F105 - 308, Flux Core Arc Welding (FCAW) Welding Process Emission Factors

CALCULATION METHODS

Annual Emissions: Ea = Ua x EF (lbs/lb rod) x (1-e)
Hourly Emissions: Eh = Uh x EF (lbs/lb rod) x (1-e)

Ea = Annual emissions of each listed toxic air contaminant per welding rod, (lbs/year)
Eh = Maximum hourly emissions of each listed toxic air contaminant per welding rod, (lbs/hour)
Ua = Annual usage of each welding rod, (lbs/year)
Uh = Maximum hourly usage of each welding rod, (lbs/hour)
EF = Emission Factor (lbs/lb rod)

Emission Factors:
(1) Complete AP-42 information from Final Section 12.19 (1/95): EF = Trace Metal EF (Table 12.19-2)
(2) Incomplete AP-42 Final Section 12.19 (1/95): EF = FGR (Table 12.19-1) x FCF x Ci (MSDS)
(3) No AP-42 information but known welding process: EF = FGR (District Default) x FCF x Ci (MSDS)
(4) District Study or AWMA information: EF = Trace Metal EF
(5) Incomplete District Study information: EF = FGR (District Study) x FCF x Ci (MSDS)
(*) Incomplete AP-42, District, or AWMA Hexavalent Chromium information: EF = Cr (Total Chromium in Fumes) EF x HCR

NOTES:

- Emission factors assume "uncontrolled" releases. Emission control methods and efficiencies reported are be applied within the emission calculations.
- Fume generation rates (FGR) are based on the following:
  - EPA AP-42 Final Section 12.19 (1/95) Table 12.19-1 (PM10 EF)
  - ARB, Richard Bode: 0.01 (GMAW, TIG, MIG), 0.02 (SMAW, FCAW), 0.00005 (SAW), 0.05 (unspecified)
- Fume Correction Factors (FCF) per District engineering discussions with Industry:
  - 0.5464 (GMAW, TIG, MIG), 0.2865 (SMAW, FCAW, SAW), 1.0 (unspecified)
- Trace metal emission factors are based on the following:
  - AWMA Volume 59, 2009, Issue 5 (Pages 619-626) Table 2 and Table 3
  - EPA AP-42 Final Section 12.19 (1/95) Table 12.19-2
  - District engineering estimates using rod compositions (Ci) from MSDS
- Hexavalent chromium conversion rates (HCR) are per District engineering reviews of studies on welding:
  - 0.05 (GMAW, TIG, MIG), 0.55 (SMAW), 0.0005 (SAW), 0.10 (FCAW, unspecified)

POLLUTANT	DISTRICT EMISSION FACTORS (lbs/lb rod)	REFERENCE DOCUMENT	FACTOR	(UNITS)	COMMENTS
NOX					
CO					
SOX					
TOG					
VOC					
TSP	9.10E-03				Assume PM10 = TSP
PM10	9.10E-03	EPA Table 12.19-1 (1/95) AP-42	9.1	lb/1000 lbs rod	Assume PM10 = Fume Generation Rate (FGR)
Al					
Al2O3	7.82E-05	Historical Welding SDS - Harris 308LT	3	%	District Procedure (2) EF = FGR x FCF x Ci
Be					
Cd					

Co					
Cr	7.82E-04	Historical Welding SDS - Harris 308LT	30	%	District Procedure (2) EF = FGR x FCF x Ci
Cr(VI)	7.82E-05	AWMA Page 623	10	%	District Procedure (*) EF = Cr EF x HCR
Cu					
Mn	1.04E-04	Historical Welding SDS - Harris 308LT	4	%	District Procedure (2) EF = FGR x FCF x Ci
Ni	3.91E-04	Historical Welding SDS - Harris 308LT	15	%	District Procedure (2) EF = FGR x FCF x Ci
P					
Pb					
Crystalline Silica					
V					
Zn					

REFERENCES:

EPA AP-42 Chapter 12.19: https://www.epa.gov/sites/production/files/2020-11/documents/c12s19.pdf

AWMA: https://www.tandfonline.com/doi/abs/10.3155/1047-3289.59.5.619

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