SECTION 407413 - RESISTANCE TEMPERATURE DEVICES

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.

Element type depends on specific application, but RTDs with a thin-film element are typically favored over RTDs with a wire-wound element. Thin-film elements are intrinsically vibration resistant and are generally less expensive than equivalent wire-wound element RTDs.

RTDs exhibit a mostly linear positive change in electrical resistance with changes to temperature. Pure metallic elements such as platinum, nickel, copper, and nickel-iron alloys are commonly used as the primary sensing material. Platinum is typically selected because it can withstand relatively high temperatures while providing high accuracy and stability. Many RTD elements are fragile and are housed in a protective sheath while connected to extension wires to protect them from mechanical strain and adverse ambient conditions.

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

Thin-film element resistance temperature detectors (RTDs).

Thermowells.

Temperature transmitters.

Temperature indicators.

Temperature recorders.

* + - * 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 407416 - Thermocouples: Thermocouples and accessories for use as temperature detectors.

* + - 1. REFERENCE STANDARDS

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

* + - * 1. ASME International:

ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard.

* + - * 1. ASTM International:

ASTM E1137 - Standard Specification for Industrial Platinum Resistance Thermometers.

* + - * 1. International Electrotechnical Commission:

IEC 60751 - Industrial Platinum Resistance Thermometers and Platinum Temperature Sensors.

* + - * 1. National Electrical Manufacturers Association:

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

* + - * 1. NSF International:

NSF 61 - Drinking Water System Components - Health Effects.

NSF 372 - Drinking Water System Components - Lead Content.

* + - 1. 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 information for system materials and component equipment, including connection requirements.
        5. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

Include separate Paragraphs for additional certifications.

* + - * 1. Source Quality-Control Submittals: Indicate results of [**shop**] [**factory**] tests and inspections.
        2. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
        3. Qualifications Statement:

Coordinate following Subparagraph with requirements specified in QUALIFICATIONS Article.

Submit qualifications for manufacturer.

* + - 1. QUALITY ASSURANCE

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

* + - * 1. Ensure that materials of construction of wetted parts are compatible with process liquid.
        2. Materials in Contact with Potable Water: Comply with NSF Standard 61 and NSF Standard 372.

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 Work of this Section on Site.
      1. QUALIFICATIONS

Coordinate following Paragraph with 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. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
         2. Store materials according to manufacturer instructions.
         3. Protection:

Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.

Provide additional protection according to manufacturer instructions.

* + - 1. WARRANTY

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

* + - * 1. Furnish [**five**] <**\_\_\_\_\_\_\_\_**>-year manufacturer's warranty for RTDs and accessories.

1. PRODUCTS
   * + 1. RTD
          1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12825&mf=04&src=wd):

designer to provide two manufacturers 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.

Thin-film elements can attain higher resistances with less metal, and therefore may be less expensive than a similar wire-wound element.

* + - * 1. Primary Element:

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

Comply with ASTM E1137/E1137M.

Accuracy: Plus or minus [**0.1**] <**\_\_\_\_\_\_\_\_**> percent at 32 deg. F .

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

Continuous-Averaging RTD: Plus or minus [**0.5**] <**\_\_\_\_\_\_\_\_**> deg. F at base resistance temperature.

Base Resistance at 32 Deg. F : [**100**] [**500**] [**1,000**] <**\_\_\_\_\_\_\_\_**> ohms.

Thermal Coefficient of Resistance: <**\_\_\_\_\_\_\_\_**> percent resistance change/deg. C.

Minimum Stability: <**\_\_\_\_\_\_\_\_**> deg. F per year.

Tolerance Class: <**\_\_\_\_\_\_\_\_**>[**, according to IEC 60751**].

Vibration Resistance: [**30**] <**\_\_\_\_\_\_\_\_**> g over frequency range 10 Hz to 1.0 kHz.

Self-Heating: Maximum <**\_\_\_\_\_\_\_\_**> deg. F with power dissipation of [**10.0**] <**\_\_\_\_\_\_\_\_**> mW.

Current:

Operating: [**1**] <**\_\_\_\_\_\_\_\_**> ma.

Maximum: [**20**] <**\_\_\_\_\_\_\_\_**> ma.

Encapsulation: [**Epoxy**] [**Series 300 stainless steel**] [**Anodized aluminum**] [**Aluminum oxide**] [**Copper**].

Configuration: [**Four**] [**Two**]-wire.

Connector: Four-pin; male.

* + - * 1. Housing:

Material: Welded [**Type 316L stainless steel**] <**\_\_\_\_\_\_\_\_**>.

Connection: [**Threaded**] <**\_\_\_\_\_\_\_\_**>.

* + - * 1. Probe:

Diameter: [**1/4**] [**1/8**] <**\_\_\_\_\_\_\_\_**> inch

Length: <**\_\_\_\_\_\_\_\_**> inches.

Operating Temperature:

Sensing End: [**Minus 58**] <**\_\_\_\_\_\_\_\_**> to [**plus 482**] <**\_\_\_\_\_\_\_\_**> deg. F

Connector: Maximum [**185**] <**\_\_\_\_\_\_\_\_**> deg. F

Maximum Response Time: [**3.5**] <**\_\_\_\_\_\_\_\_**> sec.

* + - * 1. Accessories:

Extension Cable:

Length: <**\_\_\_\_\_\_\_\_**> inches.

Consider probes with suitable plastic coating if used in harsh or corrosive environments.

Molded Plastic Probe Connector:

Material: <**\_\_\_\_\_\_\_\_**>.

Consider protective heads of suitable materials if necessary to prevent sensors from being physically damaged.

Protective Head:

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

* + - 1. THERMOWELLS

Thermowells for temperature instruments are typically recommended for process systems if pressure or velocity could potentially damage probe, or if process fluid is viscous, abrasive, or corrosive.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12826&mf=04&src=wd):

designer to provide two manufacturers 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.

Optional materials listed in following Paragraph are for use in water or wastewater. Consult with manufacturer for other process fluids.

* + - * 1. Description:

Material: [**Brass**] [**Copper**] [**Stainless steel**] [**Monel**] <**\_\_\_\_\_\_\_\_**>.

Process Connection:

Flanged:

Size: <**\_\_\_\_\_\_\_\_**> inch

Rating: <**\_\_\_\_\_\_\_\_**> lb., according to ASME B16.5.

Material: <**\_\_\_\_\_\_\_\_**>.

Threaded: <**\_\_\_\_\_\_\_\_**> inch NPT.

Socket Weld: Match pipe size [**as indicated on Drawings**].

Sanitary.

Instrument Connection: <**\_\_\_\_\_\_\_\_**> inch

Bore Diameter: <**\_\_\_\_\_\_\_\_**> inch.

Accessories: Plug and chain.

* + - 1. TRANSMITTERS
         1. Transmitter Output:

4 to 20 mA dc analog signal.

Accuracy: Plus or minus <**\_\_\_\_\_\_\_\_**> percent of full scale.

* + - * 1. Housing Material: Cast aluminum.
        2. HMI:

Touch-screen programming, functioning through enclosure window without opening enclosure.

Display:

Size: Four lines by 16 characters.

Type: Backlit digital display.

User-selectable engineering units.

Readout of diagnostic error messages.

* + - * 1. Mounting:

Integral or remote mounting up to <**\_\_\_\_\_\_\_\_**> feet from meter.

Mounting Locations Less Than 4 Feet above Grade: Provide stainless-steel mounting posts.

* + - * 1. Transmitter Communication Interface: [**PROFIBUS**] <**\_\_\_\_\_\_\_\_**>.
        2. Communication Firmware and Software: <**\_\_\_\_\_\_\_\_**>.
        3. Accessories:

Current signal output simulation.

Empty pipe detection.

Self-diagnostics.

Automatic zero adjustment.

Stainless-steel sunshield.

Signal Cable: Provided by flow meter manufacturer.

* + - 1. INDICATORS
         1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12827&mf=04&src=wd):

designer to provide two manufacturers 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. Description:

Integrally mounted in transmitter housing.

Scale: Graduated.

Length: [**<\_\_\_\_\_\_\_\_> inches**] [**As indicated on Drawings**].

Units: <**\_\_\_\_\_\_\_\_**> gpm

Mounting: [**Wall**] [**Panel**].

* + - 1. RECORDERS
         1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12828&mf=04&src=wd):

designer to provide two manufacturers 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. Description:

Minimum Diameter: 10 inches

Rotation Cycle: Once per [**day**] [**week**] [**month**].

Drive Mechanism:

Synchronous motor.

<**\_\_\_\_\_\_\_\_**> V ac, <**\_\_\_\_\_\_\_\_**> Hz.

* + - 1. OPERATION
         1. Control Power:

120 V ac, single phase, 60 Hz.

Furnish local transformers as required.

* + - * 1. Enclosures: NEMA 250 Type [**1**] [**4**] <**\_\_\_\_\_\_\_\_**>.
      1. SOURCE QUALITY CONTROL
         1. Provide shop inspection and testing of completed assembly.

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

* + - * 1. Director’s Inspection:

Make completed typical RTD available for inspection at manufacturer's factory prior to packaging for shipment.

Notify Director’s Representative at least [**seven**] <**\_\_\_\_\_\_\_\_**> days before inspection is allowed.

* + - * 1. 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 if reliance on manufacturer's approved quality-control program is sufficient for Project requirements.

* + - * 1. Certificate of Compliance:

If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.

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

1. EXECUTION
   * + 1. EXAMINATION
          1. Verify that items provided by other Sections of Work are ready to receive Work of this Section.
       2. INSTALLATION
          1. Coordinate location and configuration of RTDs with final equipment installations.
          2. Ensure that instruments are located to be easily accessible for maintenance.

\*\*\*\*\*\* [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. Manufacturer Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than <**\_\_\_\_\_\_\_\_**> [**days**] [**hours**] on Site for installation, inspection, startup, field testing, and instructing Director’s Representative in maintenance of equipment.
         2. 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 that equipment has been properly installed and is ready for startup and testing.
      1. DEMONSTRATION
         1. Demonstrate routine maintenance and emergency repair or replacement procedures to Director’s Representative.
      2. ATTACHMENTS

When relying on separate schedules, tables, illustrations, or forms to specify product requirements, include list of each attachment. Include identical list of attachments in Project Manual table of contents.

Insert attachments following END OF SECTION. Consider following examples when developing Project schedule.

* + - * 1. RTD Schedule:

RTD-463:

[**Manufacturer: <\_\_\_\_\_\_\_\_>.**]

[**Model: <\_\_\_\_\_\_\_\_>.**]

Location: <**\_\_\_\_\_\_\_\_**>.

Type: <**\_\_\_\_\_\_\_\_**>.

Mounting: [**Thermowell**] <**\_\_\_\_\_\_\_\_**>.

Process Liquid: <**\_\_\_\_\_\_\_\_**>.

RTD-464:

[**Manufacturer: <\_\_\_\_\_\_\_\_>.**]

[**Model: <\_\_\_\_\_\_\_\_>.**]

Location: <**\_\_\_\_\_\_\_\_**>.

Type: <**\_\_\_\_\_\_\_\_**>.

Mounting: [**Thermowell**] <**\_\_\_\_\_\_\_\_**>.

Process Liquid: <**\_\_\_\_\_\_\_\_**>.

END OF SECTION 407413