SECTION 464311 - CHAIN-AND-FLIGHT CLARIFIER EQUIPMENT

Note that this section has only been edited for NYSOGS standardization and has not been technically edited. The designer shall make all technical edits specific to the project for this section.

This Section includes chain-and-flight ("chain-and-scraper") clarifier equipment and accessories. Chain-and-flight collectors are installed in rectangular clarifiers to push settled solids toward withdrawal points. Flights are often installed to protrude above the water surface, such that they push floating scum and other solids toward a removal device.

1. GENERAL
   * + 1. SUMMARY
          1. Section Includes:

Chain-and-flight clarifier collectors.

Scum-removal equipment.

Effluent troughs and weir assembly.

Weirs and baffles.

* + - * 1. Related Requirements:

List other Sections directly related to or affecting Work of this Section. Include Sections specifying information expected to be found in this Section as well as Sections required to describe complete system or assembly requirements.

Section 460548 - Vibration and Seismic Controls for Water and Wastewater Equipment: Requirements for vibration and seismic control for equipment specified in this Section.

Section 460553 - Identification for Water and Wastewater Equipment: Nameplates for equipment specified in this Section.

* + - 1. DEFINITIONS

Limit list of definitions to terms unique to this Section and not provided elsewhere.

* + - * 1. FRP: Fiberglass-reinforced plastic.
        2. UHMW PE: Ultra-high-molecular-weight polyethylene.
      1. REFERENCE STANDARDS

List reference standards included within text of this Section, with designations, numbers, and complete document titles.

* + - * 1. American Society of Mechanical Engineers:

ASME B17.1 - Keys and Keyseats.

ASME B29.100 - Double-Pitch Roller Chains, Attachments, and Sprockets.

* + - * 1. ASTM International:

ASTM D4020 - Standard Specification for Ultra-High-Molecular-Weight Polyethylene Molding and Extrusion Materials.

* + - * 1. National Electrical Manufacturers Association:

NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

* + - 1. PREINSTALLATION MEETINGS
         1. Convene minimum [**one week**] [**<\_\_\_\_\_\_\_\_> weeks**] prior to commencing Work of this Section.
      2. SUBMITTALS

Only request submittals needed to verify compliance with Project requirements.

* + - * 1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
        2. Manufacturer’s installation instructions shall be provided along with product data.
        3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
        4. Product Data: Submit manufacturer's product data for system materials and component equipment, including electrical characteristics.
        5. Shop Drawings:

Indicate system materials and component equipment.

Submit wiring and control diagrams, installation and anchoring requirements, fasteners, and other details.

* + - * 1. Manufacturer's Certificate:

Certify that [**products**] <**\_\_\_\_\_\_\_\_**> meet or exceed [**specified requirements**] <**\_\_\_\_\_\_\_\_**>.

Certify installation is completed according to manufacturer's instructions.

Include separate Paragraphs for additional certifications.

* + - * 1. Manufacturer's Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.
        2. Source Quality-Control Submittals: Indicate results of [**shop**] [**factory**] tests and inspections.
        3. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
        4. Manufacturer Reports: Attest that equipment has been installed according to manufacturer's instructions.
        5. Qualifications Statement:

Coordinate following Subparagraph with requirements specified in QUALIFICATIONS Article.

Submit qualifications for manufacturer.

* + - 1. CLOSEOUT SUBMITTALS
         1. Project Record Documents: Record actual locations of installed chain-and-flight clarifier equipment.
         2. Operation and Maintenance Data: Submit maintenance instructions for equipment and accessories.
      2. MAINTENANCE MATERIAL SUBMITTALS
         1. Spare Parts:

Furnish [**one set**] [**two sets**] of manufacturer's recommended spare parts.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Furnish [**two**] <**\_\_\_\_\_\_\_\_**> of <**\_\_\_\_\_\_\_\_**>.

* + - * 1. Tools: Furnish special [**wrenches**] <**\_\_\_\_\_\_\_\_**> and other devices required for Director’s Representative to maintain and calibrate equipment.
      1. QUALITY ASSURANCE

Include this Article to specify compliance with overall reference standards affecting products and installation included in this Section.

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Perform Work according to <**\_\_\_\_\_\_\_\_**> standards.

Include following Paragraph only when cost of acquiring specified standards is justified.

* + - * 1. Maintain <**\_\_\_\_\_\_\_\_**> [**copy**] [**copies**] of each standard affecting the Work of this Section on Site.
      1. QUALIFICATIONS

Coordinate following Paragraph with the requirements specified in SUBMITTALS Article.

* + - * 1. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum [**three**] <**\_\_\_\_\_\_\_\_**> years' [**documented**] experience.
      1. DELIVERY, STORAGE, AND HANDLING
         1. Deliver materials in manufacturer's packaging including installation instructions.
         2. Inspection: Accept clarifier equipment on Site in original packaging and inspect for damage.
         3. Store materials according to manufacturer's instructions.
      2. EXISTING CONDITIONS
         1. Field Measurements:

Verify field measurements prior to fabrication.

Indicate field measurements on Shop Drawings.

* + - 1. WARRANTY

This Article extends warranty period beyond one year. Extended warranties may increase construction costs and Owner enforcement responsibilities. Specify warranties with caution.

* + - * 1. Furnish [**five**] [**10**] <**\_\_\_\_\_\_\_\_**>-year manufacturer's warranty for chain-and-flight clarifier equipment and accessories.

1. PRODUCTS
   * + 1. CHAIN-AND-FLIGHT GRIT-REMOVAL EQUIPMENT
          1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=11706&mf=04&src=wd):

DESIGNER TO PROVIDE TWO MANUFACTURER’S AND APPROVED EQUIVALENT FOR ALL LISTED PRODUCTS.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Subparagraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

* + - * 1. Flights:

Size: [**8**] <**\_\_\_\_\_\_\_\_**> inches high by [**3**] <**\_\_\_\_\_\_\_\_**> inches thick.

Length: [**As indicated on Drawings**] [**As appropriate to tank width**] <**\_\_\_\_\_\_\_\_**>.

Spacing: 10 feet o.c.

Sweeps: Provide lip on leading edge of each flight to sweep tank floor.

Wipers:

Material: [**Neoprene**] [**UHMW PE**].

* + - * 1. Return Tracks and Brackets:

Return Tracks:

Material: [**Type 316 stainless-steel angle, 1/4 inch thick**] [**FRP, same as flight, 3/8 inch thick**].

Size: 3 inches by 3 inches

Brackets:

Description: Support rails on 1/4-inch -thick, Type 316 stainless-steel brackets.

Minimum Distance between Rail and Tank Wall: 9 inches

Maximum Spacing: 10 feet

Wearing Strips:

Material: [**Polyethylene (PE)**] <**\_\_\_\_\_\_\_\_**>.

Size: 3 inches by 3/8 inch thick.

Attach with Type 316 stainless-steel washers welded to top of return track angle, maximum 30 inches o.c.

* + - * 1. Collector Chain:

Material: [**High-strength polymer**] [**Glass-reinforced nylon**] [**Stainless steel**] [**Welded steel**] [**Cast iron**] <**\_\_\_\_\_\_\_\_**>.

Load Rating: 4,500 lbf

Pin:

Minimum 1-inch diameter fiberglass rod in polymeric sleeve.

Attachment: Type 316 stainless-steel cotters.

Attachment:

Bolt flights to brackets to mount on extended chain pins, secured with Type 316 stainless-steel cotters.

Mounting Hole Spacing: Comply with ASME B29.100.

* + - * 1. Sprockets:

Driven Sprockets:

Description: Nonmetallic, segmental PE teeth mounted on a split polymeric hub.

Attachment: Bolt each rim segment to hub with not less than four stainless-steel bolts.

Headshaft Sprockets:

Material: Same as idler sprockets.

Seating: Keyed; comply with ASME B17.1.

Idler Sprockets:

Material: [**Molded polyurethane**] [**UHMW PE, ASTM D4020**].

Construction: Split.

Drive Chain Tensioner Sprockets: Solid polyurethane.

Idler Shaft Support Brackets:

Material: Type 316 stainless steel.

Design: Two piece.

Attachment: Bolt to Type 316 stainless-steel wall support bracket anchored to tank wall.

Take-Up Assembly:

Minimum Travel: 6 inches

Provide Type 316 stainless-steel take-up frame and screw assembly.

Connection Hardware: Type 316 stainless steel.

* + - * 1. Shafts:

Material: Full-width, cold-rolled solid steel.

Stub shafts are not permitted.

Minimum Shaft Diameter:

Longitudinal Collector Head (Driving) Shaft: 4 inches

Longitudinal Collector Turn Shaft: 6 inches

* + - * 1. Bearings:

Submerged Bearings:

Type: Split, self-aligning.

Linings: [**PE**] [**or**] [**polyurethane**].

Housing Bracket: [**Split type**] [**or**] [**open on one side to permit removal of shaft without removing housing bracket**].

Provide required supports for attachment to concrete surfaces.

Nonsubmerged Bearings:

Type: Self-aligning, split pillow block.

Provide lubrication fittings.

* + - * 1. Drive Assemblies:

Description: Common drive assembly for each pair of collectors, including motor, flexible coupling, output shaft speed reducer, drive sprockets, jaw clutches, and other equipment required for independent operation of collectors.

Speed Reducers:

Design: Right angle, dual output.

Type: Helical reduction gear.

Housing:

Oil filled.

Case: [**Cast iron**] [**or**] [**steel**], moisture proof.

Provide accessible oil fill and drain plugs.

Drive Sprockets:

Polyurethane plate section bolted to steel shear plate and mounted on cast-iron driving hub.

Shear Pins: Aluminum.

Cast nylon drive and drive hubs are not permitted.

Jaw Clutch:

Description: Clutch to permit individual operation of either sludge-collection mechanism.

Location: Inside collector drive assembly cover.

Drive Chains:

Design: Nonmetallic, low friction.

Material: [**Cast nylon**] <**\_\_\_\_\_\_\_\_**>.

Chain Pins: Stainless steel.

Chain Links: One-piece construction.

Load Rating: 1,750 lbf

Chain Tightener: Provide for drive chain tension adjustment.

* + - * 1. Effluent Trough:

Material: [**Welded steel**] [**FRP**] <**\_\_\_\_\_\_\_\_**> construction.

Connections: Bolted, with [**neoprene**] <**\_\_\_\_\_\_\_\_**> gaskets.

* + - * 1. Effluent Weir Plates:

Material: [**Steel**] [**FRP**] <**\_\_\_\_\_\_\_\_**> construction.

Minimum Vertical Adjustment: 3 inches

* + - * 1. Operation:

Electrical Characteristics:

[**<\_\_\_\_\_\_\_\_> hp**] [**<\_\_\_\_\_\_\_\_> RLA**].

Voltage: <**\_\_\_\_\_\_\_\_**> V, [**single**] [**three**] phase, 60 Hz.

Maximum [**Fuse Size**] [**Circuit Breaker Size**] [**Overcurrent Protection**]: <**\_\_\_\_\_\_\_\_**> A.

Minimum Circuit Ampacity: <**\_\_\_\_\_\_\_\_**>.

Minimum Power Factor: <**\_\_\_\_\_\_\_\_**> percent at rated load.

Control Panel:

Factory mounted.

NEMA 250 [**Type 1**] [**Type 4**] <**\_\_\_\_\_\_\_\_**>.

Single-point power connection and grounding lug.

Overload Alarm:

Waterproof, torque-actuated unit or indicating ammeter, designed to indicate driven load continuously.

Annunciate alarm for impending excessive load, and de-energize drive unit when such load is reached.

Disconnect Switch: Factory-mounted [**in control panel**] [**on equipment**].

Operation Sequences: <**\_\_\_\_\_\_\_\_**>.

* + - * 1. Scum-Removal Equipment:

Description: Slotted pipe spanning the width of clarifier.

Material: [**Carbon steel**] [**Stainless steel**] [**Nonmetallic**].

Operation: [**Manual**] [**Motorized**].

Scum Baffle:

Description: Baffle attached to effluent trough to keep floating scum from reaching effluent weirs.

Material: FRP.

Minimum Thickness: 1/4 inch

Width: 9 inches, adjustable to 3 inches above maximum water level.

Attach to effluent trough with FRP brackets and stainless-steel bolts.

Scum Trough:

Material: Welded steel.

Minimum Thickness: 1/4 inch

Provide flanged connection for scum discharge pipe.

Type: Adjustable dipping weir.

Collector Pipe:

Material: Steel construction.

Comply with ASTM A53,Schedule 20 minimum.

Operator:

Type: Manual operating lever, mounted on collector pipe.

Material: Steel pipe.

Minimum Diameter: 1-1/4 inches

Length: [**Extend minimum 3 feet above top of tank wall**] [**As indicated on Drawings**].

* + - * 1. Effluent Weir Plates:

Material: [**Steel**] <**\_\_\_\_\_\_\_\_**>.

Minimum Vertical Adjustment: 3 inches

* + - * 1. Accessories:

Carry Wearing Shoes:

Description: Two per flight, to ride on floor-mounted wear strips.

Material: UHMW PE, ASTM D4020.

Width: [**3**] <**\_\_\_\_\_\_\_\_**> inches

Thickness: Minimum [**1/2**] <**\_\_\_\_\_\_\_\_**> inch

Longitudinal Collectors Minimum Length: [**5-1/2**] <**\_\_\_\_\_\_\_\_**> inches

Connectors: Stainless steel.

Wearing Surfaces: Reversible, with two usable wearing surfaces per wearing shoe.

Return Rail Wearing Shoes:

Description: Two per flight, to ride on return rails.

Material: UHMW PE, ASTM D4020.

Width: [**3**] <**\_\_\_\_\_\_\_\_**> inches

Thickness: Minimum [**1/2**] <**\_\_\_\_\_\_\_\_**> inch

Minimum Length: [**4**] <**\_\_\_\_\_\_\_\_**> inches

Connectors: Stainless steel.

Guide Lugs: Provide guide lugs for proper tracking of the flight on the track.

Wearing Surfaces: Reversible, with two usable wearing surfaces per wearing shoe.

Wearing Strips:

Secure to basin floor with Type 316 stainless-steel fasteners.

Material: UHMW PE, ASTM D4020.

Minimum Size: 3 inches wide by 3/8 inch thick by 10 feet long.

Configuration: [**Slotted**] <**\_\_\_\_\_\_\_\_**>, countersunk.

Drive Guards:

Material: Type 316 stainless steel.

Occupational Safety and Health Administration approved.

* + - 1. SOURCE QUALITY CONTROL

Include one or both of following Paragraphs to require Director's inspection or witnessing of test at factory.

* + - * 1. Director’s Inspection: Make completed clarifier equipment available for inspection at manufacturer's factory prior to packaging for shipment. Notify Director’s Representative at least [**seven**] <**\_\_\_\_\_\_\_\_**> days before inspection is allowed.
        2. Director’s Witnessing: Allow witnessing of factory inspections and test at manufacturer's test facility. Notify Director’s Representative at least [**seven**] <**\_\_\_\_\_\_\_\_**> days before inspections and tests are scheduled.

Include following Paragraph when reliance on fabricator's approved quality-control program is sufficient for Project requirements.

* + - * 1. Certificate of Compliance: When fabricator is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.

Specified shop tests are not required for Work performed by approved fabricator.

1. EXECUTION
   * + 1. EXAMINATION
          1. Verify that clarifier basin is installed and ready to receive chain-and-flight clarifier equipment.
       2. INSTALLATION
          1. Install chain-and-flight clarifier equipment according to manufacturer's instructions.
          2. Weir Plates: Mount weir plates against double bead of sealant.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Installation Standards: Install Work according to <**\_\_\_\_\_\_\_\_**> standards.
      1. FIELD QUALITY CONTROL
         1. Dry Startup: Run equipment without liquid in basins and inspect for:

Alignment of sprockets, chain, flights, and wearing surfaces.

Binding and excessive heat buildup in drive units.

* + - * 1. Wet Startup: Run equipment with wastewater in basins and verify proper operation.
        2. Manufacturer Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than <**\_\_\_\_\_\_\_\_**> days on Site for installation, inspection, field testing, and instructing Director’s Representative in maintenance of equipment.
        3. Equipment Acceptance:

Adjust, repair, modify, or replace components failing to perform as specified, and rerun tests.

Make final adjustments to equipment under direction of manufacturer's representative.

* + - * 1. Furnish installation certificate from equipment manufacturer's representative attesting equipment has been properly installed and is ready for startup and testing.
      1. ADJUSTING
         1. Adjust <**\_\_\_\_\_\_\_\_**>.
         2. Check control module functions.
      2. DEMONSTRATION
         1. Demonstrate equipment startup, shutdown, routine maintenance, and emergency repair procedures to Director’s Representative.

END OF SECTION 464311