Breakpoint Chlorination Dose for Ammonia

Chlorine dose to pass breakpoint for a given ammonia nitrogen, with ammonia oxidised to nitrogen gas or to nitrate, plus other demand and the free residual wanted.

Input parameters

Unit system: SI

Parameter	Value	Unit
Ammonia nitrogen	0.40000	mg/L
Ammonia end product	Nitrogen gas (3 HOCl per 2 NH3)	
Other chlorine demand (iron, manganese, organics)	0.80000	mg/L
Free chlorine residual wanted	0.50000	mg/L
Flow	2,500.0	m³/d

Calculated results

Parameter	Value	Unit
Chlorine to ammonia-N mass ratio	7.5926	
Chlorine to reach breakpoint	3.0371	mg/L
Total chlorine dose	4.3371	mg/L
Chlorine feed	10.843	kg/d

Notes for this case

• Stoichiometric. In practice breakpoint needs about 8–10 mg Cl_2 per mg NH_3-N because some ammonia goes to nitrate and other side products; check by a bench breakpoint curve.

Formula and method

$$2NH_3 + 3HOCl \rightarrow N_2 + 3H_2O + 3HCl, \quad \frac{Cl_2}{N} = \frac{1.5 \times 70.9}{14.007} = 7.6$$

$$NH_3 + 4HOCl \rightarrow NO_3^- + H_2O + H^+ + 4HCl, \quad D = R\,[NH_3 - N] + D_{other} + C_{free}$$

Variables

$NH_3 - N$	Ammonia nitrogen	kg/m³
route	Ammonia end product	-
D_{other}	Other chlorine demand (iron, manganese, organics)	kg/m³
C_{free}	Free chlorine residual wanted	kg/m³
Q	Flow	m³/s
$Cl_2 : N$	Chlorine to ammonia-N mass ratio	-
D_{bp}	Chlorine to reach breakpoint	kg/m³
D	Total chlorine dose	kg/m³
$\dot{m}$	Chlorine feed	kg/s

Method and standards

Stoichiometry of breakpoint chlorination.

Assumptions and limits

- Stoichiometric minimum; pH 7–8.

Report details

Report reference	FCC-8YFS-R1W8 (the same inputs always give the same reference)
Generated	23 November 2026, 17:34 UTC
Calculator	Breakpoint Chlorination Dose for Ammonia
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/environmental/drinking-water/breakpoint-chlorination-dose

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.