COLORADO
Department of Public Health & Environment

Water Quality Control Division
Engineering Section

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Chlorine Disinfection Tank Baffle Factor Projection by Computational Fluid Dynamics (CFD) Modeling
Drinking Water Design Application and Checklist

A. Project and System Information			
System Name			
Project Title			
County			
PWSID			
System Owner			
Representative			
Address			
Email		Phone	
Design Company Name			
Design Engineer		CO License Number	
Address			
Email		Phone	

Signatures of System Representatives			
Role	**Date**	**Typed Name**	**Signature**
The owner is an individual, corporation, partnership, association, state or political subdivision thereof, municipality, or other legal entity.			
Applicant / System Legal Representative			
The system legal representative is the legally responsible agent and decision-making authority for a public water system (e.g. mayor, president of a board, public works director). The Designer or Consulting Engineer is not the legal representative.			

Directions: Prior to submission to the CDPHE (Department), the application must be signed by the Owner and/or a System Legal Representative. I was the engineer/person in responsible charge for (identify portions of work): _____
During the preparation of the design submittal for the above-referenced project. To the best of my knowledge, the design is consistent with the most recent published version of the *Design Criteria for Potable Water Systems*, and that all site-specific deviations requests are listed in this report.

Typed Name of Responsible Party

Date Signed

Signature

License # - if prepared by a P.E.

P.E. Stamp and Signature

Computational Fluid Dynamics (CFD) Submittal Checklist

In accordance with the Regulation 11 and the Design Criteria for Potable Water Systems, the design review process must include a 'complete design' developed in accordance with the Department's CFD Modeling of Chlorine Contactors Technical Guidance document.

Project and System Information			
Project Title			
System Name			
Section Number and Design Report Requirements	**Applicant to fill out**		
	Included/ Addressed in Submittal? Yes/No/NA	**Location in Submittal (Design Report, Plans, Other document)**	
1. Basic Project Information – REQUIRED FOR ALL SUBMITTALS			
2. CFD Model Geometry and Mesh Details			
3. CFD Model Setup Summary			
4. Key figures			
5. Supplemental or Other Pertinent Information			
Plans and Specifications			
1. Available plans such as Design Drawings for new facilities, or as-built drawings, photographs, field measurement and verifications as available for existing facilities.			
2. Other schematics			
3. Specifications			

Section 1: Basic Project Information

A. Project and System Information						
Project Title						
PWSID (Assigned by Division)						
B. Public Water System (PWS) Type	Community (CWS)	☐	Non-Transient, Non-Community (NTNC)	☐	Transient, Non-Community (TNC)	☐
C. Current Primary Source Classification	Surface Water	☐	Groundwater Under Direct Influence (GWUDI)			☐
D. Design Submittal Scope – Provide technical justification for approving baffling factor for disinfection contact volume using CFD modeling.						

E. Estimated Project Schedule and Cost Estimate (if applicable)		**F. Rated Capacity (Calculations in Section 5)**	
Estimated Construction Date		Minimum Flow	
Estimated Completion Date		50^{th} Percentile Flow	
Estimated Project Cost		90^{th} Percentile Flow	

G. Brief project summary and description of chlorine contact basin configuration

Description and scope of proposed project. Please attach a schematic of geometry in the Modeling Report.
(Example text: "A 0.187 MG baffled square contact basin provided chorine contact time for a sample problem. The constant volume tank has inlet and outlet pipes at opposite corners, with 8 baffle walls creating a 9 pass serpentine system. The tank geometry, pipe locations, baffle configuration and dimensions are included in the report.")

Response:

Description of an existing water facility components utilized. Please attach a schematic of the modeled system in Modeling Report. (Example text: "Only the CCB, 10 diameters of influent pipe and 10 diameters of outlet pipe were included in the model, other parts of the plant were outside of the scope. The choline was added well upstream of the facility and fully mixed with a static mixers, therefore not included in the model.")
Response:

Surface Water Treatment Rule (SWTR) Compliance Strategy – Monthly Operating Report Choice (Regulation 11.8 of the *Colorado Primary Drinking Water Regulations Regulation 11*)

☐	Minimum chlorine residual monitoring (used if flowrate is relatively constant, assumes conservative temperature, pH and tank level assumptions. Supplier responsible for monitoring contact tank level. MOR requires reporting chlorine residual concentration to demonstrate disinfection)
☐	Log Inactivation monitoring (allows for variations in pumping rate based on temperature and pH of the water. Supplier responsible for monitoring pH, temperature, contact tank level, chlorine residual concentration and flow rate. Each parameter is reported on the MOR to demonstrate disinfection)

H. Requested Deviation From CFD Modeling of Chlorine Contactors Technical Guidance document

No.	**Guidance Section** (e.g., Section X.X. Convergence Criteria)	**Site Specific Deviation Request** (additional information can be included in the supplemental information)	**Location in Submittal (page)**
1			
2			
3			
4			
5			
6			
7			

Section 2: CFD Model Geometry and Mesh Details (Guidance Document Sections 3.3.3)

Project Title:			
Report Requirements	**Included/ Addressed in Submittal? Yes/No/NA**	**Location in Submittal (Design Report, Plans, Other document)**	**Comments**
Software, Version:			
Geometry Source (Electronic or printed from design drawings, as-builts or field measurements):			
Mesh Type / Strategy (note cell shapes used):			
Mesh Dependency:			
R2 for mesh comparison			
Cell Size Range (note units):			
Cell Count:			
Volume (note units):			
Cell count to volume ratio (note units):			
Average Cell size (note units):			
Maximum aspect Ratio (Aspect ratio is solver dependent, 1:4 or less is generally acceptable in the main flow region):			
Maximum Skewness (Skewness is solver dependent, but generally should be less than 0.6 for hexahedral cells, and under 0.9 for tetrahedral cells, other cell shapes fall in-between.):			
Other metrics:			
General Comments:			

Notes:

Section 3: CFD Model Setup (Guidance Document Section 3.5)

Project Title:			
Report Requirements	**Included/ Addressed in Submittal? Yes/No/NA**	**Location in Submittal (Design Report, Plans, Other document)**	**Comments**
Software, Version:			
Double precisions:			
Discretization scheme:			
Simulation approach (Steady, transient, hybrid):			
Turbulence Model (k-e, k-w, SST or RSM recommended):			
Boundary Conditions:			
Grid Independence Checks (velocity profiles, point comparison, provide additional explanation if other methods are used):			
Convergence Criteria (residual, mass balance, monitors):			
Iterations to convergence (number, greater than 5000 indicates instability in the solution, poor mesh quality, or poor initialization, provide explanation):			
Continuity Check (mass balance):			
Model Head loss (does it fall in expected range):			
Number of Flow conditions simulated (sufficient number to capture expected operating range, minimum flow at maximum water level and maximum flow at minimum water at a minimum):			
Maximum velocity (should fall within expected range):			
Maximum turbulence intensity:			
Tracer method (Eulerian - step/pulse or Lagrangian):			
General Comments:			
Notes:			

Section 4: Model Report Elements (Guidance Document Sections 3 and 4)

Project Title:			
Report Elements	**Included/ Addressed in Submittal? Yes/No/NA**	**Location in Submittal (Design Report, Plans, Other document)**	**Comments**
Introduction:			
CFD Modeling Approach (Section 3):			
Model Development (Section 3):			
Model Results (Section 4):			
Recommendations:			
Other Comments:			

Notes:

Section 5: Key Figures

Project Title:			
Report Requirements	**Included/ Addressed in Submittal? Yes/No/NA**	**Location in Submittal (Design Report, Plans, Other document)**	**Comments**
General - Geometry			
General - Mesh Image			
Convergence - Residual Image			
Convergence - Tracked Parameter Images			
Modeled Tracer Curve			
Plan View of Velocity at Mid-Depth			
General Comments:			

Notes:

Section 6: Supplemental/Other Information (Guidance Document Section 5 or other information)

Project Title:
Supplemental Information
Additional deviation request information