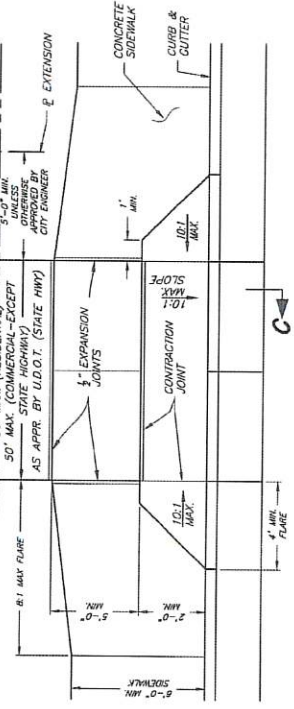
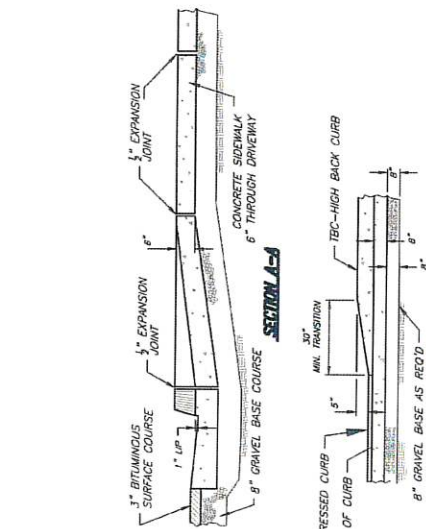


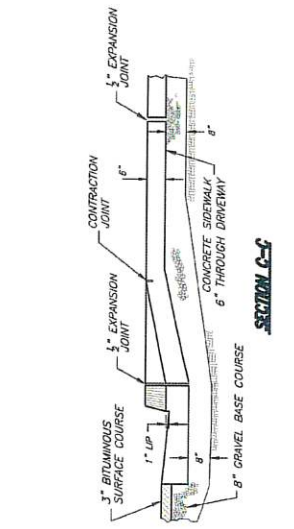
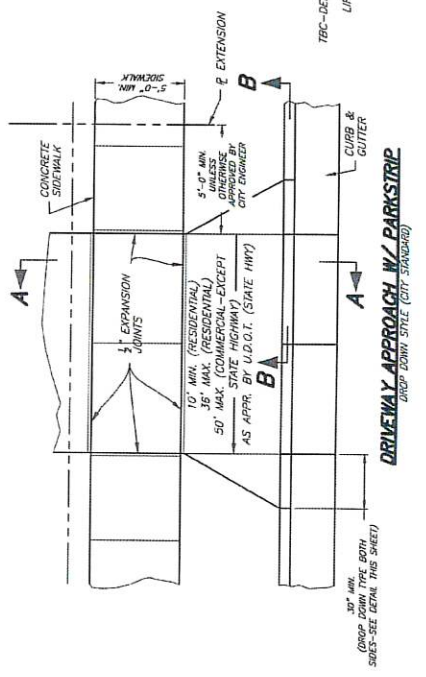


Engineering Standards and
Drawings for:

Concrete Projects

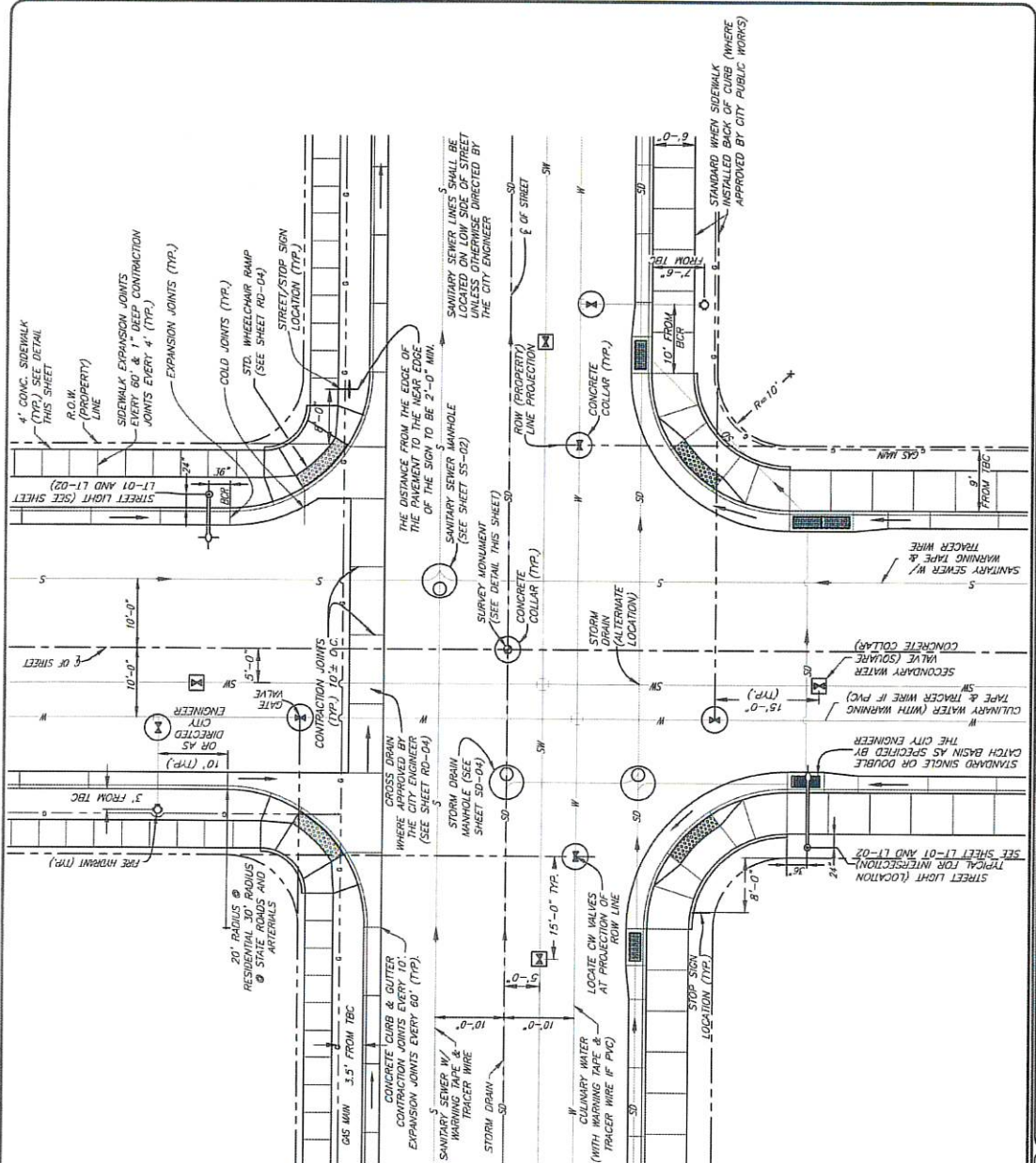


DRIVEWAY APPROACH W/ ADJACENT SIDEWALK



SECTION B-B

NO.	REVISION
1	ADDITION
2	REVISION
3	ADDITION
4	REVISION
5	ADDITION
6	REVISION
7	ADDITION
8	REVISION
9	ADDITION
10	REVISION
11	ADDITION
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15	ADDITION
16	REVISION
17	ADDITION
18	REVISION
19	ADDITION
20	REVISION

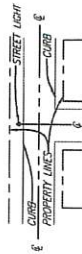


STREET JOINTS:

1. PRESSURIZED IRRIGATION SYSTEM DESIGN AS APPROVED BY REVIEW OR MOUNTAIN VIEW IRRIGATION.
2. THE NUMBER OF VALVES REQUIRED AT EACH INTERSECTION SHALL BE DETERMINED BY THE CITY WATER DEPARTMENT.
3. EXACT LOCATION OF STREET AND REGULATORY SIGNS SHALL BE SPECIFIED BY THE CITY ENGINEER FOR SPECIFIC INTERSECTIONS.
4. SIGNS TO BE INSTALLED AND PAID FOR BY THE DEVELOPER.
5. CITY UTILITY LINES MUST BE LOCATED IN A PUBLIC RIGHT-OF-WAY. NO CITY UTILITIES MAY BE LOCATED IN A PRIVATE PROPERTY. ALL UTILITY LINES MAINTAINED BY THE CITY MUST ALSO BE IN A PUBLIC RIGHT-OF-WAY.
6. ON LOCAL STREETS WHERE THE PARK STRIPS ARE UTILIZED, FOR L.I.D. DRY UTILITIES SHALL BE LOCATED IN A 15' PUE BEHIND THE PROPERTY LINE.

STREET LIGHTING:

- A. ALL LOCAL STREET LIGHTING ALWAYS BE INSTALLED IN THE WEST ASH AT RIGHT ANGLES TO STREET.
- B. ALWAYS LOCATE STREET LIGHT IN CLOSE PROXIMITY TO STREET SIGN.
- C. T INTERSECTION SHALL BE LIT WITH LIGHT ASSEMBLY LOCATED OPPOSITE OF INTERSECTION OF INTERSECTING STREET. (SEE DIAGRAM BELOW)
- D. PLACE STREET LIGHT AT PROPERTY LINES, EXCEPT NEAR INTERSECTIONS; AVOID FUTURE DRIVEWAY CONFLICTS.
- E. SEE SHEET LT-01 AND LT-02 FOR STREET LIGHT DETAILS



PROJECT NO.	2020-0125
DATE	06 58
RD-03	

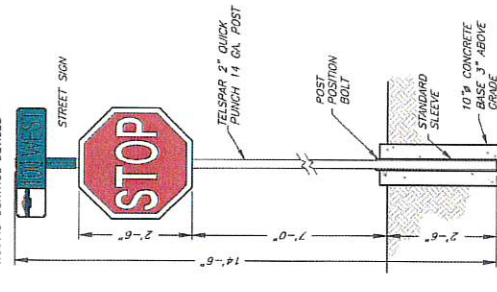
NORTH OGDEN CITY CORPORATION
PUBLIC WORKS STANDARDS
PUBLIC ROADS - TYPICAL INTERSECTION DETAILS

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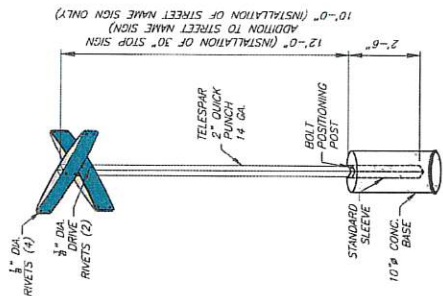
BY	J. CHAMBERLAIN
CHECKED	A. THOMPSON
DATE	06 58
SCALE	AS SHOWN
PROJECT	RD-03
SHEET NO.	RD-03

ALL SIGNS SHALL CONFORM TO THE REQUIREMENTS OF THE CURRENT MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES*

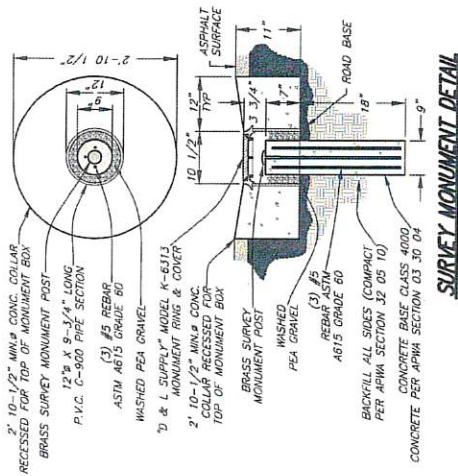


STREET SIGN & POST

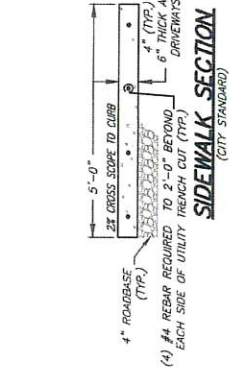
- STREET SIGN NOTES:**
- BACKGROUND SHALL BE GREEN, HIGH INTENSITY REFLECTIVE SHEETING 9FP-85 (TYPE IIIA)
 - LEGEND SHALL BE WHITE LETTERS, HIGH INTENSITY REFLECTIVE SHEETING 9FP-85 (IIIa)
 - SIGN BLANKY SHALL BE 6081-16 HEAT TREATED HIGH TENSILE STRENGTH ALUMINUM COILING 1200 FINISH-THICKNESS SHALL BE 0.08"
 - EACH SIGN SHALL CONSIST OF TWO PLATES RIVETED TOGETHER & MOUNTED AS SHOWN
 - SIGN ON PRIVATE ROADS SHALL MEET ALL SPECIFICATIONS FOR STANDARD SIGNS, EXCEPT BACKGROUND SHALL BE BLUE
 - ALL STREETS WITH NAMES MUST ALSO SHOW LOCATIONS COORDINATE DESIGNATION
 - CITY ENGINEER MUST BE CONTACTED PRIOR TO MAKING SIGNS TO VERIFY PROPER NAMES AND COORDINATES



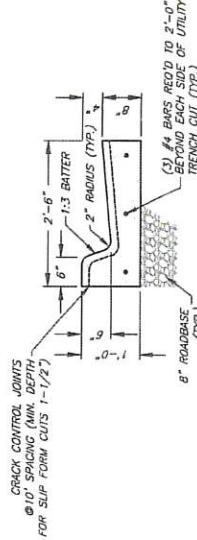
STREET SIGN & POST



SURVEY MONUMENT DETAIL



SIDEWALK SECTION



CURB & GUTTER SECTION

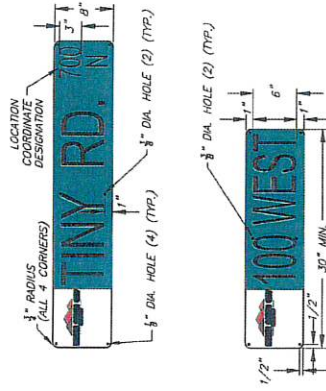


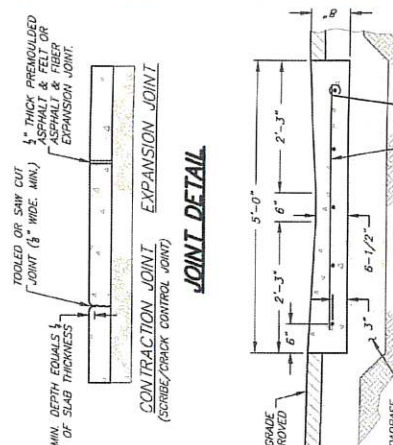
PLATE DETAIL

North Osgood City Corporation
Public Works Standards
Public Roads - Typical Intersection Details

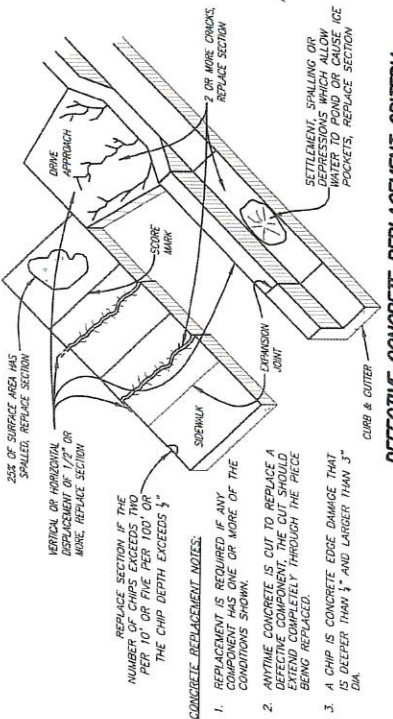
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CRS ENGINEERS PC, 5th FLOOR, SUITE 500, 300 N. 10TH ST., OMAHA, NE 68102

DATE	BY
CHECKED	DATE
DESIGNED	DATE
DRAWN	DATE
SCALE	
PROJECT	
NO.	

2025.01.25
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RD-03A

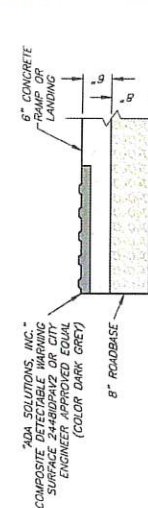


JOINT DETAIL



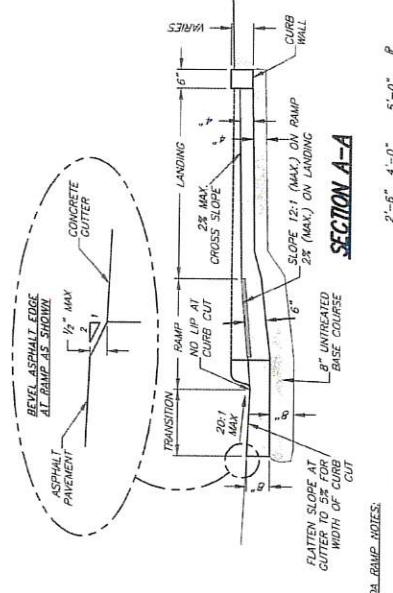
CROSS DRAIN SECTION
(WHERE APPROVED BY CITY PUBLIC WORKS DIRECTOR AND THE CITY ENGINEER)

DETECTABLE WARNING SURFACE DETAIL

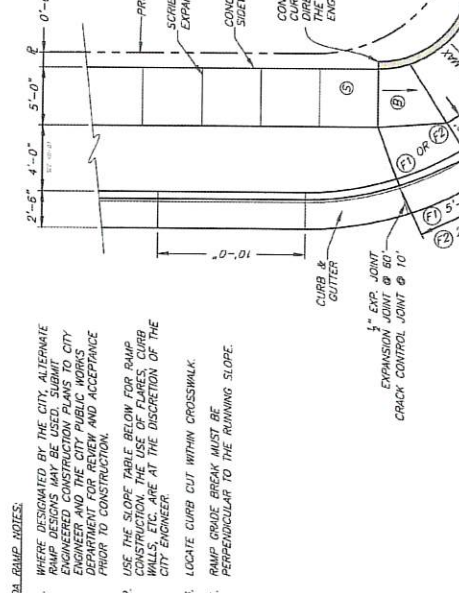


DETECTABLE WARNING SURFACE NOTES:

1. LOCATE DETECTABLE WARNING SURFACE SO THAT THE LOCATED CURB IS 6 TO 8 INCHES FROM THE CURB LINE OR OTHER POTENTIAL HAZARD. PROVIDE 2-FOOT MINIMUM CLEAR.
2. PROVIDE DETECTABLE WARNING SURFACE FOR FULL WIDTH OF CURB CUT.
3. THE DETECTABLE WARNING SURFACE DOWNS SHALL BE PERPENDICULAR TO THE DIRECTION OF PEDESTRIAN TRAVEL TO THE RAMP ON THE OPPOSITE SIDE OF THE STREET.
4. THE STANDARD COLOR FOR THE DETECTABLE WARNING SURFACE SHALL BE THE PRE-APPROVED CONTRASTING COLOR. THE EXISTING SIDEWALK COLOR IS NOT STANDARD. THE STANDARD COLOR OF THE DETECTABLE WARNING SURFACE SHALL BE AS APPROVED BY THE CITY ENGINEER OR AUTHORIZED REPRESENTATIVE.
5. WHEN A DETECTABLE WARNING SURFACE DOWNS IS CUT, THE REMAINING PORTION OF THE DOWNS SHALL BE BEVELLED TO A MAXIMUM SLOPE OF 1:2.

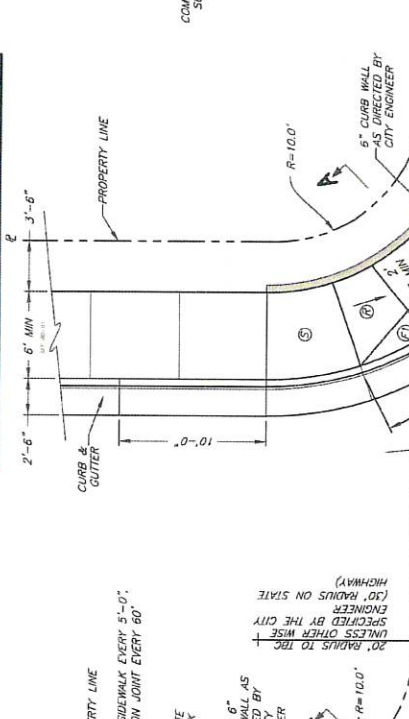


SECTION A-A



WHEELCHAIR RAMP DETAIL 'A'
CITY STANDARD (WITH PARK STRIP)

DEFECTIVE CONCRETE REPLACEMENT CRITERIA



CONCRETE REPLACEMENT NOTES:

1. REPLACEMENT IS REQUIRED IF ANY COMPONENT HAS ONE OR MORE OF THE CONDITIONS SHOWN.
2. ANYTIME CONCRETE IS CUT TO REPAIR A DEFECTIVE COMPONENT, THE CUT SHOULD EXTEND COMPLETELY THROUGH THE PIECE BEING REPLACED.
3. A CHIP IS CONCRETE EDGE DAMAGE THAT IS DEEPER THAN 1/4" AND LARGER THAN 3" DIA.

ITEM	MAX RUNNING SLOPE*	CROSS SLOPE**
L	2% (1V:48H)	2% (1V:48H)
R	8.33% (1V:12H)	2% (1V:48H)
S	---	2% (1V:48H)
F	TRAVELABLE SURFACE (1:10:10)	---
T	NON-TRAVELABLE SURFACE	2% (1V:48H)
B	BLENDED TRANSITION	5% (1V:20H) 2% (1V:48H)

* RUNNING SLOPE IS IN THE DIRECTION OF PEDESTRIAN TRAVEL.
** SLOPE IS PERPENDICULAR TO PEDESTRIAN TRAVEL.

REQUIRES WRITTEN CITY APPROVAL (WITHOUT PARK STRIP)

WHEELCHAIR RAMP DETAIL 'B'
REQUIRES WRITTEN CITY APPROVAL (WITHOUT PARK STRIP)

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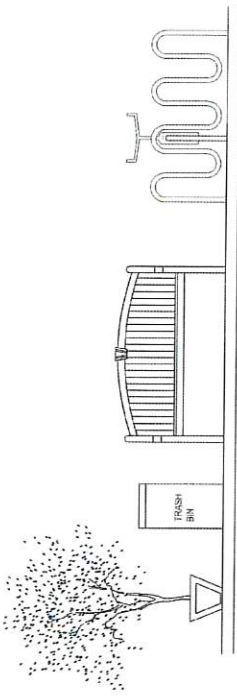
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2020-0125
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RD-04



**PARK STRIP AMENITY DETAIL (SEE SHEET NOTES)
 WASHINGTON BLVD. FROM 2650 NORTH TO SOUTH CITY LIMITS &
 2700 NORTH FROM THE WEST CITY LIMIT TO 475 EAST**

SHEET NOTES:

STREET TREES:

1. MINIMUM 2 INCH CALIPER TREES EVENLY SPACED BETWEEN EXISTING STREET LIGHTS. IF THERE ARE NO STREET LIGHTS, THE TREES AND SPACING SHALL BE APPROVED BY THE PLANNING COMMISSION.
2. ADDITIONAL TREES MAY BE ADDED IF DESIRED BY PROPERTY OWNER.
3. ALLOWED TREES FOR WASHINGTON BLVD (SUITABLE UNDER POWER LINES):
 - FLOWERING CRABAPPLE (NON-FRUITING, NON-WEeping VARIETIES)
 - CANADA CHOKECHERRY (WHITE FLOWERS, GREEN LEAVES TURN PURPLE)

FURNISHINGS:

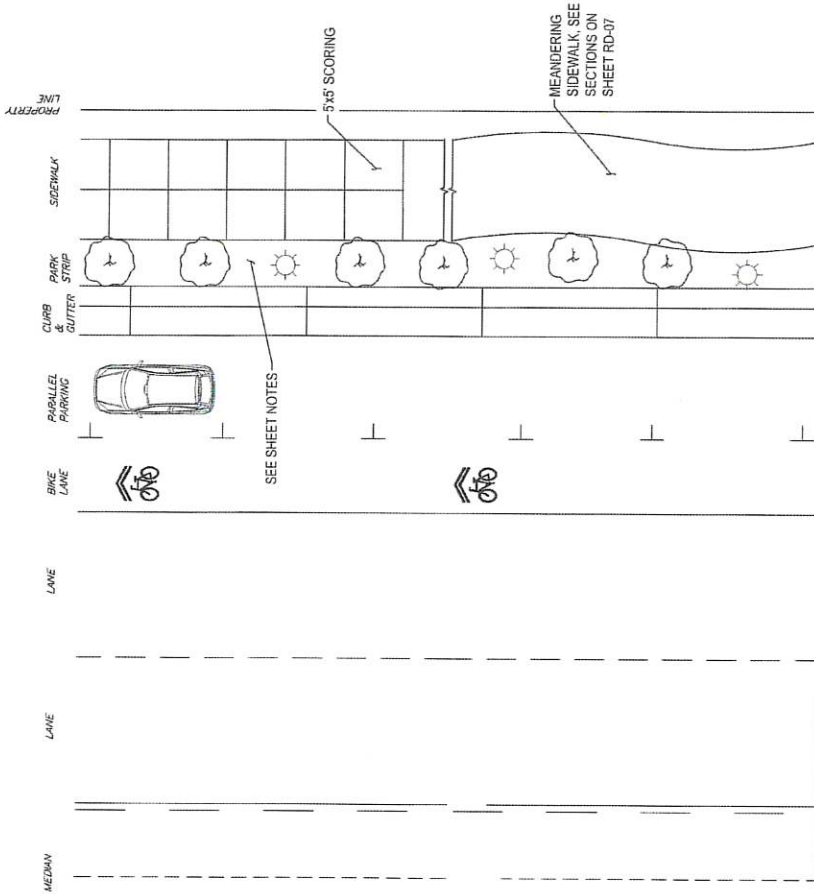
1. SEATING, PLANTERS, TRASH RECEPTACLES, BIKE RACKS TO BE LOCATED AT BUS STOPS SHOWN ABOVE.
2. DECORATIVE STREET LIGHTS SHALL BE PLACED AT A MAXIMUM 100 FT SPACING

PARK STRIP:

1. PARKING STRIP GROUND COVER AS APPROVED BY THE PLANNING COMMISSION; IT MAY INCLUDE A XERISCAPE DESIGN
2. PARK STRIP WIDTHS ARE DETERMINED BY CONSIDERING THE AVAILABLE AREA BETWEEN THE BACK OF CURB TO THE PROPERTY LINE AFTER DEDUCTING THE SIDEWALK WIDTH.

SIDEWALK:

1. STANDARD SIDEWALK WIDTH IS 10', WITH 5'x5' SCORING PATTERN.
2. SIDEWALK WIDTH LESS THAN 10' MAY BE APPLICABLE ON A CASE BY CASE BASIS, BUT IN NO CASE LESS THAN 8' IN WIDTH.
3. SIDEWALK WIDTHS DIFFER ON MOUNTAIN RD. AND MONROE BLVD, SEE TYPICAL SECTIONS ON SHEET RD-07.



PLAN VIEW

WASHINGTON BLVD., MOUNTAIN ROAD, AND MONROE BLVD STREETSCAPE

<p>CRS ENGINEERS Answers to Infrastructure®</p> <p>4248 S. BIRCHBLVD. SUITE 200 SALT LAKE CITY, UT 84142 P. 801.338.5881 WWW.CRSENGINEERS.COM</p>		<p>NORTH OGDEN CITY CORPORATION PUBLIC WORKS STANDARDS STREETSCAPE STANDARDS</p>		<p>DATE: 2024-01-25</p> <p>SCALE: 1" = 50'</p> <p>PROJECT: RD-08</p>
<p>BY: CHANCELLER</p> <p>IN CHARGE: A. THOMPSON</p> <p>DESIGNER: A. THOMPSON</p> <p>CHECKER: D. LORIE</p> <p>DATE: 1/25/24</p> <p>SCALE: 1" = 50'</p>		<p>FOR THE LOCAL AGENCY TO REVIEW AND APPROVE THE PROJECT, SIGNATURE AND DATE OF REVIEWER:</p> <p>DATE OF REVIEW: _____</p> <p>DATE OF APPROVAL: _____</p> <p>APPROVED BY: _____</p>		<p>DATE: 1/25/24</p>



SECTION 5

PORTLAND CEMENT CONCRETE

- 5.1 SCOPE: This section of the specifications defines materials to be used in all portland cement concrete work and requirements for mixing, placing, finishing, and curing.
- 5.2 MATERIALS: Materials used in portland cement concrete and reinforcing of portland cement concrete shall meet the following requirements.
- A. Cement: Portland cement shall be Type II or as approved by the City Engineer and shall comply with the Standard Specification for Portland Cement, ASTM C-150.
 - B. Aggregates: Concrete aggregates shall conform to Tentative Specifications for Concrete Aggregates, ASTM C-33.
 - C. Water: Water used in mixing concrete shall be clean and free from oil, acid, salt, injurious amounts of alkali, organic matter or other deleterious substances.
 - D. Entraining Agent: An air-entraining agent shall be used in all concrete exposed to the weather. The agent shall conform to ASTM Designation C-175 and C-260.
 - E. Admixtures: No admixture (except calcium chloride) will be permitted to be used in portland cement concrete unless such use is specifically authorized by the City Engineer. Calcium chloride shall conform to ASTM Standard Specification D-98.
 - F. Reinforced Steel: All bar material used for reinforcement of concrete shall be grade 60 steel conforming to the requirements of ASTM Designation A-615 and shall be deformed in accordance with ASTM Designation A-305.
 - G. Welded Wire Fabric: Welded wire fabric for concrete reinforcement shall conform to the requirements of ASTM A-185.
-



- 5.1 CONCRETE MIX: For the purpose of practical identification, concrete has been divided into three classes: Class A, B, and C. Basic requirements and use for each class are as defined below:

CLASS	Minimum Cement (sacks/c.y.)	Minimum 28-day Compressive Strength (p.s.i.)	Primary Use
"A"	6-1/2	4,000	Reinforced structural concrete
"B"	6	3,500	Sidewalk, curb, batters, cross gutters, pavements and unreinforced footings and
"C"	5	2,500	Thrust blocks, anchors, mass concrete



All concrete shall also comply with the following requirements.

B. **Aggregates:** The maximum size of the aggregate shall be not larger than one-fifth of the narrowest dimension between forms within which the concrete is to be cast, nor larger than three-fourths of the minimum clear spacing between reinforcing bars or between reinforcing bars and forms. For unreinforced concrete slabs, the maximum size of aggregates shall not be larger than one-fourth the slab thickness.

C. **Water:** Sufficient water shall be added to the mix to produce concrete with the minimum practicable slump. The slump of mechanically vibrated concrete shall not exceed four inches. No concrete shall be placed with a slump in excess of five inches. The maximum permissible water-cement ratio (including free moisture on aggregates) shall be 5 and 5-3/4 gallons per bag of cement respectively for Class A and B air entrained concrete.

C. **Air-Entraining:** Air content for air-entrained concrete shall comply with the following:

Course Aggregate Size (in.)	Air Content %
1-1/2 to 2-1/2	5 +/- 1
3/4 or 1	6 +/- 1
3/8 or 1/2	7 +/- 1

The air-entraining agent shall be added as liquid to the mixing water by means of mechanical equipment capable of accurate measurement and control.

D. **Calcium Chloride:** Calcium chloride may be added as an accelerator with prior approval of the City Engineer during cold weather, with maximum amount being two pounds per sack of cement.

5.3 **FORMS:** Forms shall be substantially built and adequately braced so as to withstand the liquid weight of concrete. All linings, studding, walling and bracing shall be such as to prevent bulging, spreading, or loss of true alignment while pouring and displacement of concrete while setting.

Metal forms shall be used for curb and gutter work unless otherwise specified by the City Engineer. All edge forms for sidewalk pavements, curbs, and gutters shall be of sufficient rigidity and adequately braced to accurately maintain line and grade. Prior to concrete placement, all forms shall be lightly coated with oil to prevent concrete adhesion to form materials.



Forms for curved sections shall be so constructed and placed that the finish surface of walls and edge of sidewalks, curbs and gutters will not deviate appreciable from the arc of the curve.

Exposed vertical and horizontal edges of the concrete in structures shall be chamfered by the placing of moldings in the forms at those locations shown on the Drawings.

5.4 JOINTS: Joints shall be provided for sidewalk and curb and gutter as follows:

A. Sidewalks:

Shall have scribed joints at intervals equal to the width of the sidewalk but not to exceed 10 feet or as directed. Joints shall be approximately 3/16" wide and be approximately 1/4 of the total slab thickness. Expansion joint in sidewalk shall be at intervals not to exceed 60 feet and shall extend the full depth of the concrete.

B. Curb and Gutter:

Shall be cut into lengths of 10 feet by the use of 1/8 inch steel division plates of the exact cross section of the curb and gutter when constructed by hand methods. Curb and gutter constructed with a lay down machine shall be scribed with joints which shall be approximately 1/16" wide and be approximately 1/4 of the total curb thickness.

5.5 REINFORCEMENT AND EMBEDDED ITEMS: Reinforcing steel shall be clean and free from rust, scale, paint, grease, or other foreign matter which might impair the bond. It shall be accurately bent and shall be tied to prevent displacement when concrete is poured. Reinforcing steel shall be held in place by only metal or concrete ties, braces and supports. No steel shall extend from or be visible on any finished surface and shall have a minimum of 1-1/2 inch concrete cover.

The Contractor shall use concrete chairs for holding the steel away from the subgrade, and spreader or other type bars for securing the steel in place. The spreader bars shall be not less than 3/8 inch in diameter.

5.6 PREPARATIONS: Before batching and placing concrete, all equipment for mixing and transporting the concrete shall be cleaned, all debris and ice shall be removed and dried (as to be occupied by the concrete, forms shall be thoroughly wetted (except in freezing weather) or oiled, and masonry filler units that will be in contact with concrete shall be well drenched (except in freezing weather), and the reinforcements shall be well drenched (except in freezing weather), and the reinforcements shall be thoroughly cleaned of ice or other coatings. Water shall be removed from spaces to receive concrete.

5.7 When placing concrete on earth surfaces the surfaces shall be free from frost, ice, mud, and water. When the subgrade surface is dry soil or pervious material, it shall be sprayed with water immediately before placing of concrete or shall be covered with waterproof sheathing paper or a plastic membrane. No concrete shall be placed until the surfaces have been inspected and approved by the City Engineer or City Inspector.



- 5.8 CONCRETE MIXING: All concrete shall be ready-mixed and delivered in accordance with ASTM C-94. The concrete shall be mixed until there is a uniform distribution of the materials. Sufficient water shall be used in mixing concrete to produce a mixture which will flatten and quake when deposited in place, but not enough to cause it to flow. Sufficient water shall be used in concrete in which reinforcement is to be embedded, to produce a mixture which will flow sluggishly when worked and which, at the same time, can be conveyed from the mixer to the forms without separation of the coarse aggregate from the mortar. In no case shall the quantity of water used be sufficient to cause the collection of a surplus in the forms or exceed the maximum allowable slump as specified in 5.3 (b).
- 5.9 DEPOSITING: Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. The concrete placing shall be carried on at such a rate that the concrete is at all times plastic and flows readily into the corners of forms and reinforcing bars. No concrete that has partially hardened or been contaminated by foreign material shall be deposited in the work, nor shall retempered concrete be used. No concrete shall be dropped more than 3 feet. Concrete delivered to the job site having a temperature which exceeds 90° F shall not be placed. Concrete cooling methods during hot weather will be approved by the City Engineer.

All concrete in structures shall be vibrator compacted during the operation of placing and shall be thoroughly worked around reinforcement and embedded fixtures and into the corners of the forms.

- 5.10 PLACING CONCRETE IN COLD WEATHER: No concrete shall be poured where the air temperature is lower than 40° F, at a location where the concrete cannot be covered or protected from the surrounding air. When concrete is poured below a temperature of 35° F the ingredients of the concrete shall be heated so that the temperature of the mixture shall not be less than 50° or more than 100° F. Before mixing, the heated aggregates shall not exceed 125° F and the temperature of the heated water shall not exceed 175° F. Cement shall not be added while the temperature of the mixed aggregates and water is greater than 100° F. When there is likelihood of freezing during the curing period, the concrete shall be protected by means of an insulating covering and/or heating to prevent freezing of the concrete for a period of not less than 7 days after placing. Concrete shall not be placed on frozen soil.

Equipment for protecting concrete from freezing shall be available at the job site prior to placing concrete. Particular care shall be exercised to protect edges and exposed corners from freezing. In the event heating is employed, care shall be taken to ensure that no part of the concrete becomes dried out or is heated to temperatures above 90° F. The housing, covering, or other protection used shall remain in place and intact at least 24 hours after the artificial heating is discontinued. Combustion heaters shall not be used during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.



- 5.11 FINISHING: All concrete finish work shall be carefully performed and shall produce a top quality visual appearance as is common to the industry. After the concrete for slabs has been brought to the established grade and screened it shall be worked with a magnesium float and then given a light broom finish. In no case shall dry cement or a mixture of dry cement and sand be sprinkled on the surface to absorb moisture or hasten hardening. Surface edges of all slabs shall be rounded to a radius of 1/2 inch.

After concrete has been poured in curb and gutter forms it shall be puddled and spaded so as to ensure a thorough mixture, eliminate air pockets, and create uniform and smooth sides. Before the concrete has thoroughly set, and while the concrete is still green, the forms shall be removed, and the front and top sides shall be finished with a flat or steel trowel to make a uniform finished surface. Wherever corners are to be rounded, special steel trowels shall be used while the concrete is workable and the corners constructed to the dimensions specified.

The top and face of the curb and also the top of the apron on combined curb and gutter must be finished true to line and grade and without any irregularities of surface noticeable to the eye. The gutter shall not hold water to a depth of more than one fourth (1/4) of an inch, nor shall any portion of the surface or face of the curb or gutter depart more than one-fourth (1/4) of an inch from a straight edge ten (10) feet in length, placed on the curb parallel to the center line of the street nor shall any part of the exposed surface present a wavy appearance.

- 5.12 CURING AND PROTECTION: As soon as the concrete has hardened sufficiently to prevent damage, the finished surface shall be protected for curing one of the following ways:
- A. Ponding of water on the surface or continuous sprinkling.
 - B. Application of absorptive mats such as 3-inch of cured hay, clean straw or fabric kept continuously wet.
 - C. Application of two inches of moist earth or sand uniformly distributed on the surface and kept saturated by spraying with water.
 - D. Application of light colored waterproof plastic materials, conforming to "Specifications for Waterproof Sheet Materials for Curing Concrete" ASTM C-171, placed and maintained in contact with the surface of the concrete.
 - E. Application of a curing compound, conforming to "Specifications for Liquid Membrane - Forming Compounds for Curing Concrete" ASTM C-309. The compound shall be light in color and shall be applied in accordance with the manufacturer's recommendations immediately after any water sheen, which may develop after finishing has disappeared from the concrete surface.



The freshly finished surface shall be protected from hot sun and drying winds until it can be sprinkled or covered as above specified. The concrete surface must not be damaged or pitted by rain. The contractor shall provide and use, when necessary, sufficient tarpaulins to completely cover all sections that have been placed within the preceding twelve (12) hours.

The Contractor shall erect and maintain suitable barriers to protect the finished surface. Any section damaged from traffic or other causes occurring prior to its official acceptance, shall be repaired or replaced by the Contractor at his own expense in a manner satisfactory to the City Engineer.

Defective concrete conditions or surfaces shall be removed, replaced or repaired as directed to meet the approval of the City Engineer.

Minimum Measure

Construction Site Stormwater Runoff Control

Subcategory

Good Housekeeping/Materials Management

Description of Concrete Washout at Construction Sites

Concrete and its ingredients

Concrete is a mixture of cement, water, and aggregate material. Portland cement is made by heating a mixture of limestone and clay containing oxides of calcium, aluminum, silicon and other metals in a kiln and then pulverizing the resulting clinker. The fine aggregate particles are usually sand. Coarse aggregate is generally gravel or crushed stone. When cement is mixed with water, a chemical reaction called hydration occurs, which produces glue that binds the aggregates together to make concrete.

Concrete washout

After concrete is poured at a construction site, the chutes of ready mixed concrete trucks and hoppers of concrete pump trucks must be washed out to remove the remaining concrete before it hardens. Equipment such as wheelbarrows and hand tools also need to be washed down. At the end of each work day, the drums of concrete trucks must be washed out. This is customarily done at the ready mixed batch plants, which are usually off-site facilities, however large or rural construction projects may have on-site batch plants. Cementitious (having the properties of cement) washwater and solids also come from using such construction materials as mortar, plaster, stucco, and grout.

Environmental and Human Health Impacts

Concrete washout water (or washwater) is a slurry containing toxic metals. It's also caustic and corrosive, having a pH near 12. In comparison, Drano liquid drain cleaner has a pH of 13.5. Caustic washwater can harm fish gills and eyes and interfere with reproduction. The safe pH ranges for aquatic life habitats are 6.5 – 9 for freshwater and 6.5 – 8.5 for saltwater.

Construction workers should handle wet concrete and washout water with care because it may cause skin irritation and eye damage. If the washwater is dumped on the ground (Fig. 1), it can run off the construction site to adjoining roads and enter roadside storm drains, which discharge to surface waters such as rivers, lakes, or estuaries. The red arrow in Figure 2 points to a ready mixed truck chute that's being washed out into a roll-off bin, which isn't watertight. Leaking washwater, shown in the foreground, will likely follow similar



Figure 1. Chute washwater being dumped on the ground



Figure 2. Chute washwater leaking from a roll-off bin being used as a washout container

paths to nearby surface waters. Rainfall may cause concrete washout containers that are uncovered to overflow and also transport the washwater to surface waters. Rainwater polluted with concrete washwater can percolate down through the soil and alter the soil chemistry, inhibit plant growth, and contaminate the groundwater. Its high pH can increase the toxicity of other substances in the surface waters and soils. Figures 1 and 2 illustrate the need for better washout management practices.

Best Management Practice Objectives

The best management practice objectives for concrete washout are to (a) collect and retain all the concrete washout water and solids in leak proof containers, so that this caustic material does not reach the soil surface and then migrate to surface waters or into the ground water, and (b) recycle 100 percent of the collected concrete washout water and solids. Another

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objective is to support the diversion of recyclable materials from landfills. Table 1 shows how concrete washout materials can be recycled and reused.

Table 1 – Recycling concrete washout materials

Uses of Recycled Materials	Concrete Washout Materials					
	Washwater	Cement fines ^a	Fine aggregate	Coarse aggregate	Hardened concrete	Unused wet concrete
Reused to washout additional mixer truck chutes or drums	x					
Reused as a ready mixed concrete ingredient	x	x ^b	x	x		
Reused as an ingredient of precast concrete products, e.g., highway barriers, retaining wall blocks, riprap	x	x	x	x		x
Reused as crushed concrete products, e.g., road base or fill		x	x	x	x	
Reused to pave the yards of ready mixed concrete plants						x
Returned back to a surface water, e.g., river, lake, or estuary	x ^c					

- a. Fine particles of cementitious material (e.g., Portland cement, slag cement, fly ash, silica fume)
 b. Recyclable, if allowed by the concrete quality specifications
 c. Treated to reduce the pH and remove metals, so it can be delivered to a municipal wastewater treatment plant, where it is treated further and then returned to a natural surface water

Washwater recycling, treatment, disposal

Washwater from concrete truck chutes, hand mixers, or other equipment can be passed through a system of weirs or filters to remove solids and then be reused to wash down more chutes and equipment at the construction site or as an ingredient for making additional concrete. A three chamber washout filter is shown in Figure 3. The first stage collects the coarse aggregate. The middle stage filters out the small grit and sand. The third stage has an array of tablets that filter out fines and reduces the pH. The filtered washwater is then discharged through a filter sock. An alternative is to pump the washout water out of the washout container (Fig 4) and treat the washwater off site to remove metals and reduce its pH, so it can be delivered to a publicly owned treatment works (POTW), also known as a municipal wastewater treatment plant, which provides additional treatment allowing the washwater to be discharged to a surface water. The POTW should be



Figure 3. Concrete washout filter

contacted to inquire about any pretreatment requirements, i.e., the National Pretreatment Standards for Prohibited Dischargers (40CFR 403.5) before discharging the washwater to the POTW. The washwater can also be retained in the washout container and allowed to evaporate, leaving only the hardened cementitious solids to be recycled.

Solids recycling

The coarse aggregate materials that are washed off concrete truck chutes into a washout container can be either separated by a screen and placed in aggregate bins to be reused at the construction site or returned to the ready mixed plant and washed into a reclaimer (Fig. 5). When washed out into a reclaimer, the fine and course aggregates are separated out and placed in different piles or bins to be reused in making fresh concrete. Reclaimers with settling tanks separate cement fines from the washwater, and these fines can also be used in new concrete unless prohibited by the user's concrete quality specifications.



Figure 5. Ready mixed truck washing out into a reclaimer

Hardened concrete recycling

When the washwater in a construction site concrete washout container has been removed or allowed to evaporate, the hardened concrete that remains can be crushed (Fig. 6) and reused as a construction material. It makes an excellent aggregate for road base and can be used as fill at the



Figure 6. Crushed concrete stockpile and crusher

construction site or delivered to a recycler. Concrete recyclers can be found at municipal solid waste disposal facilities, private recycling plants, or large construction sites.



Figure 4. Vacuuming washwater out of a washout container for treatment and reuse

Wet concrete recycling

Builders often order a little more ready mixed concrete than they actually need, so it is common for concrete trucks to have wet concrete remaining in their drum after a delivery. This unused concrete can be returned to the ready mixed plant and either (1) used to pour precast concrete products (e.g., highway barriers, retaining wall blocks, riprap), (2) used to pave the ready mixed plant's yard, (3) washed into a reclaimer, or (4) dumped on an impervious surface and allowed to harden, so it can be crushed and recycled as aggregate. Unused wet concrete should not be dumped on bare ground to harden at construction sites because this can contribute to ground water and surface water contamination.

Washout Containers

Different types of washout containers are available for collecting, retaining, and recycling the washwater and solids from washing down mixed truck chutes and pump truck hoppers at construction sites.

Chute washout box

A chute washout box is mounted on the back of the ready mixed truck. If the truck has three chutes, the following procedure is used to perform the washout from the top down: (1) after the pour is completed, the driver attaches the extension chute to the washout box, (2) the driver then rotates the main chute over the extension chute (Fig. 7) and washes down the hopper first then the main chute, (3) finally the driver washes down the flop down chute and last the extension chute hanging on the box. All washwater and solids are captured in the box.



Figure 7. Chute washout box

After the wash down, washwater and solids are returned to the ready mixed plant for recycling. A filter basket near the top of the washout box separates out the coarse aggregates so they can be placed in a bin for reuse either at the construction site or back at the cement plant.

Chute washout bucket and pump

After delivering ready mixed concrete and scraping the last of the customer's concrete down the chute, the driver hangs a washout bucket shown in Figure 8 (see red arrow) on the end of the truck's chute and secures the hose to insure no leaks. The

driver then washes down the chute into the bucket to remove any cementitious material before it hardens. After washing out the chute, the driver pumps (yellow arrow points to the pump) the washwater, sand, and other fine solids from the bucket up into the truck's drum to be returned to the ready mixed plant, where it can be washed into a reclaimer. A removable screen at the bottom of the washout bucket prevents coarse aggregate from entering the pump. This coarse aggregate can also be returned to the plant and added to the coarse aggregate pile to be reused. All the materials are recycled.



Figure 8. Chute washout bucket and pump

Hay bale and plastic washout pit

A washout pit made with hay bales and a plastic lining is shown in Figure 9. Such pits can be dug into the ground or built above grade. The plastic lining should be free of tears or holes that would allow the washwater to escape (Fig. 10). After the pit is used to wash down the chutes of multiple ready mixed trucks and the washwater has evaporated or has been vacuumed off, the remaining hardened solids can be broken up and removed from the pit. This process may damage the hay bales and plastic lining. If damage occurs, the pit will need to be repaired and relined with new plastic. When the hardened solids are removed, they may be bound up with the plastic lining and have to be sent to a landfill, rather than recycled. Recyclers usually accept only unmixed material. If the pit is going to be emptied and repaired more than a few times, the hay bales and plastic will be generating additional solid waste. Ready mixed concrete



Figure 9. Hay bale and plastic washout pit



Figure 10. Leaking washout pit that has not been well maintained

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trucks can use hay bale washout pits, but concrete pump trucks have a low hanging hopper in the back that may prevent their being washed out into bale-lined pits.

Vinyl washout container



Figure 11. Vinyl washout pit with filter bag

The vinyl washout container (Fig. 11) is portable, reusable, and easier to install than a hay bale washout pit. The biodegradable filter bag (Fig. 12) assists in

extracting the concrete solids and prolongs the life of the vinyl container. When the bag is lifted, the water is filtered out and the remaining concrete solids and the bag can be disposed of together in a landfill, or the hardened concrete can be delivered to a recycler. After the solids have been removed several times and the container is full of washwater, the washwater can be allowed to evaporate, so the container can be reused. The washwater can be removed more quickly by placing another filter bag in the container and spreading water gelling granules evenly across the water. In about five minutes, the water in the filter bag will turn into a gel that can be removed with the bag. Then the gel and filter bag can be disposed of together.



Figure 12. Extracting the concrete solids or gelled washwater

Metal washout container

The metal roll-off bin (Fig. 13) is designed to securely contain concrete washwater and solids and is portable and reusable. It also has a ramp that allows concrete pump trucks to wash out their hoppers (Fig. 14). Roll-off providers offer recycling services, such as, picking up the roll-off bins after the washwater has evaporated and the solids have hardened, replacing them with empty washout bins, and delivering the hardened concrete to a recycler (Fig. 15), rather than a landfill. Some providers will vacuum off the washwater, treat it to remove metals and reduce the pH, deliver it to a wastewater treatment plant for additional treatment and



Figure 13. Mixer truck being washed out into a roll-off bin

subsequent discharge to a surface water. Everything is recycled or treated sufficiently to be returned to a natural surface water.



Figure 14. Pump truck using the ramp to wash out into a roll-off bin



Figure 15. Delivering hardened Concrete to a recycler

Another metal, portable, washout container, which has a rain cover to prevent overflowing, is shown in Figure 16. It is accompanied by an onsite washwater treatment unit, which reduces the pH and uses a forced weir tank system to remove the coarse aggregate, fine aggregate, and cement fines. The washwater can then be reused at the construction site to wash out other mixer truck chutes and equipment. The solids are allowed to harden together and can be taken to a concrete recycler (Fig. 17) to be crushed and used as road base or aggregate for making precast products, such as retaining wall blocks. All materials are recycled.



Figure 16. Washout container with a rain cover and onsite washwater treatment



Figure 17. Delivering hardened concrete to a recycler

Siting Washout Facilities

Concrete washout facilities, such as washout pits and vinyl or metal washout containers, should be placed in locations that provide convenient access to concrete trucks, preferably near the area where concrete is being poured. However they

should not be placed within 50 feet of storm drains, open ditches, or waterbodies. Appropriate gravel or rock should cover approaches to concrete washout facilities when they are located on undeveloped property. On large sites with extensive concrete work, washouts should be placed at multiple locations for ease of use by ready mixed truck drivers. If the washout facility is not within view from the pour location, signage will be needed to direct the truck drivers.

Operating and Inspecting Washout Facilities

Concrete washout facilities should be inspected daily and after heavy rains to check for leaks, identify any plastic linings and sidewalls have been damaged by construction activities, and determine whether they have been filled to over 75 percent capacity. When the washout container is filled to over 75 percent of its capacity, the washwater should be vacuumed off or allowed to evaporate to avoid overflows. Then when the remaining cementitious solids have hardened, they should be removed and recycled. Damages to the container should be repaired promptly. Before heavy rains, the washout container's liquid level should be lowered or the container should be covered to avoid an overflow during the rain storm.

Educating Concrete Subcontractors

The construction site superintendent should make ready mixed truck drivers aware of washout facility locations and be watchful for improper dumping of cementitious material. In addition, concrete washout requirements should be included in contracts with concrete delivery companies.

Reference

NRMCA 2009. *Environmental Management in the Ready Mixed Concrete Industry*. 2PEMRM. 1st edition. By Gary M. Mullins. Silver Springs, MD: National Ready Mixed Concrete Association.

Websites and Videos

Construction Materials Recycling Association
www.concreterecycling.org

National Ready Mixed Concrete Association
www.nrmca.org

National Ready Mixed Concrete Research and Education Foundation
www.rmc-foundation.org

Additional information and videos on concrete washout containers and systems can be found by a web search for "concrete washout."

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