Best Practice

Title: Slurry
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Introduction

The collection, handling, disposal and recycling of slurry/water from concrete grinding, sawing and drilling applications remain important issues for the industry. A growing number of cities, counties, states, provinces and countries are developing regulations as a means to enforce safe, environmentally-friendly methods for slurry handling. Since there is no single standard to deal with water and concrete slurry, it is important to take proactive efforts with regard to the tools, techniques and procedures used in this segment of the industry.

Usually the slurry generated by cutting or coring concrete is the responsibility of the owner, therefore the slurry collection, handling and disposal should be addressed in the scope of work. This best practice document can also aid the owner in refining the scope of work for slurry management to include realistic and practical expectations.

The main purpose of this Best Practice document is to compile a database of tools and ideas for dealing with concrete slurry and to address industry and environmental concerns. With the aid of contractors reviewing and contributing to this database, CSDA can gain a better understanding of the issues relating to water usage, runoff and slurry. With this understanding, the association will be able to use the right tools and techniques to improve slurry collection, handling, recycling and proper disposal.

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1. Administration and Planning

A. Addressing Legal Requirements and Regulations

1. Understand who are the controlling legal authorities and applicable regulations/laws
2. Follow a Storm Water Pollution Prevention Plan (SWPPP), as applicable. The National Pollutant Discharge Elimination System (NPDES) standard issued by the Environmental Protection Agency (EPA) sets stringent requirements on disposing of potential pollutants in land and waterways.
3. Address Hazardous Material (HAZMAT) restrictions. Slurry is a liquid with potentially high pH values. Many landfills are Solid Waste Landfills that impose additional requirements on handling liquid waste.

4. Use wet grinding, cutting or coring techniques to minimize respirable crystalline silica (RCS) dust exposure to meet OSHA standard for Construction Industry RCS Exposure 29-CFR 1926.1153.
    a. OSHA Hierarchy- (1) Remove the Hazard, (2) Engineered Controls, (3) Administrative Controls, and (4) PPE.
    b. Must have a Competent Person (CP) and Written Exposure Control Plan.
    c. Three Options: Table-1, performance option and scheduled monitoring.

B. Pre-Bid Considerations
    1. What does the general contractor and/or owner require? Are the requirements clearly identified in the contract?
    2. What regulations are in force for the project?
    3. Who is responsible for the collection, handling and disposal or slurry?
    4. Is there an approved dumpsite? Where is it located in proximity to the work site? What are the hours and fees? Are there any special handling requirements for the dumpsite?
    5. Is there water available on the jobsite?
    6. Can the slurry be treated and the water recycled for use in the project? Can the slurry/water 'run off'?

C. Pre-Job Planning
    1. Is there full agreement with owner/general contractor on slurry control?
    2. Do the operators understand all the requirements?
    3. Will the 'slurry controls' interfere with other work? jobsite access? Safety of workers?
    4. Set up the collection system prior to performing any work that will generate slurry.

2. Slurry Generation, the Need/Value of Slurry, Minimization and Avoidance of Slurry

A. Water/slurry is sometimes used to keep metal bonded diamonds 'open' by providing an abrasive paste to wear away the metal bond to expose new sharp diamond grinding points.

B. Water is sometimes used for cooling. The abrasive grinding action can generate a significant amount of heat capable of doing damage to the diamonds or bond, thermal damage to the blade cores as a loss of tension or core cracking, and/or damage to the weld or solder/braze that holds the segments on the core, barrel or plate causing it to melt or crack. In addition, excessive heat on some surface coatings and sealers can melt or burn, coating the diamond tool and preventing it from grinding or polishing the slab surface.

C. Water can be used to control dust generation to minimize RCS exposure. Sometimes water can be minimized if applied as a mist (misting may have physical limitations on where and how it is used, depending on the volume of dust generated, the misting point/area and the surface tension of the water/mist). Sometimes the amount of water can be minimized in grinding, honing and polishing steps to generate a thicker slurry paste by using less water. This paste is still able to control the RCS exposure and excessive heat generated by the tooling.

D. Water used on the jobsite and the slurry generated can sometimes create other hazards that need to be considered and addressed. These hazards include slippery surfaces that create a slip hazard, water wicking potentially damaging areas below the work face (when working on an elevated slab, for example), slurry runoff staining areas on or around the structure that the slurry is generated from, and water/slurry freezing in cold weather.

E. Water use on some jobs can delay the application of an adhesive, coating or joint fill material until the surface has dried completely. This can add additional steps in order to allow the surface to dry and could require additional cleaning. This is important for areas that have a film or pool of dried slurry to allow for the appropriate bond from the adhesive, coating or fill material.

3. Tools and Techniques for the Collection, Handling, Transportation and Storage of Slurry

A. Determine the 'low point' of the specific work area to potentially let gravity assist the flow of the water/slurry and minimize the use of pumps.
B. Restrict access to the worksite as needed to minimize hazards associated with the water/slurry and/or RCS exposure. Clearly post with appropriate hazard signs.
C. Use polyurethane sheets or tarps to protect surfaces from slurry splash or spray.
D. Collection and control – wet/slurry vacuums, shrouds/slurry collection rings, wands, squeegees, troughs/socks/bags/'pig' to direct flow and pumps (dewatering, semi-trash or trash pumps).
E. For small to mid-sized vacuums in rough terrain, the slurry could possibly splash past the ball float and damage the vacuum motor. The size of the vacuum tank could be a limitation on the weight of a full vacuum. Slurry can sometimes foam up and the bubbles or slurry mist (both may be abrasive) can get past the ball float and damage the vacuum motors. Some slurry vacuums offer nylon or other filters to protect the motors to minimize the damage from abrasive mist/foam. Sometimes a surfactant can be added to the vacuum to minimize the foaming. Another alternative is using a superabsorbent polymer in the vacuum drum that can solidify/gel the slurry as it is being collected to minimize sloshing and splashing of the slurry/water in the drum.
F. Thick paste slurries can be diluted with water to help the vacuum suck up the liquid.
G. Drum vacuum heads using standard 55-gallon drums are very common to minimize the number of times the slurry is transferred (simply move the vacuum head to another drum). The drums can be used to help facilitate the settling of the slurry to recycle the water and later handling the sludge.
H. Large vacuum trucks and other mobile devices are available to handle large amounts of slurry on road jobs. Some large systems utilize centrifuges to separate out the solids from the water in the slurry so the water can be treated for disposal or recycled.
I. Flocculants can be used to accelerate the settling time in recycling the water by quickly separating the solids. Flocculants require some level of agitation of the slurry to mix in the floc to properly drop out the solids from the slurry. If the slurry is thick and pasty, additional water can be added to allow the floc to mix thoroughly in the slurry and to help drop more of the solids out of the slurry. It seems counter intuitive, but the additional water will separate back out and pull out more water from the original slurry, potentially creating an even more concentrated slurry. Air bubblers can be used to stir in the floc in lieu of mixers.
J. Recycling slurry water. The water might have a high Ph, which could potentially damage equipment so it might be worth monitoring the pH level and adding an acid to lower the pH. Note high pH alkaline solutions can be irritating to the skin. Typically a 9-1/2 pH is the threshold for a ground dump and typically 12.5 or more is considered hazardous. In 55-gallon drums, a large drill mixer can be used to mix in the floc and as solids sink the water can be transferred (or decanted) out using a small dewatering pump or a wet vacuum with a wand. On larger tanks or truck vacuums, a cascading system of weirs can be used to get a larger volume of clean water available faster. The weir system acts as a series of individual settling tanks. Only the cleanest of the water out of the slurry in each tank is able to flow over the weir into the next tank in the series.

K. Storage of slurry. The slurry can be stored in pits, tanks, drums or other structures using liners. Be certain the structure can handle the weight of the slurry. Have a plan for handling potential leaks. 55-gallon drums are very common and the water can be decanted off after settling. Drum dollies help move the barrels. Drums can be strapped to a pallet so a forklift or pallet jack can be used to move them around the jobsite.
L. Filter presses can be used to process slurry to squeeze out the clean water and leave cakes/bricks for disposal of the solids from the slurry. The water can be recycled. Some filter presses work more efficiently when the slurry is pretreated with a flocculent. The floc will increase the particle size in the slurry so the small openings in the filter press are more open and less susceptible to being plugged up.
M. Autoscrubbers, mops and pressure washers can be used to clean up a jobsite. Some chemicals are available to help in the cleanup of dried concrete or dried slurry by softening the cement to allow it to release the bond to the surface so it can be easily cleaned off the surface.
N. For wire sawing, gutters around wire cut lines can reduce the water needs and ease the means of properly wetting the wire, along with controlling the spray and making collection more efficient.
O. The location of nozzles to direct the application of water can potentially reduce the amount of water needed and thus reduce the amount of slurry generated. On some high speed blades or high speed burnishers, use a center feed water system to deliver water at the flange. The centripetal acceleration of the tool pulls the water across the face of the tool to ultimately reduce the amount of water needed to still keep the complete surface area of the tool wet.
P. Surfactants will make the water ‘wetter’ and reduce the surface tension on the water droplets. This makes the water more effective at dust control and can sometimes reduce the amount of water needed.
Q. Spoil areas may be provided on some jobsites by the owner for temporary storage.
R. Regardless of how the slurry is collected or stored on the jobsite, plan for where and how the slurry will be properly disposed of.
S. Hauling slurry. If you decant to water prior to moving, you will be hauling less weight and volume. The liquid’s center of gravity shifts as it moved during transport. In large tanks or trucks, a large shift in the center of gravity can be potentially dangerous. One technique to handle sloshing liquid is to put baffles in the tank.
T. Vacuum truck services are available in many areas. For some jobs it might be worth considering subcontracting a waste hauler/super sucker truck.
U. Some concrete batch plants will accept slurry.
V. Slurry can be solidified and treated as solid waste. Large dewatering/filter bags in a tank with a drain can allow the water to slowly drain out of the slurry. The solids remain in the bag for disposal. Settling pits or tanks can allow solids in the slurry to settle out and the water can evaporate or be decanted. Cascading tanks or weirs can be used to allow the solids to settle out of the water (used more in dynamic water flow scenarios whereby water is being continually recirculated). A filter press can be used to press out the water from the slurry and create a solid cake/brick. Flocculants can speed up the process of separating solids in slurry. Super Absorbent Polymers (SAPs) can be used to absorb the water and dry out slurry. The SAPs have been shown to pass a paint filter test (PFT) method 9095B, which is a key consideration for disposing in a solid waste landfill. The alkalinity of slurry and some dissolved elements in the slurry can reduce the effectiveness of the SAPs, thus requiring more than a theoretical ideal amount to be used, or the slurry can be pretreated to make it more efficient with the SAP.

4. Testimonials

A. CSDA contractors use slurry collection as an additional revenue stream and some operate vacuum trucks. These contractors charge a percentage of the total job costs to dump at a controlled location if one is not readily available on the jobsite.
B. Other contractors are located next to concrete batch plants and form agreements to dump all slurry at the batch plant.
C. One CSDA member subcontracts large slurry jobs out to a specialist. Caution should be exercised with this option. Always check the hauler's license to confirm the legitimacy of the business, because any lawsuits will name all parties involved.
D. Some areas have water shortages (usually during certain times of the year) and water recycling can be a job specific requirement.
E. One member uses pneumatic misters to cool diamond wire when cutting metal structures. Very small amounts of water are drawn into the mister with a thin plastic tube.
F. One member uses silt curtains in the water surrounding the cutting area to control the movement of solids.

5. Testing

1. pH testing.
2. TCLP Testing
3. Air Monitoring
4. Paint Filter Test (PFT) 40CFR264.314 Special requirement for bulk and containerized liquids. (a) The Placement of bulk or non-containerized liquid hazardous waste of hazardous waste containing free liquids (whether or not sorbents have been added) in any landfill is prohibited. (b) To demonstrate the absence of presence of free liquids in either a containerized or bulk waste, the following test must be used: Method 9095B (Paint Filter Liquids Test) as described in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication SW-846, as incorporated by reference in § 260.11 of this chapter…..

6. Resources

A. OSHA standard for Construction Industry RCS Exposure 29-CFR 1926.1153
B. Concrete Slurry Analysis, an Engineering Report. CSDA offers a 62-page report entitled Chemical Characterization of Concrete Slurry Samples and Development of Guidelines for Slurry Management from an independent engineering firm. The study was conducted to initiate a compilation of baseline criteria to assist in the establishment of guidelines for management of slurry as a hazardous or non-hazardous waste material. For information or to order the document, call CSDA at 727-577-5004
C. OSHA Small Entity Compliance Guide for the Respirable Crystalline Silica Standard for Construction, OSHA 3902-11 2016.
D. The Concrete Sawing and Drilling Association, **www.csda.org/silica**
E. OSHA, **www.osha.gov/silica/**
F. Silica Safe, **www.silica-safe.org**
G. Construction Industry Safety Coalition, **www.buildingsafely.org**