCVR)

ENERGY MANAGEMENT		
E1	EMS LOOP CABLE	(EMS SYSTEM - TC)
E2	EMS LOCAL CONTROL CABLE	(TC - MODULE / CONTROLS)

FIRE ALARM  
FA REFER TO FIRE ALARM DRAWINGS FOR CABLE TYPES AND QUANTITIES

### General Notes



**Addams Elementary School New Building and Modernization**  
Fresno Unified School District  
4774 East Yale Avenue Fresno, CA

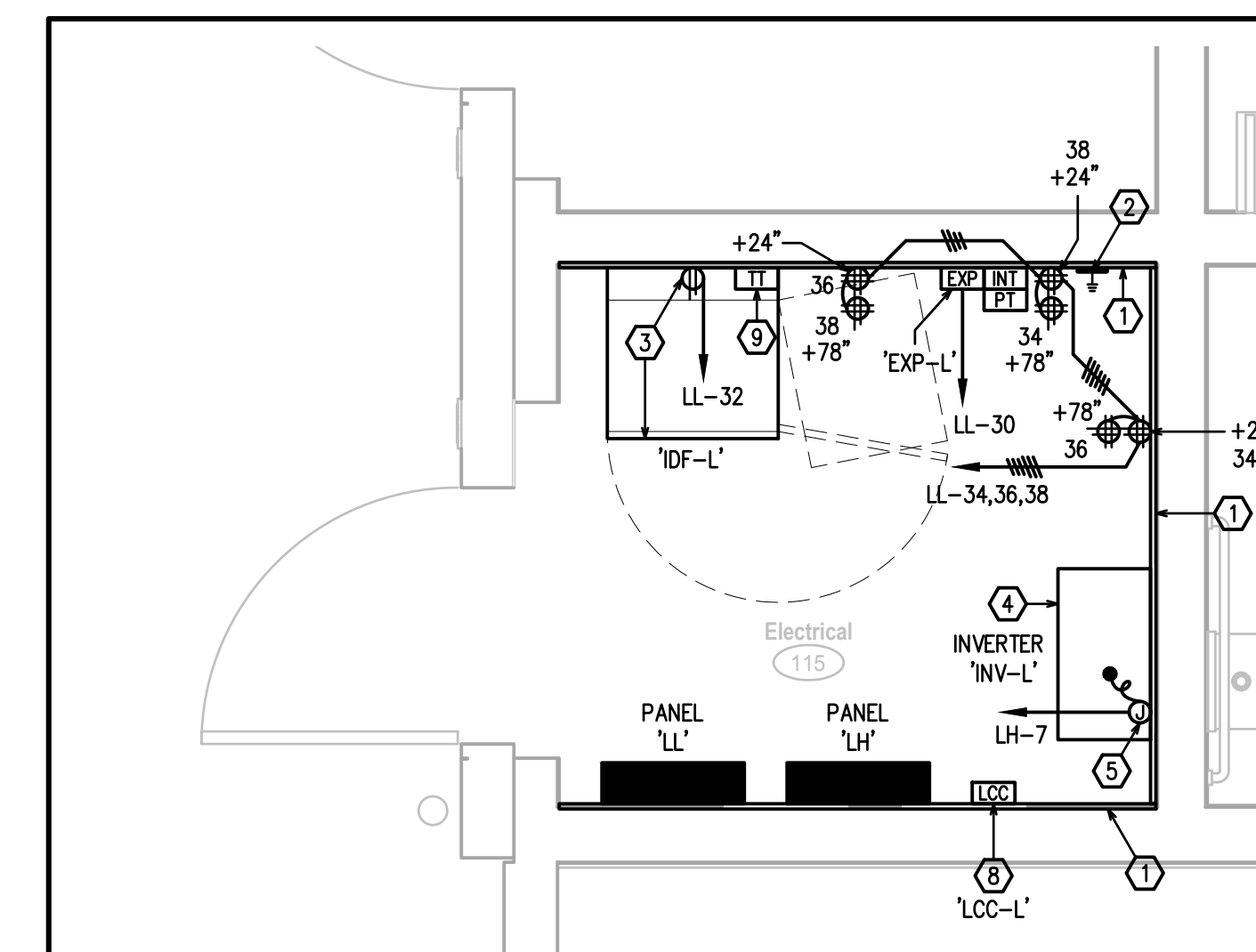
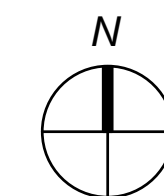
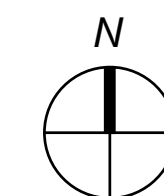
### ELECTRICAL DETAILS AND LOW VOLTAGE SINGLE LINE DIAGRAM

### Drawing

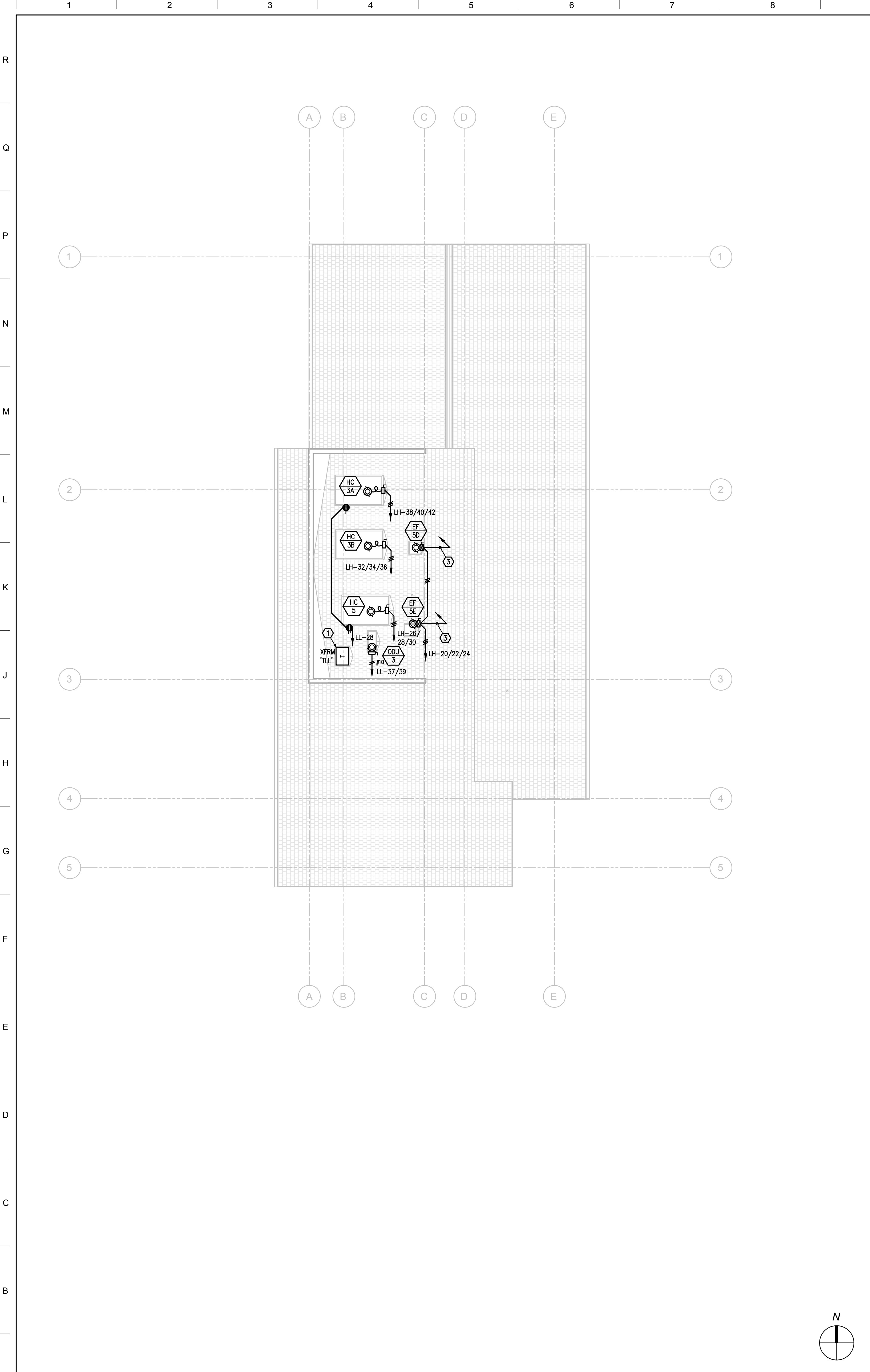


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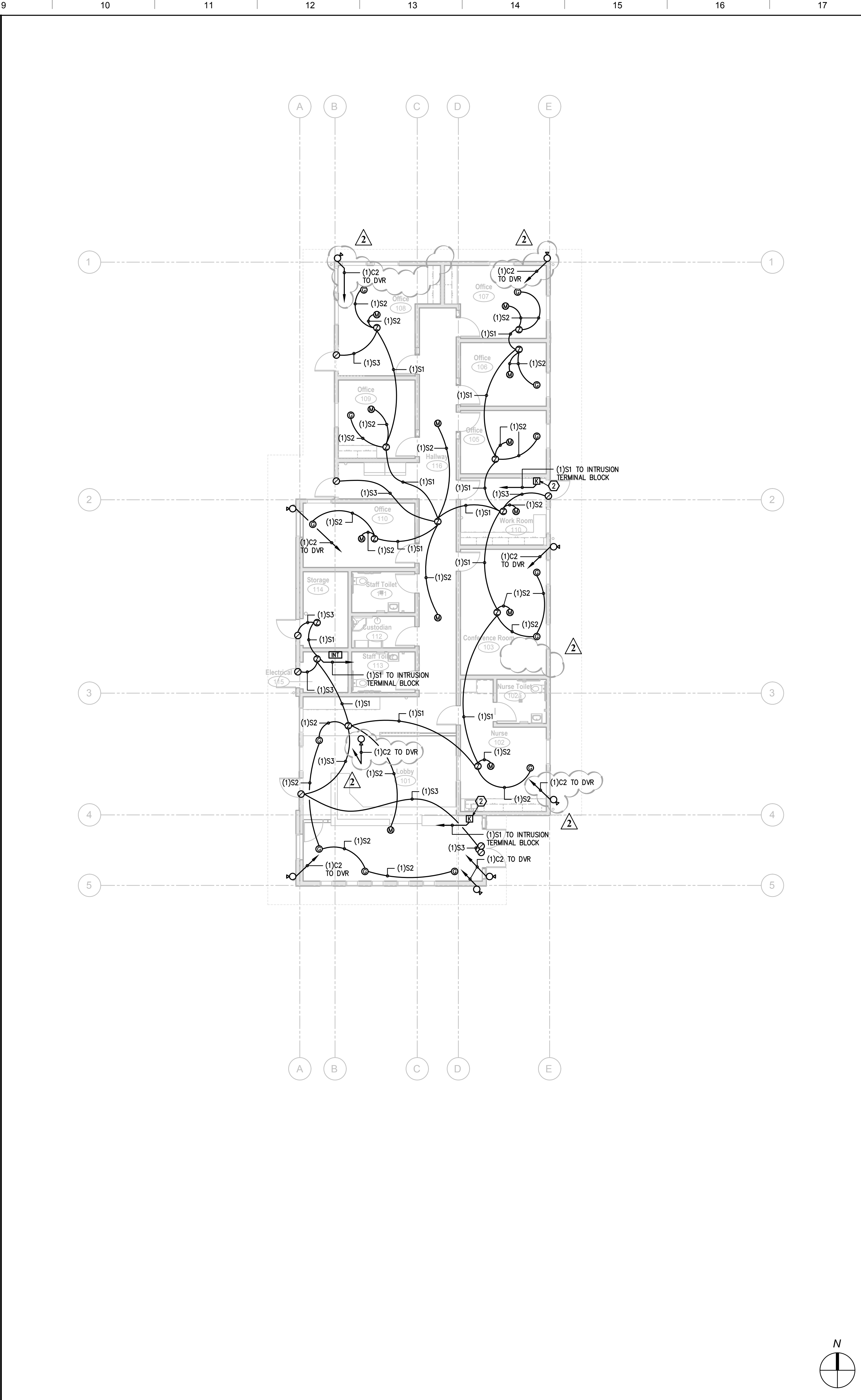
No.	Revision/Submission		Date
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Scale: As indicated	Drawn By: EN	<div style="font-size: 2em; font-weight: bold; text-align: center;">X/E104</div>	
Project Number: 1725	Checked By: SD		
Date: 04/03/2019	Reviewed By: SD		
		Sheet: _____ of: _____	



Date:	04/05/2019	Reviewed By:	OD
18	19	20	



A1 ROOF POWER PLAN



A9 INTRUSION PLAN

DSA File No.:

DSA Application No.:  
02-117220

Agency Approval

DRAWING KEY NOTES

1. ROOF MOUNTED TRANSFORMER. SEE POWER SINGLE LINE DIAGRAM A11X/E105 AND DETAIL A11X/E103.
2. PROVIDE KEYPAD AT LOCATION DIRECTED BY FUSD.
3. RUN 3/4" C. TO HC UNIT FOR CONTROL.

General Notes



**Hardin-Davidson Engineering**  
356 Pollasky Ave., Suite 200, Clovis, CA 93612  
559.323.4995 tel • 559.323.4928 fax  
www.hardin-davidson.com



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**Addams Elementary School New Building and Modernization**  
Fresno Unified School District  
4774 East Yale Avenue Fresno, CA

Project

**Building L - Administration**  
ROOF POWER, INTRUSION PLANS

Drawing

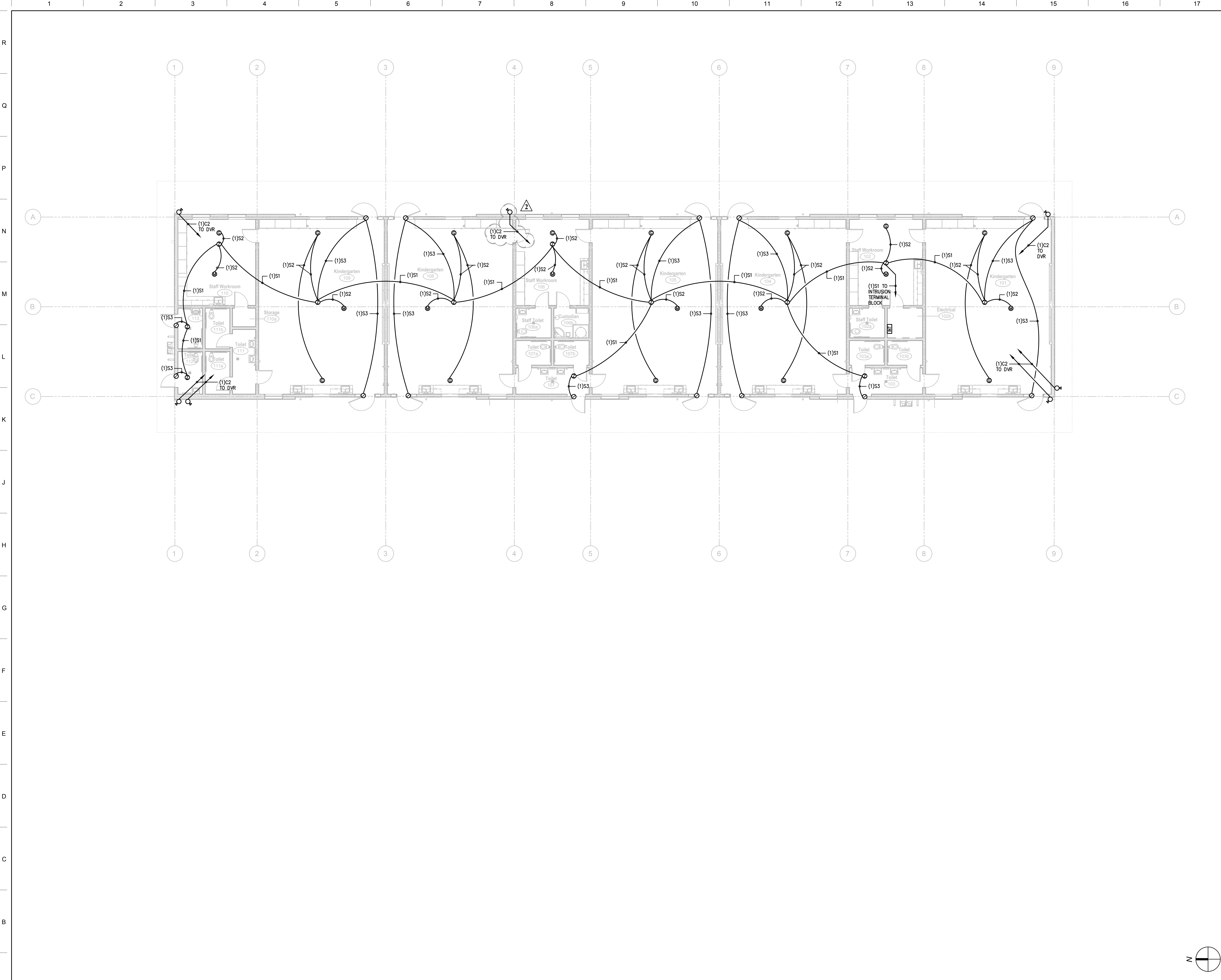


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2	Revision 2	05/21/2021
Revision		
	Designed By: SD	Copyright 2018 Darden Architects
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Project Number: 1725	Checked By: SD	
Date: 04/03/2019	Reviewed By: SD	
		Sheet: _____ of: _____



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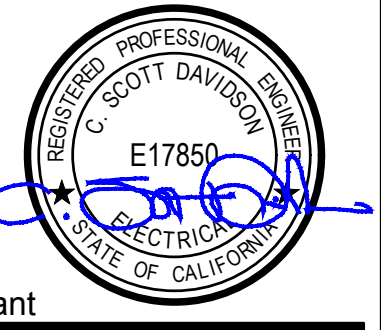
DSA Application No.:  
02-117220

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General Notes



**Hardin-Davidson Engineering**  
356 Pollasky Ave., Suite 200, Clovis, CA 93612  
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SCOTT DAVIDSON  
E17850  
REGISTERED PROFESSIONAL ENGINEER  
ELECTRICAL  
STATE OF CALIFORNIA

Consultant

**Addams Elementary School New Building and Modernization**  
Fresno Unified School District  
4774 East Yale Avenue Fresno, CA

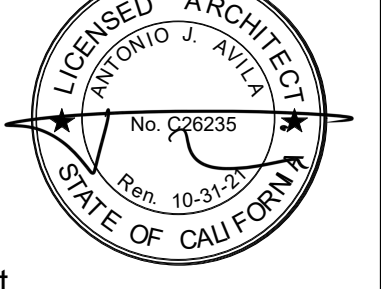
Project

**Building M - Kindergarten Classroom Building**  
INTRUSION PLAN

Drawing



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GREGORIO J. AVILA  
No. C26235  
REGISTERED ARCHITECT  
STATE OF CALIFORNIA

Architect

No.	Revision/Submission	Date
2	Revision 2	05/21/2021

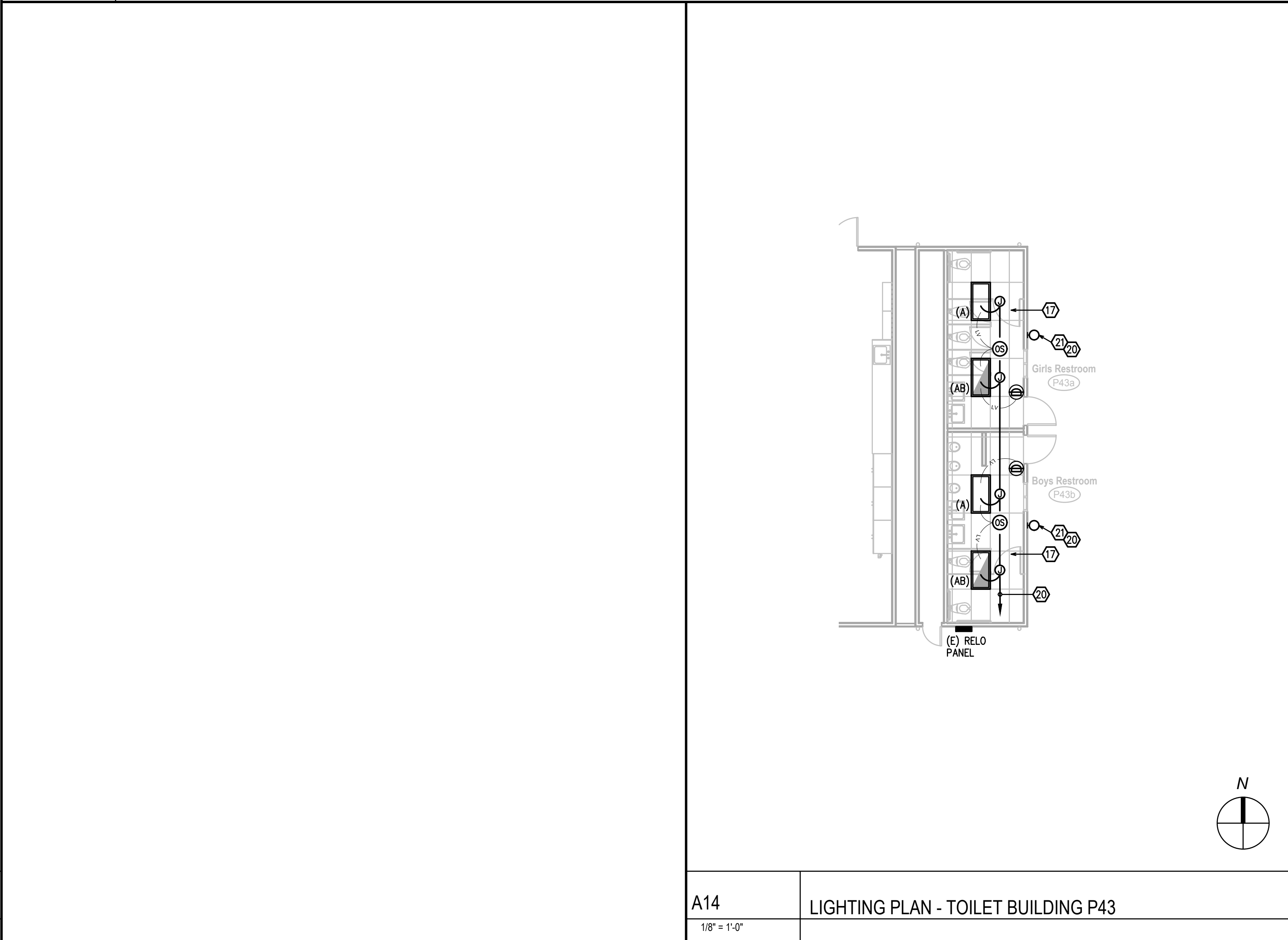
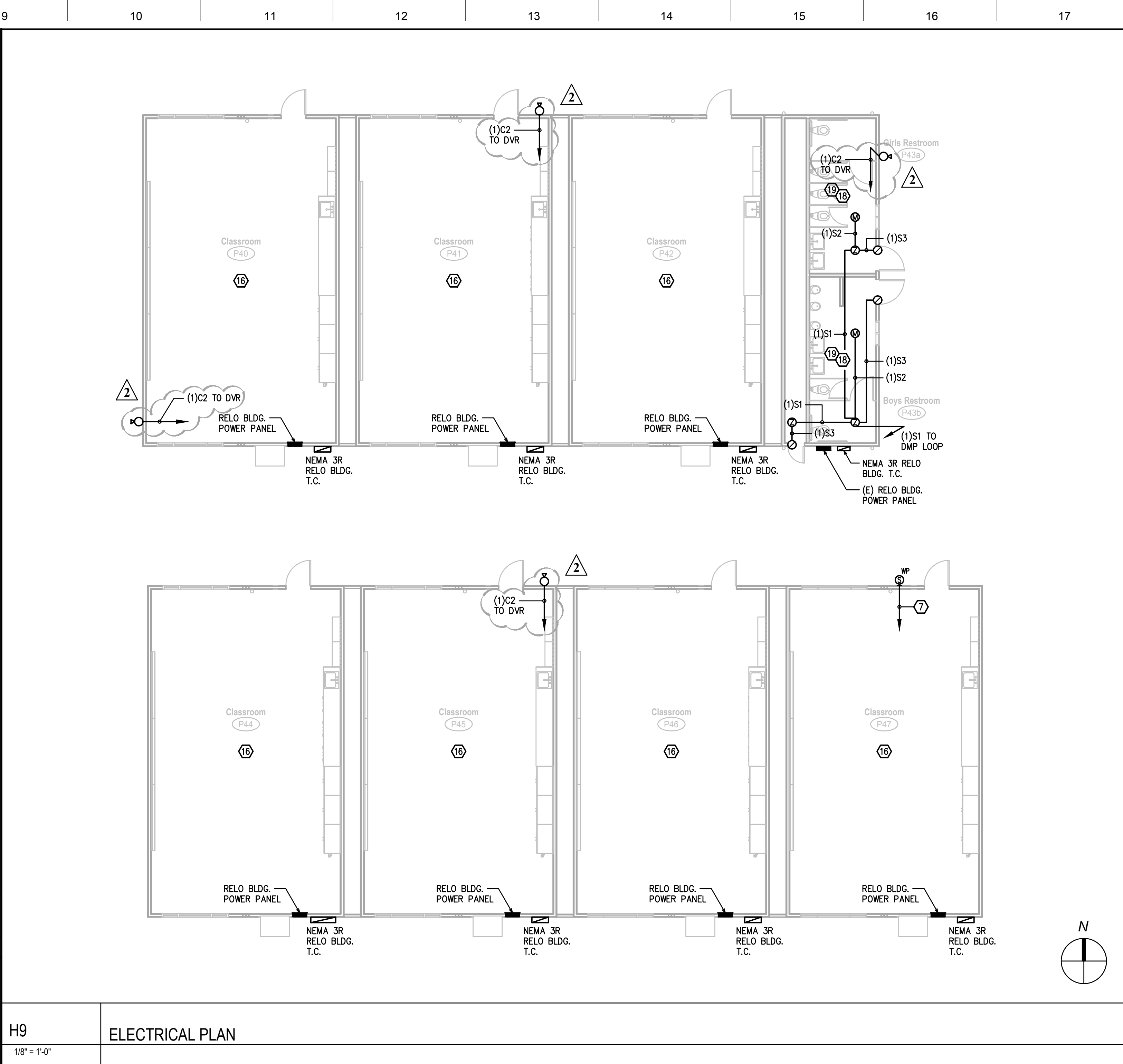
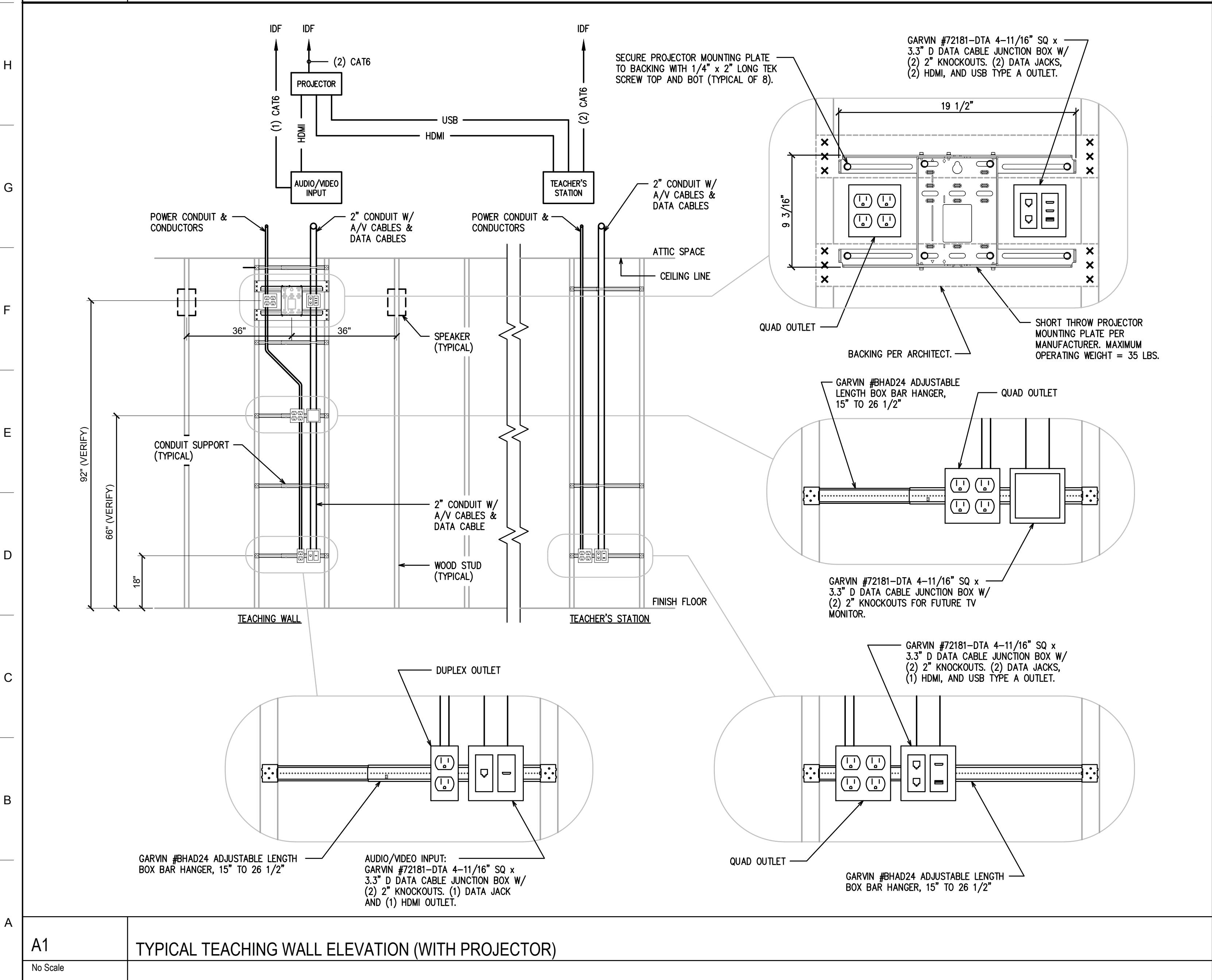
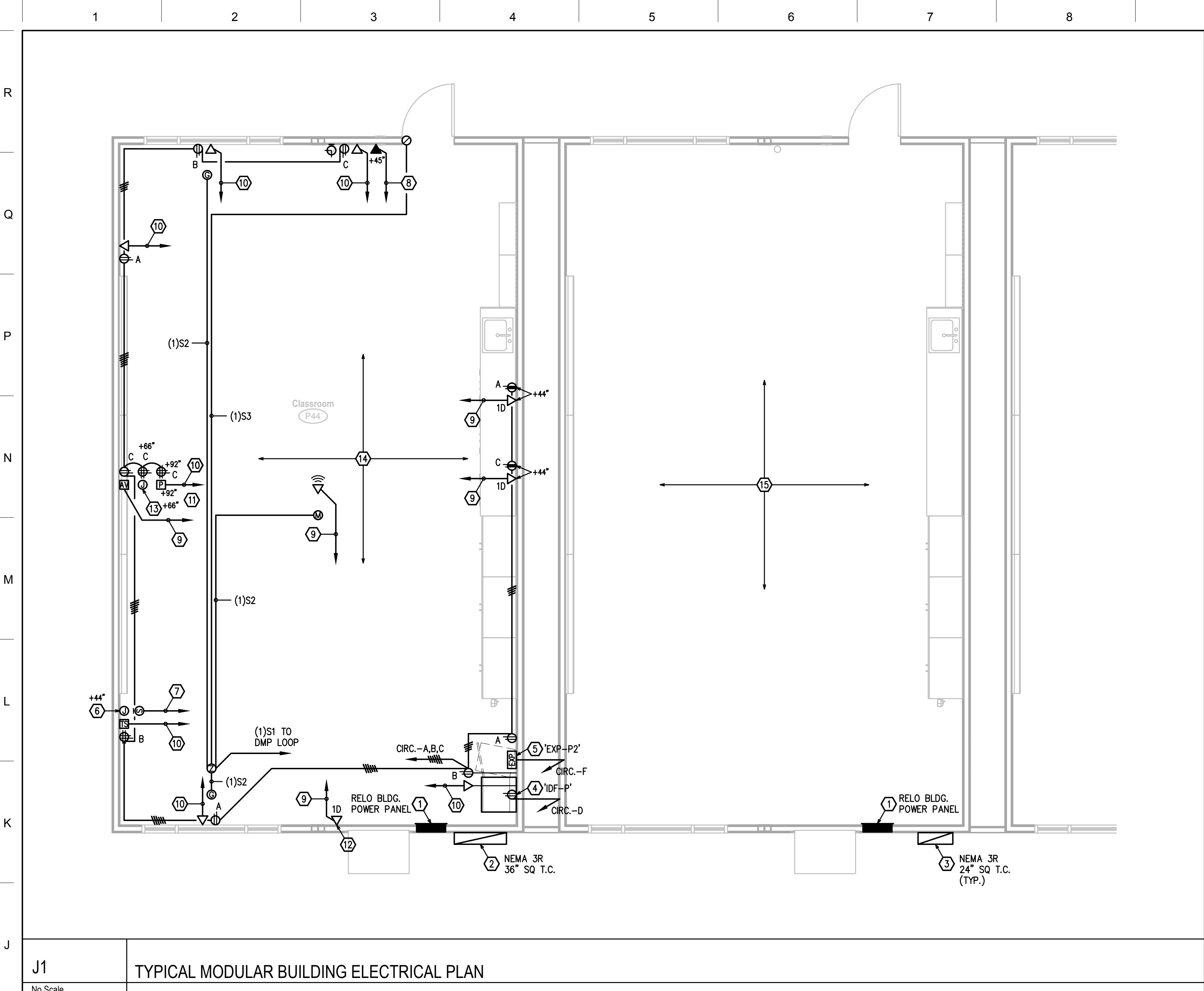
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Project Number: 1725	Checked By: SD
Date: 04/03/2019	Reviewed By: SD

M/E301

Sheet: \_\_\_\_\_ of: \_\_\_\_\_

A1 INTRUSION PLAN



18 19 20

DSA File No.:  
DSA Application No.: 02-117220  
Agency Approval

**DRAWING KEY NOTES**

- RELO BUILDING POWER PANEL PER-INSTALLED BY MANUFACTURER. SEE POWER SINGLE LINE DIAGRAM.
- NEMA 3R 36" SQ TERMINAL CABINET WITH PULL CAN ABOVE. SEE DETAIL L1X/E104.
- NEMA 3R 24" SQ TERMINAL CABINET WITH PULL CAN ABOVE FOR ALL RELO BUILDINGS UNLESS OTHERWISE NOTED. SEE DETAIL L1X/E104.
- IDF CABINET PER SPECS AT +80" AFF TO BOTTOM OF CABINET (RELO BUILDING "P43" ONLY). MOUNT POWER OUTLET INSIDE IDF. SEE DETAIL L5X/E104. CONNECT TO DEDICATED 120V 20A CIRCUIT IN RELO POWER PANEL. PROVIDE 120V 20A 1-POLE CIRCUIT BREAKER.
- NAC EXPANDER PANEL (RELO BUILDING "P44" ONLY). CONNECT TO DEDICATED 120V 20A CIRCUIT IN RELO POWER PANEL. PROVIDE 120V 20A 1-POLE CIRCUIT BREAKER WITH RED HANDLE LOCK-ON DEVICE. CONNECT FA. SEE FIRE ALARM PLANS.
- J-BOX WITH BLANK PLATE AND 1" C. STUB TO PA SPEAKER FOR FUTURE PANIC BUTTON CONNECTION.
- (1)P TO PA TERMINAL BLOCK.
- (1)T TO TEL PATCH BLOCK.
- (1)D TO DATA PATCH PANEL.
- (2)D TO DATA PATCH PANEL.
- FURNISH AND INSTALL A COMPLETE AND OPERATING AUDIO VISUAL SYSTEM AT EACH RELO BUILDING CLASSROOM, INCLUDING: EPSON BRIGHTLINK 695W ULTRA SHORT THROW PROJECTOR, PROJECTOR MOUNT (DETAIL A1P/E201), EPSON ELSPRO2 ACCESSORY SPEAKERS, EB86M EDGE+ USB INTERACTIVE WHITEBOARD SYSTEM, SMARTMARKER PACK AND ALL CABLING, BALLUNS, SETUP, CALIBRATION, AND MISCELLANEOUS APPURTENANCES.
- PROVIDE DATA OUTLET FOR AC UNIT TCP. VERIFY LOCATION WITH MECHANICAL PRIOR TO ROUGH-IN.
- 2-GANG J-BOX WITH BLANK PLATE FOR FUTURE TV MONITOR A/V CONNECTION. VERIFY LOCATION PRIOR TO ROUGH-IN. SEE DETAIL A1P/E201.
- ALL RELO BUILDING POWER OUTLET SHALL BE TAMPER RESISTANT.
- SEE RELO BUILDING CLASSROOM "P44" FOR INTERIOR ELECTRICAL IMPROVEMENTS AT ALL RELO BUILDINGS.
- SEE TYPICAL MODULAR BUILDING ELECTRICAL PLAN J1P/E201.
- REPLACE EXISTING INTERIOR LIGHTING SYSTEM WITH NEW.
- REPLACE ALL EXISTING POWER OUTLETS WITH TAMPER RESISTANT NORMAL & GFI OUTLETS.
- REMOVE ALL EXISTING INTRUSION DEVICES, FIRE ALARM DEVICES, AND CABLING.
- RECONNECT TO EXISTING LIGHTING CIRCUIT.
- REPLACE EXISTING EXTERIOR LIGHT FIXTURE WITH COOPER LIGHTING #XTOR4B-W-SZ. PATCH AND PAINT EXTERIOR WALL TO MATCH EXISTING.

**DEMOLITION GENERAL NOTES**

THE CONTRACTOR SHALL FIELD SURVEY THE EXISTING CONDITIONS AND PERFORM ALL ELECTRICAL DEMOLITION AND PREPARATION AS REQUIRED TO ACCOMMODATE THE WORK SHOWN IN THESE PLANS, THE REMAINDER OF THE CONTRACT DOCUMENTS, AND ANY OTHER WORK IMPLIED BY THE SCOPE OF THE PROJECT.

- DEMO LIGHTING SYSTEM, TO INCLUDE SWITCHES, MISCELLANEOUS CONTROLS, CONDUCTORS, JUNCTION BOXES, CONDUITS, ETC., THAT ARE NO LONGER REQUIRED. PATCH ANY OPENINGS, OR PROVIDE NEW CEILING TILES, IN VOIDS CAUSED BY THE REMOVAL OF FIXTURES.
- REMOVE EXISTING INTRUSION DEVICES AND CABLING.
- REMOVE EXISTING FIRE ALARM DEVICES AND CABLING.
- REMOVE EXISTING ELECTRICAL FEEDS TO ANY EXISTING EQUIPMENT THAT IS SCHEDULED FOR DEMOLITION OR IS ALREADY NON-FUNCTIONAL, TO INCLUDE DISCONNECT SWITCHES, CONDUCTORS, JUNCTION BOXES, CONDUIT, ETC.
- REMOVE ANY ABANDONED AND UNUSED WIRING, CONDUIT, ETC. ON BUILDINGS SCHEDULED FOR WORK UNDER THIS PROJECT.
- THE CONTRACTOR SHALL, PRIOR TO COMMENCING WORK, ARRANGE A MEETING WITH THE DISTRICT PROJECT MANAGER AND THE ENGINEER OF RECORD IN ORDER TO CLARIFY THE EXACT SCOPE OF ELECTRICAL SYSTEMS DEMOLITION.

General Notes

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**Addams Elementary School New Building and Modernization**  
Fresno Unified School District  
4774 East Yale Avenue Fresno, CA  
Project

**Portable Classrooms**  
ELECTRICAL PLAN AND TYPICAL MODULAR BUILDING ELECTRICAL PLAN  
Drawing

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No.	Revision/Submission	Date
2	Revision 2	05/21/2021

Revision	
Designed By:	SD
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Scale:	As indicated	Drawn By:	EN
Project Number:	1725	Checked By:	SD
Date:	04/03/2019	Reviewed By:	SD

**P/E201**  
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