

Racine Water Utility (RWU)
Racine WTP Filter Rehabilitation Project
Scope of Work – April 7, 2022

The Racine Water Utility (RWU) has requested CDM Smith to provide a proposal for an evaluation of potential improvements to the existing filters at the Racine Water Treatment Plant (WTP). The evaluation would include an engineering assessment of the existing filtration process to determine the condition of the concrete, underdrains, troughs, media profile, surface wash system, and valve actuators.

CDM Smith’s scope of work, schedule, and fee is summarized below.

Scope of Work

Task 1 – Kickoff Meeting, Review Information, and Development of Project Plan

Subtasks

- 1.1 Plan, schedule, facilitate, and document the results of a Project “Kick-off” workshop. Objectives for the Kick-off workshop include:
 - a. review the Project scope, schedule, and budget
 - b. establish RWU’s Project expectations
 - c. clearly define and prioritize the goals and objectives of the Project
- 1.2 Prepare appropriate meeting materials and document the results of the workshop in the form of a meeting summary document.
- 1.3 Collect records and information regarding the existing filters at the Racine WTP. This will include record drawings for the filters, shop drawings for the underdrain system, current backwash processes, and filter operating data.
- 1.4 Develop health and safety plan for CDM Smith work activities, including confined space entry, for the filter bed inspection and filter dig.
- 1.5 Prepare procedure for filter bed inspection. The procedure would include the following items:
 - a. Inspection of filter operation prior to entering the filter dig;
 - b. Filter digs at three filters, including one small filter (1-8), one medium filter (9-12) and one large filter (13-16);
 - c. Site specific Health and Safety Plan

Deliverables

- “Project Kick-off” Workshop Summary
- Filter bed inspection plan

Meetings

- “Project Kick-off” Workshop with RWU staff

Task 2 – Conduct Condition and Process Assessment

Subtasks

- 2.1 Review and analyze the filter record and operating data gathered under Task 1.
- 2.2 Conduct filter digs at three filters, including one small filter (1-8), one medium filter (9-12) and one large filter (13-16). Filters will be inspected for the following:
 - a. Visual condition of the exposed underdrain blocks
 - b. Media surface (Mounding, craters, holes, depressions cracks)
 - c. Mudball/silt accumulation
 - d. Media separation from walls
 - e. Structural defects visible in filter basin walls
 - f. Media in backwash troughs
 - g. Visual condition of backwash troughs and supports
 - h. Depth measurements will be taken at multiple locations within three filter beds.
 - i. Optional: Samples of filter media can be collected during the filter digs for analysis by an independent qualified media testing laboratory. Typical filter media test parameters can include effective size, uniformity coefficient, specific gravity, acid solubility, Moh’s hardness, and elemental scale analysis. The cost for any laboratory testing of filter media are not included in this proposed scope and fee proposal.
- 2.3 Conduct an evaluation of the filter backwash and surface wash processes at three filters, including one small filter (1-8), one medium filter (9-12) and one large filter (13-16). The backwash evaluation will include measurements of media expansion.
- 2.4 Prepare a filter condition assessment memorandum that summarizes the results of the filter evaluations.

Deliverables

- Draft and final versions of the filter condition assessment memorandum

Meetings

- Filter condition assessment findings workshop.

Task 3 – Alternatives Evaluation

Subtasks

- 3.1 Based on the Task 2 findings, filter improvement alternatives will be developed and evaluated to address concerns identified during the condition assessment. The alternatives are anticipated to include the following:
- a. Improvements to the filter boxes and filter operating gallery (replacement of filter media, rehabilitation/replacement of filter underdrains, rehabilitation/replacement of filter troughs)
 - b. Improvements to the filter backwash process (rehabilitation of existing surface wash system, implementation of air scour wash system)
 - c. Improvements to the filter pipe gallery (continued replacement of valve actuators, implementation of filter-to-waste, rehabilitation of aging piping)
- 3.2 Prepare a filter alternatives evaluation memorandum that summarizes the results of the filter evaluations. The memorandum will compare the alternatives along order-of-magnitude cost comparison and non-cost factor comparison.

Deliverables

- Draft and final versions of the filter alternatives evaluation memorandum

Meetings

- Filter alternative evaluation workshop.

Task 4 – Filter Improvements Report, Cost Estimate, and Implementation Plan

- 4.1 Develop the filter improvements report that includes the following:
- a. Summary of the results of the evaluations conducted under Tasks 2 and 3.
 - b. Conceptual-level engineers opinion of probable construction cost (OPCC) of the recommended improvements
 - c. Phased implementation plan for the recommended improvements, including a discussion on current reported lead times, supply chain, etcetera.

Deliverables

- Draft and final versions of the filter improvements report

Meetings

- Filter improvements report review meeting

Schedule

We anticipate the following schedule and milestones

- Task 1 - Kick-off meeting Within 2 weeks of the NTP
- Task 2 - draft condition assessment memo Within 6 weeks of the NTP

- Task 3 - draft alternatives evaluation memo Within 10 weeks of the NTP
- Task 4 - draft filter improvements report Within 14 weeks of the NTP

Fee


CDM Smith's fee for this scope is not-to-exceed \$67,904 with monthly invoices consistent with work performed. Exhibit 1 provides a breakdown of fee by task and labor category.

Responsibilities of RWU

The following activities shall be the responsibility of RWU:

- a. Provide to CDM Smith any available record drawings, environmental or hazardous materials evaluations, operating data (excel format) and reports from previous studies/evaluations for the Racine WTP filters.
- b. Provide verbal assistance with the Health and Safety Plan.
- c. Construction of the filter dig box to be used in the filter media excavation (see appendix 1 for filter dig box details)
- d. Staff assistance to install and remove filter dig box from filter
- e. Backwashing filter
- f. Ladders to gain access into the filter and filter dig box
- g. Filter isolation and Lockout / Tagout
- h. 20 clean 5-gallon buckets to separate gravel layer and excavate media
- i. Laboratory costs for optional filter media sample analysis.

Racine Water Utility Filter Rehabilitation Project
 April 7, 2022

	CDM Smith										
	Principal-in-Charge	Project Manager	Filters & Hydraulics	Structural Engineer	Environmental Specialist	Support Staff	QA/QC	Admin	Total Project Labor Hours	Total Expenses	Total Project Cost
PROJECT TASKS	HOURS										
TASK 1 - Kickoff Meeting and Data Collection											
Kickof Meeting	3	8	8					4	23	\$ 75	\$ 4,524
Collect and Review Existing Filter Data			10						10		\$ 1,746
TASK 2 - Condition and Process Assessment											
Site Visit for Physical Condition Assessment		4	12	8		4	2		30	\$ 150	\$ 6,049
Backwash Expansion Testing and Filter Dig		8	20				2		30	\$ 75	\$ 6,077
Prepare Condition Assessment Memorandum		2	16	16		4	2	2	42		\$ 7,697
TASK 3 - Alternatives Analysis											
Develop and Evaluate Filter Alternatives		4	80	8	4	6	4		106		\$ 19,468
Prepare Alternatives Evaluation Memorandum		2	16	4	2	4	2	2	32		\$ 5,968
Review Workshop with RWU	3	4	4						11	\$ 75	\$ 2,410
TASK 4 - Filter Improvements Report, Cost Estimate, Implementation Plan											
Prepare Draft Project Report		2	40	3	3	4	10	2	64		\$ 12,059
Prepare Final Project Report		2	8						10		\$ 1,906
PROJECT SUBTOTAL	6	36	214	39	9	22	22	10	358	\$ 375	\$ 67,904

Appendix 1

Filter Trench Box Fabrication

The following is a suggested procedure for fabrication of filter trench box for use in the filter dig investigation. This fabrication procedure can be modified, as needed.

Construction Materials

- (4) 4'x8'x3/4" Plywood Sheets
- (2) 2"x4"x10' Lumber
- (12) 1/2" x 5" Stainless Steel Hex Bolts
- (12) 1/2" x 3" Stainless Steel Hex Bolts
- (24) Stainless Steel 1/2" Oversized Washers
- (24) Stainless Steel 1/2" Hex Nuts.
- 50' Rope

Fabrication Procedure

1. Cut the plywood sheets into four 54"x36" pieces. Bevel bottom of cut plywood pieces at locations indicated in Figure 6-1.
2. Cut each 2"x4"x10" into (2) 2"x4"x54" lengths. Bevel bottom of all (4) 2"x4"x54" as indicated in Figure 6-1.
3. Drill 1/2" holes through 2"x4" lumber and plywood at locations indicated in the following figure.
4. Piece together plywood pieces and 2"x4" lumber as shown in Figure 6- and insert 1/2" stainless steel bolts at locations indicated in Figure 3. Once all bolts are inserted, add oversized stainless steel washers and add stainless steel hex nut to tighten.
5. Drill holes on two sides and install rope to facilitate lowering and raising the trench box out of the filter basin

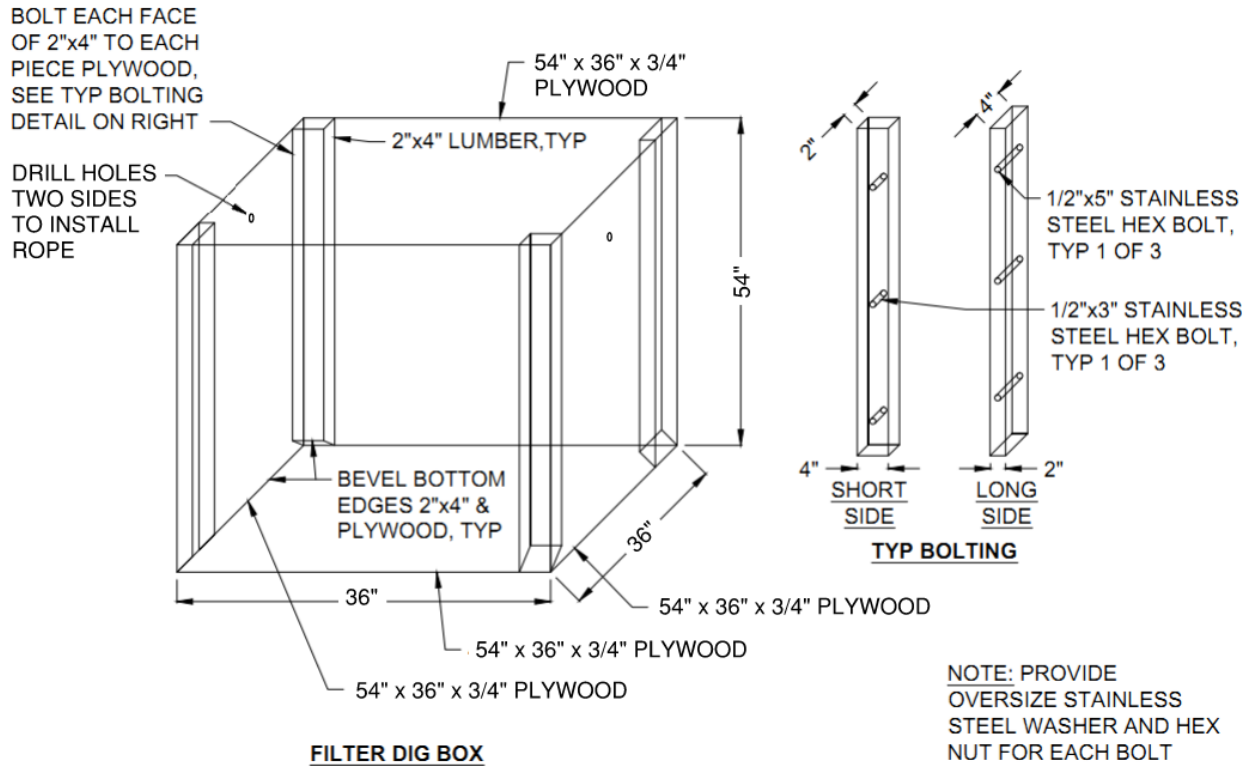


Figure: Filter Trench Box Fabrication