Christina Schwerdtfeger

It appears that the Protectiveness Review (PR) has omitted consideration of hexavalent chromium, a known carcinogen and toxic air contaminant (TAC), which has Effects Screening Levels (ESLs) that were established by TCEQ in 2014. My concern is that the PR is incomplete and has underestimated the risk associated with toxic air contaminants (TACs) from CBPs. See attached letter with technical details.

407 Old Blue Mountain Ln
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June 9, 2023

Gwen Ricco, MC 205
Office of Legal Services
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Subject: Non-Rule Project No. 2022-033-OTH-NR: Omission of Cr(VI) from PR

Ms. Ricco,

I am providing written comments to TCEQ about the proposed revisions to the rule for Standard Permits for Concrete Batch Plants (CBPs).

My name is Christina Schwerdtfeger. I am a retired environmental professional with 34 years of experience and a PhD in chemistry. During my career, I performed hundreds of audits of industrial facilities to assess their compliance with environmental regulations and determine the effectiveness of their environmental management systems. I was a certified auditor for ISO 14001 and specialized in air quality permitting, operational controls, record-keeping and training.

PURPOSE

Based on my professional experience, it appears that the Protectiveness Review (PR) has omitted consideration of hexavalent chromium, a known carcinogen and toxic air contaminant (TAC), which has Effects Screening Levels (ESLs) that were established by TCEQ in 2014.

My concern is that the PR is incomplete and has underestimated the risk associated with toxic air contaminants (TACs) from CBPs.

PRESENCE OF HEXAVALENT CHROMIUM AT CBPs

Hexavalent chromium is a known contaminant in bulk materials used at CBPs and appears in fugitive dust emissions. Because of the substantial health risks (acute and chronic), other regulatory agencies have previously evaluated and quantified the levels of this TAC:

a) South Coast Air Quality Management District (SCAQMD)
SCAQMD performed "Hexavalent Chromium Bulk Material Analysis" in 2008 to quantify the concentration of hexavalent chromium in starting materials and off-site fugitive dust samples from eight CBPs.[1]

SCAQMD found that concentrations in bulk materials (i.e., sand, cement, fly ash, spillage piles, etc.) ranged from <5 to 14,000 parts per billion (ppb) of hexavalent chromium.

[1] Hexavalent Chromium Bulk Material Analysis (SCAQMD, 2008) accessed at: http://www.aqmd.gov/docs/default-source/air-quality/special-monitoring-and-emissions-studies/hexavalent-chromium-study/hexavalent-chromium-bulk-material-analysis.pdf

Facility Owner	Hexavalent Chromium Concentration (ppb)		
	Concrete	Sand / Gravel (Aggregate)	Fly Ash
Angelus Block	3,050	<4 - 2000	
Rancho Ready Mix	14,000	10	
Alpha Materials	2,550	<5	1,250
Robertson Ready Mix	8,170	<10	9,250
Engelauf	1,740	2,100	
Abandoned Gravel Operation		40	
Oglebay Norton		40	
Inland Concrete Products	8,370	20	
Average (ppb)	6,313	403	5,250
Average (ppm)	6.3	0.4	5.2

In addition, SCAQMD collected twenty-three (23) samples from nearby residences to assess hexavalent chromium concentrations in off-site fugitive dust. Results ranged from 200 to 14,000 ppb.

b) San Diego Air Pollution Control District (SDAPCD)
SDAPCD documented hexavalent chromium concentrations in several CBP operations in 1993 and updated its guidance in 2023:[2]

Metal	Range (ppm)	Cement Dust	Fly Ash	Baghouse (Plant)
Hexavalent Chromium	3 to 80	5	3	2

These values are in the same range as those identified by SCAQMD.

DISCLOSURE OF HEXAVALENT CHROMIUM IN SDSs

Since the studies from SCAQMD and SDAPCD were completed over 15 years ago, it was decided to look for more current information. The majority of suppliers of cement, flyash and aggregate do not quantify the hexavalent chromium content of their products in Safety Data Sheets (SDSs). However, a few recent SDSs were found which provide insight.

a) SDSs from Ash Grove Portland Cement

Ash Grove is one of the few manufacturers that discloses the hexavalent chromium content in SDSs for two of its products:

[2] Concrete Batch Plant Operations (SDAPCD, Initiated in 1993 and update on February 3, 2023) accessed at: https://www.sdapcd.org/content/dam/sdapcd/documents/permits/emissions-calculation/mineral-products-industry-concrete-batch-plant/APCD-concrete.pdf

Product Name from Ash Grove	Product Type	Hexavalent Chromium Content (ppm)
Portland Cement[3]	Cement	0 - 120
Duracem® F[4]	Fly Ash	20-40

These values are substantially higher than the concentrations measured by SCAQMD and SDAPCD over 15 years ago. Ash Grove has a manufacturing facility in Midlothian, TX.

b) SDS for Portland Cement from Martin Marietta

Martin Marietta has multiple facilities in Texas and sells Portland cement. Martin Marietta makes the following disclosures in its SDS for Portland Cement:[5]

Portland Cement contains trace amounts of hexavalent chromium [Cr(VI)] and certain chromium compounds which are listed on the NTP and IARC lists of carcinogens. The total amounts of chromium and chromium compounds in Portland Cement are typically less than 0.003% and hexavalent chromium less than 0.001%.

NOTE: The concentration of hexavalent chromium (<0.001%) is equivalent to <10 ppm. This value is in the range of previous studies by SCAQMD and SDAPCD.

TCEQ's ESL for Hexavalent Chromium

TCEQ performed its own toxicology review and adopted short-term and long-term ESLs for hexavalent chromium in 2014.[6] Hexavalent chromium has substantial acute and chronic effects:

- Acute inhalation exposure to hexavalent chromium may cause irritation and damage to the nose, throat and lungs. Well established link to lung cancer.
- Dermal exposure to hexavalent chromium may also cause allergic contact dermatitis and skin sensitization.
- Hexavalent chromium has been classified by International Agency for Research on Cancer (IARC) as Group 1, carcinogenic to humans.

ESLs are chemical-specific air concentrations set to protect human health and welfare. TCEQ uses the ESLs in its air permitting program to determine appropriate levels of risk.

Recommendation: TCEQ needs to assess hexavalent chromium emissions from CBPs against the ESLs established in 2014 in order to completely assess the risk.

[3] Safety Data Sheet for Portland Cement (Ash Grove, Jun 2021) accessed at: https://static1.squarespace.com/static/5f39b10071a9b67f78f74a82/t/60facf80ce03864274bd6d4d/1627049858296/Portland+Cement+EN+OSHA+GHS+SDS+2021-06-22+%28revised%29.pdf

[4] Safety Data Sheet for DuracemF (Ash Grove, Jun 2021) accessed at: https://static1.squarespace.com/static/5f39b10071a9b67f78f74a82/t/60fad3b008bf7f1ae137dced/1627050929543/Duracem%C2%AE+F+EN+OSHA+GHS+SDS+2021-06-22+%28revised%29.pdf

[5] Safety Data Sheet for Portland Cement (Martin Marietta, June 2018) accessed at: https://mcdn.martinmarietta.com/assets/safety-data-sheets/portland-cement-sds-june-2018_b.pdf

[6] Hexavalent Chromium (Particulate Compounds) (TCEQ Toxicology Division, August 4, 2014) accessed at: https://www.tceq.texas.gov/downloads/toxicology/dsd/final/hexavalent_chromium.pdf

PROTECTIVENESS REVIEWS

In TCEQ's original Protectiveness Review (PR) completed in 2012 and the revised version completed in 2023[7], TCEQ used nickel as a proxy for nine toxic metals in its air dispersion modeling and risk assessment.[8] The following rationale was provided by TCEQ:[9]

> **"The commission evaluated nickel since it has the highest short-term emission rate and lowest effects screening level (ESL) out of all trace metals."**

This approach was appropriate for the original PR completed in 2012 since an ESL had not yet been established for hexavalent chromium.

Metal	1-hr ESL (ug/m3)	Annual ESL (ug/m3)	Year ESL Adopted by TCEQ
Hexavalent Chromium	0.39	0.0043	2014
Nickel	0.33	0.059	2011
Chromium (III) Compounds	3.6	0.041	2009

If this rationale is still used by TCEQ in 2023, nickel is no longer an appropriate proxy for all trace toxic metals because:

- Annual ESL for Hexavalent Chromium is 13.7x lower compared to nickel; and
- 1-hr ESL for Hex Chrome is 18% higher compared to nickel.

Recommendation: TCEQ cannot ignore hexavalent chromium emissions in the revised PR. The risk for hexavalent chromium must be assessed using the ESLs that TCEQ established in 2014.

USE OF SOURCE-SPECIFIC DATA OUTSIDE OF AP-42

It is agreed that AP-42 Table 11.12-6 does not include emission factors for hexavalent chromium or its weight fraction in cement or flyash.[10] However, this omission does not relieve TCEQ from the obligation of estimating emissions from hexavalent chromium. EPA describes the limitations of the emission factors in AP-42[11] and when source-specific emission tests can be used:

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[7] Concrete Batch Plant Protectiveness Review (TCEQ, Feb 24, 2023) accessed at: https://www.tceq.texas.gov/downloads/permitting/air/nsr/nsr-stakeholders/22033-oth-nr-cbpsp23-4-modelingreport.pdf

[8] The nine toxic metals evaluated by TCEQ included: arsenic, beryllium, cadmium, total chromium, lead, manganese, nickel, total phosphorus and selenium per AP-42 Table 11.12-8.

[9] Quotation taken from page 9 of Amendments to the Concrete Batch Plants Air Quality Standard Permit, Summary Document Draft Work Product (TCEQ, 2012) accessed at: https://www.tceq.texas.gov/assets/public/permitting/air/NewSourceReview/Mechanical/cpbpermitv38.pdf

[10] AP-42: Compilation of Air Emissions Factors, Section 11.12 Concrete Batching (USEPA, June 2006) accessed at: https://www.epa.gov/sites/default/files/2020-10/documents/c11s12.pdf

[11] AP-42: Compilation of Air Emissions Factors Volume I, Introduction, page 1 (EPA, January 1995) accessed at: https://www.epa.gov/sites/default/files/2020-09/documents/c00s00.pdf

Data from source-specific emission tests or continuous emission monitors are usually preferred for estimating a source's emissions because those data provide the best representation of the tested source's emissions. However, test data from individual sources are not always available and, even then, they may not reflect the variability of actual emissions over time. Thus, emission factors are frequently the best or only method available for estimating emissions, in spite of their limitations.

Recommendation: TCEQ should use the compositional and emissions data from other regulatory agencies. The source-specific data from SCAQMD and SDAPCD were collected from multiple CBPs and reflect the variability of actual emissions.

ESTIMATING HEXAVALENT CHROMIUM EMISSIONS

TCEQ can and should use emission factors and the weight fractions for hexavalent chromium which have been developed for CBP operations and are currently being used by another regulatory agency, San Joaquin Valley Air Pollution Control District (SJVAPCD). Their spreadsheet compiled the concentration of hexavalent chromium in cement and flyash in September 2016[12] to provide specific numeric values for SJVAPCD's permitting program.

Substances	Weight Fraction[13]			
	Aggregate	Sand	Fly Ash	Cement
Hexavalent Chromium	1.40E-06	0.00E+00	3.00E-06	5.00E-06
Nickel	2.80E-05	0.00E+00	1.20E-05	2.50E-05

The weight fraction data from SJVAPCD in the table below was converted to ppm to compare against values listed previously from SCAQMD and SDAPCD.

Substances	Concentration (ppm)			
	Aggregate	Sand	Fly Ash	Cement
Hexavalent Chromium	1.4	0	3	5
Nickel	28	0	12	25

If TCEQ wishes to continue using nickel as a proxy for all trace metals, the ratio of hexavalent chromium to nickel can be used to estimate emissions for hexavalent chromium per the table below:

[12] Cement PM10 – Spreadsheet for Calculating PM10 Emission from CBPs (SJVAPCD, Sept 2016) accessed at: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiTjd_Oka3_AhWkmGoFHWUcBVYQFnoECAwQAQ&url=https%3A%2F%2Fwww.valleyair.org%2Fbusind%2Fpto%2Femission_factors%2FCriteria%2FToxics%2FAsphalt%2520Concrete%2520Cement%2520Fly%2520Ash%2520Minerals%2FConcrete%2520Batch%2520Plant.xls&usg=AOvVaw19NpxSDveJRMlYyMaGYPYz

[13] The emission factors for aggregate are from the table, "DEFAULT VALUES - TRACE METAL CONCENTRATIONS" in the November 1998 San Diego Air Pollution Control District document, Aggregate Crushing Operations.

Ratio of Cr(VI) to Ni in Each Component of Concrete			
Aggregate	**Sand**	**Fly Ash**	**Cement**
0.05	NA	0.25	0.20

Flyash and cement contain the highest concentrations of hexavalent chromium relative to nickel.

Recommendation: TCEQ can and should estimate and include the concentration of Hexavalent Chromium in the emission estimate and risk assessment for CBPs. Other states have relevant and recent data which can be used to expand TCEQ's current PR where nickel is used as a proxy for all trace metals.

RESPIRABLE SILICA ESTIMATES

TCEQ described the following basis for estimating respirable silica:

> *Crystalline silica emission rates are based on a respirable silica content in cement of 1% and a respirable silica content in flyash of 7% for an overall percentage of 1.66% using a cement to flyash ratio of 89 parts of cement to 11 parts of flyash in concrete. The source of the silica content percentages is from a review of various Safety Data Sheets (SDS) for cement and flyash.*

Recommendation: For transparency purposes, TCEQ should release the SDSs that were used in its calculation so the average values can be confirmed. SDSs are publically available and are not subject to confidentiality requirements.

CONCLUSION

Thank you for the opportunity to provide TCEQ with comments on this important topic. The PR for CBP operations can and should be improved to ensure that it is complete and includes an appropriate risk determination for hexavalent chromium.

Sincerely,

Christina Schwerdtfeger

Christina Schwerdtfeger, PhD
Retired Environmental Professional