SECTION 238236 - FINNED-TUBE RADIATION HEATERS

Revise this Section by deleting and inserting text to meet Project-specific requirements.

This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
   * + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
      1. SUMMARY
         1. Section includes **[hydronic] [steam] [electric]**, **[baseboard] [and] [finned-tube]** radiation heaters.
      2. SUBMITTALS
         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: For each type of product.

Include rated capacities, operating characteristics, furnished specialties, and accessories.

* + - * 1. Shop Drawings:

Include plans, elevations, sections, and details.

Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

Include details and dimensions of custom-fabricated enclosures.

Indicate location and size of each field connection.

Retain first subparagraph below for hydronic and steam convection units.

Indicate location and arrangement of piping valves and specialties.

Retain first subparagraph below for finned-tube radiation heaters with integral controls; delete if control devices are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."

Indicate location and arrangement of integral controls.

Include enclosure joints, corner pieces, access doors, and other accessories.

Retain subparagraph below for electric convection units.

Include diagrams for power, signal, and control wiring.

Retain "Samples" paragraph below for single-stage Samples, with a subordinate list if applicable. Retain "Color Samples for Initial Selection" and "Color Samples for Verification" paragraphs for two-stage Samples.

* + - * 1. Samples: For each exposed product and for each color and texture specified.
        2. Color Samples for Initial Selection: For finned-tube radiation heaters with factory-applied color finishes.
        3. Color Samples for Verification: For each type of exposed finish.

Retain "Coordination Drawings" paragraph below for situations where limited space necessitates maximum utilization for efficient installation of different components or if coordination is required for installation of products and materials by separate installers. Coordinate paragraph with other Sections specifying products listed below. Preparation of coordination drawings requires the participation of each trade involved in installations within the limited space.

* + - * 1. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

Structural members, including wall construction, to which finned-tube radiation heaters will be attached.

Method of attaching finned-tube radiation heaters to building structure.

Penetrations of fire-rated wall and floor assemblies.

* + - * 1. Field quality-control reports.

1. PRODUCTS
   * + 1. FINNED TUBE RADIATION

Edit enclosure types in paragraph below as required, check with team leader. Use paragraph below in areas other than inmate/client/patient areas for DOCS, CFS, and OMH. Change “sloping top” to “flat top” when directed by team leader.

* + - * 1. Type A Enclosure (Standard): Sloping top design fabricated from minimum 16 USS gage sheet steel, with integral pencil-proof top outlet louver.

Supported at top by continuous wall mounting strip, and at bottom by enclosure/element brackets.

Gusset plates extending from the top and front of enclosure maintains shape during shipment and after installation.

Welded male and female slip joints at each end to allow for positive engagement and alignment of adjoining enclosures.

Use paragraph below for CFS and OMH projects. This enclosure can also be used in supervised areas in DOCS projects, check with team leader. Change “sloping top” to “flat top” when directed by Team Leader. Fill in blank in below. Use “14” gage for DOCS and CFS projects, and “16” gage for OMH projects.

* + - * 1. Type B Enclosure (Institutional): Sloping top design fabricated from minimum \_\_\_\_\_\_\_\_ USS gage sheet steel, with integral pencil-proof top outlet louvers, and pencil-proof bottom inlet louvers. Inlet louvers not integral to enclosure shall be mounted with vandal resistant fasteners.

The State will determine the output capacity of the Type B enclosure by subtracting 5 percent from the IBR Directory’s listed output capacity for the manufacturer’s listed Type A enclosure with the same element size and configuration.

Supported at top by continuous wall mounting strip, and at bottom by enclosure/element brackets.

Gusset plates extending from the top and front of enclosure maintains shape during shipment and after installation.

Welded male and female slip joints at each end to allow for positive engagement and alignment of adjoining enclosures.

Use paragraph below in unsupervised areas in DOCS projects, check with Team Leader.

* + - * 1. Type C Enclosure (Security): Sloping top, completely enclosed wrap around design fabricated from minimum 12 USS gage sheet steel, with perforated top outlet and bottom inlet.

Perforations: 1/8 inch dia holes on 3/16 inch staggered centers.

Supported at top and bottom by back plate with continuous mounting strips.

Gusset plates extending from the top and front of enclosure maintains shape during shipment and after installation.

Welded male Welded male and female slip joints at each end to allow for positive engagement and alignment of adjoining enclosures.

Manufacturers and products listed in Spec Agent and Masterworks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. ELECTRIC BASEBOARD RADIATION HEATERS

Copy this article and re-edit for each style of baseboard radiation heater, or schedule on Drawings.

* + - * 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

INDEECO.

Markel Products; TPI Corporation.

Marley Engineered Products.

Ouellet Canada Inc.

Approved equivalent.

* + - * 1. Description: Factory-packaged units constructed according to UL 499, UL 1030, and UL 2021.

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

* + - * 1. Heating Elements: Nickel-chromium-wire heating element enclosed in metallic sheath mechanically bonded to fins, with high-temperature cutout and sensor running the full length of the element. Element supports shall eliminate thermal expansion noise.

Indicate length and total capacity on Drawings.

Volts: **<Insert value>**.

Phase: **<Insert value>**.

Hertz: **<Insert value>**.

Heat Output: **<Insert W/ft.>**.

Retain "Enclosures" or "Rust-Resistant Enclosures" paragraph below, or retain both and indicate location of each enclosure type on Drawings. Verify optional features with manufacturer.

* + - * 1. Enclosures: Minimum **[0.0329-inch-] [0.0428-inch-] <Insert dimension>** thick steel, removable front cover.

Full-height back.

Full-length damper.

End panel.

**[End]** caps.

Inside and outside corners.

Joiner pieces to snap together.

Enclosure Height: **<Insert inches>**.

Enclosure Depth: **<Insert inches>**.

Finish: Baked-enamel finish in manufacturer's **[standard] [custom]** color as selected by Director’s Representative.

Element Brackets: Primed and painted steel to support front panel and element.

* + - * 1. Rust-Resistant Enclosures: Minimum **[0.040-inch-] [0.052-inch-] <Insert dimension>** thick ASTM A653, G60 galvanized-steel, removable front cover.

Full-height back.

Full-length damper.

End panel.

**[End]** caps.

Inside and outside corners.

Joiner pieces to snap together.

Enclosure Height: **<Insert inches>**.

Enclosure Depth: **<Insert inches>**.

Finish: Baked-enamel finish in manufacturer's **[standard] [custom]** color as selected by Director’s Representative.

Element Brackets: Primed and painted steel to support front panel and element.

Retain "Unit Controls" paragraph below for integral control device; delete if control devices are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."

* + - * 1. Unit Controls: **[Integral line-voltage thermostat] [Integral electronic thermostat] [Remote line-voltage thermostat]**.
        2. Accessories:

Filler sections without a heating element matching the adjacent enclosure.

Straight-blade-type receptacles complying with DSCC W-C-596G/GEN, NEMA WD 1, NEMA WD 6, and UL 498; in color selected by Director’s Representative.

* + - 1. **[HOT-WATER] [STEAM]** BASEBOARD RADIATION HEATERS

Copy this article and re-edit for each style of baseboard radiation heater, or schedule on Drawings.

* + - * 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Haydon Corporation.

Rosemex Products.

Slant/Fin Corp.

Sterling HVAC Products; a Mestek company.

Approved equivalent.

* + - * 1. Performance Ratings: Rate baseboard radiation heaters according to Hydronics Institute's "I=B=R Testing and Rating Standard for Baseboard Radiation."

Retain one of two "Heating Elements" paragraphs below.

* + - * 1. Heating Elements: Copper tubing mechanically expanded into flanged collars of evenly spaced aluminum fins resting on polypropylene element glides. One end of tube shall be belled.

If more than one configuration is required, delete nine subparagraphs below and schedule on Drawings.

Tube Diameter: **[NPS 1/2] [NPS 3/4] [NPS 1] [NPS 1-1/4] <Insert pipe size>**.

Fin Size: **[2-1/2 by 2-1/2 inches] [3 by 3 inches] <Insert dimensions>**.

Fin Spacing: **[40 per foot] [50 per foot] [58 per foot] <Insert value>**.

Number of Tiers: **<Insert number>**.

Heat Output: **<Insert Btu/h per ft.>**.

Entering-Air Temperature: **[65 deg F] <Insert temperature>**.

Retain first two subparagraphs below for hot-water radiation heaters.

Average Water Temperature: **[180 deg F] <Insert temperature>**.

Minimum Water Velocity: **[1/2 fps] <Insert value>**.

Retain "Entering Steam Pressure" subparagraph below for steam radiation heaters.

Entering Steam Pressure: **[1 psig] <Insert value>**.

* + - * 1. Heating Elements: Steel tubing mechanically expanded into flanged collars of evenly spaced steel fins resting on polypropylene element glides. Tube ends shall be threaded.

If more than one configuration is required, delete nine subparagraphs below and schedule on Drawings.

Tube Diameter: **[NPS 1-1/4] <Insert pipe size>**.

Fin Size: **[3 by 3 inches] <Insert dimensions>**.

Fin Spacing: **[52 per foot] <Insert value>**.

Number of Tiers: **<Insert number>**.

Heat Output: **<Insert Btu/h per ft.>**.

Entering-Air Temperature: **[65 deg F] <Insert temperature>**.

Retain first two subparagraphs below for hot-water radiation heaters.

Average Water Temperature: **[180 deg F] <Insert temperature>**.

Minimum Water Velocity: **[1/2 fps] <Insert value>**.

Retain "Entering Steam Pressure" subparagraph below for steam radiation heaters.

Entering Steam Pressure: **[1 psig] <Insert value>**.

Retain "Enclosures" or "Rust-Resistant Enclosures" paragraph below, or retain both and indicate location of each enclosure type on Drawings. Verify optional features with manufacturer.

* + - * 1. Enclosures: Minimum **[0.0329-inch-] [0.0428-inch-] <Insert dimension>** thick steel, removable front cover.

Full-height back.

Full-length damper.

End panel.

End caps.

Inside and outside corners.

Valve access door.

Joiner pieces to snap together.

Enclosure Height: **<Insert inches>**.

Enclosure Depth: **<Insert inches>**.

Finish: Baked-enamel finish in manufacturer's **[standard] [custom]** color as selected by Architect.

Element Brackets: Primed and painted steel to support front panel and element.

* + - * 1. Rust-Resistant Enclosures: Minimum **[0.040-inch-] [0.052-inch-] <Insert dimension>** thick ASTM A653, G60 galvanized-steel, removable front cover.

Full-height back.

Full-length damper.

End panel.

End caps.

Inside and outside corners.

Valve access door.

Joiner pieces to snap together.

Enclosure Height: **<Insert inches>**.

Enclosure Depth: **<Insert inches>**.

Finish: Baked-enamel finish in manufacturer's **[standard] [custom]** color as selected by Director’s Representative.

Element Brackets: Primed and painted steel to support front panel and element.

* + - 1. ELECTRIC FINNED-TUBE RADIATION HEATERS

Copy this article and re-edit for each style of finned-tube radiation heater, or schedule on Drawings.

* + - * 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

INDEECO.

Markel Products; TPI Corporation.

Marley Engineered Products.

Ouellet Canada Inc.

STELPRO DESIGN INC.

Trane.

Approved equivalent.

* + - * 1. Description: Factory-packaged units constructed according to UL 499, UL 1030, and UL 2021.

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

* + - * 1. Heating Elements: Nickel-chromium-wire heating element enclosed in metallic sheath mechanically bonded to fins, with high-temperature cutout and sensor running the full length of the element. Element supports shall eliminate thermal expansion noise.

Indicate length and total capacity on Drawings.

Volts: **<Insert value>**.

Phase: **<Insert value>**.

Hertz: **<Insert value>**.

Heat Output: **<Insert W/ft.>**.

Retain "Front Panel" or "Rust-Resistant Front Panel" paragraph below, or retain both and indicate location of each panel type on Drawings.

* + - * 1. Front Panel: Minimum **[0.0428-inch-] [0.0528-inch-] <Insert dimension>** thick steel.
        2. Rust-Resistant Front Panel: Minimum **[0.052-inch-] [0.064-inch-] <Insert dimension>** thick, ASTM A653, G60 galvanized steel.
        3. Wall-Mounted Back Panel: Minimum 0.0329-inch- thick steel, full height, with full-length channel support for front panel without exposed fasteners.
        4. Floor-Mounted Pedestals: Conceal conduit for power and control wiring at maximum 36-inch spacing. Pedestal-mounted back panel shall be solid panel matching front panel.
        5. Support Brackets: Locate at maximum 36-inch spacing to support front panel and element.
        6. Finish: Baked**[-enamel][-epoxy]** finish in manufacturer's **[standard] [custom]** color as selected by Director’s Representative.
        7. Damper: Knob-operated internal damper at enclosure outlet.
        8. Access Doors: Factory made, permanently hinged with tamper-resistant fastener, minimum size 6 by 7 inches, integral with enclosure.
        9. Enclosure Style: **[Sloped] [Flat]** top.

Retain features required for Project in subparagraphs below.

Front Inlet Grille: Punched louver; painted to match enclosure.

Front Inlet Grille: Extruded-aluminum linear bar grille; pencil-proof bar spacing.

Mill-finish aluminum.

Anodized finish, color as selected by Architect from manufacturer's **[standard] [custom]** colors.

Painted to match enclosure.

**[Top] [Front]** Outlet Grille: Punched louver; painted to match enclosure.

**[Top] [Front]** Outlet Grille: Extruded-aluminum linear bar grille; pencil-proof bar spacing.

Mill-finish aluminum.

Anodized finish, color as selected by Architect from manufacturer's **[standard] [custom]** colors.

Painted to match enclosure.

Enclosure Height: **<Insert inches>**.

Enclosure Depth: **<Insert inches>**.

Retain "Unit Controls" paragraph below for integral control device; delete if control devices are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."

* + - * 1. Unit Controls: Integral **[line-voltage thermostat with minimum range of 60 to 90 deg F] [low-voltage relay and control transformer for remote thermostat]**.
        2. Accessories: Integral disconnect switch, filler sections, corners, relay sections, and splice plates all matching the enclosure and grille finishes.
      1. **[HOT-WATER] [STEAM]** FINNED-TUBE RADIATION HEATERS

Copy this article and re-edit for each style of finned-tube radiation heater, or schedule on Drawings.

* + - * 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Engineered Air.

[Quincy Hydronic Technology Inc](http://www.specagent.com/Lookup?uid=123457074680).

Rosemex Products.

Slant/Fin Corp.

Sterling HVAC Products; a Mestek company.

Trane.

Approved equivalent.

* + - * 1. Performance Ratings: Rate finned-tube radiation heaters according to Hydronics Institute's "I=B=R Testing and Rating Standard for Finned-Tube (Commercial) Radiation."

Retain one of two "Heating Elements" paragraphs below.

* + - * 1. Heating Elements: Copper tubing mechanically expanded into flanged collars of evenly spaced aluminum fins resting on element supports. One end of tube shall be belled.

If more than one configuration is required, delete nine subparagraphs below and schedule on Drawings.

Tube Diameter: **[NPS 3/4] [NPS 1] [NPS 1-1/4] <Insert pipe size>**.

Fin Size: **[3 by 3 inches] [4 by 4 inches] <Insert dimensions>**.

Fin Spacing: **[40 per foot] [50 per foot] [58 per foot] <Insert value>**.

Number of Tiers: **<Insert number>**.

Heat Output: **<Insert Btu/h per ft.>**.

Entering-Air Temperature: **[65 deg F] <Insert temperature>**.

Retain first two subparagraphs below for hot-water radiation heaters.

Average Water Temperature: **[180 deg F] <Insert temperature>**.

Minimum Water Velocity: **[1/2 fps] <Insert value>**.

Retain "Entering Steam Pressure" subparagraph below for steam radiation heaters.

Entering Steam Pressure: **[1 psig] <Insert value>**.

* + - * 1. Heating Elements: Steel tubing mechanically expanded into flanged collars of evenly spaced steel fins resting on element supports. Tube ends shall be threaded.

If more than one configuration is required, delete nine subparagraphs below and schedule on Drawings.

Tube Diameter: **[NPS 1-1/4] <Insert pipe size>**.

Fin Size: **[4 by 4 inches] <Insert dimensions>**.

Fin Spacing: **[52 per foot] <Insert value>**.

Number of Tiers: **<Insert number>**.

Heat Output: **<Insert Btu/h per ft.>**.

Entering-Air Temperature: **[65 deg F] <Insert temperature>**.

Retain first two subparagraphs below for hot-water radiation heaters.

Average Water Temperature: **[180 deg F] <Insert temperature>**.

Minimum Water Velocity: **[1/2 fps] <Insert value>**.

Retain "Entering Steam Pressure" subparagraph below for steam radiation heaters.

Entering Steam Pressure: **[1 psig] <Insert value>**.

* + - * 1. Element Supports: Ball-bearing cradle type to permit longitudinal movement on enclosure brackets.

Retain "Front Panel" or "Rust-Resistant Front Panel" paragraph below, or retain both and indicate location of each panel type on Drawings.

* + - * 1. Front Panel: Minimum **[0.0428-inch-] [0.0528-inch-] <Insert thickness>** thick steel.
        2. Rust-Resistant Front Panel: Minimum **[0.052-inch-] [0.064-inch-] <Insert thickness>** thick, ASTM A653, G60 galvanized steel.
        3. Wall-Mounted Back Panel: Minimum 0.0329-inch- thick steel, full height, with full-length channel support for front panel without exposed fasteners.
        4. Floor-Mounted Pedestals: Conceal insulated piping at maximum 36-inch spacing. Pedestal-mounted back panel shall be solid panel matching front panel. Provide stainless-steel escutcheon for floor openings at pedestals.
        5. Support Brackets: Locate at maximum 36-inch spacing to support front panel and element.
        6. Finish: Baked**[-enamel][-epoxy] finish in manufacturer's [standard] [custom]** color as selected by Director’s Representative.
        7. Damper: Knob-operated internal damper at enclosure outlet.
        8. Access Doors: Factory made, permanently hinged with tamper-resistant fastener, minimum size 6 by 7 inches, integral with enclosure.
        9. Enclosure Style: **[Sloped] [Flat]** top.

Retain features required for Project in subparagraphs below.

Front Inlet Grille: Punched louver; painted to match enclosure.

Front Inlet Grille: Extruded-aluminum linear bar grille; pencil-proof bar spacing.

Mill-finish aluminum.

Anodized finish, color as selected by Architect from manufacturer's **[standard] [custom]** colors.

Painted to match enclosure.

**[Top] [Front]** Outlet Grille: Punched louver; painted to match enclosure.

**[Top] [Front]** Outlet Grille: Extruded-aluminum linear bar grille; pencil-proof bar spacing.

Mill-finish aluminum.

Anodized finish, color as selected by Architect from manufacturer's **[standard] [custom]** colors.

Painted to match enclosure.

Enclosure Height: **<Insert inches>**.

Enclosure Depth: **<Insert inches>**.

* + - * 1. Accessories: Filler sections, corners, relay sections, and splice plates all matching the enclosure and grille finishes.

1. EXECUTION
   * + 1. EXAMINATION
          1. Examine areas to receive finned-tube radiation heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
          2. Examine roughing-in for **[hydronic-piping] [steam-piping] [electrical]** connections to verify actual locations before installation of finned-tube radiation heaters.
          3. Proceed with installation only after unsatisfactory conditions have been corrected.
       2. BASEBOARD RADIATION HEATER INSTALLATION
          1. Install units level and plumb.
          2. Install enclosure continuously around corners, using outside and inside corner fittings.
          3. Join sections with splice plates and filler pieces to provide continuous enclosure.
          4. Install access doors for access to valves.
          5. Install enclosure continuously from wall to wall.
          6. Terminate enclosures with manufacturer's end caps except where enclosures are indicated to extend to adjoining walls.

Retain three paragraphs below for hot-water or steam units.

* + - * 1. Install valves within reach of access door provided in enclosure.
        2. Install air-seal gasket between wall and recessed flanges or front cover of fully recessed unit.
        3. Install piping within pedestals for freestanding units.
      1. FINNED-TUBE RADIATION HEATER INSTALLATION
         1. Install units level and plumb.
         2. Install enclosure continuously around corners, using outside and inside corner fittings.
         3. Join sections with splice plates and filler pieces to provide continuous enclosure.
         4. Install access doors for access to valves.
         5. Install enclosure continuously from wall to wall.
         6. Terminate enclosures with manufacturer's end caps except where enclosures are indicated to extend to adjoining walls.

Retain three paragraphs below for hot-water or steam units.

* + - * 1. Install valves within reach of access door provided in enclosure.
        2. Install air-seal gasket between wall and recessed flanges or front cover of fully recessed unit.
        3. Install piping within pedestals for freestanding units.
      1. CONNECTIONS

Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

Retain first five paragraphs below for hot-water or steam piping.

* + - * 1. Piping installation requirements are specified in **[Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties."] [Section 232213 "Steam and Condensate Heating Piping" and Section 232216 "Steam and Condensate Heating Piping Specialties."]** Drawings indicate general arrangement of piping, fittings, and specialties.
        2. Connect hot-water finned-tube radiation heaters and components to piping according to Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties."

Install shutoff valves on inlet and outlet, and balancing valve on outlet.

* + - * 1. Connect steam finned-tube radiation heaters and components to piping according to Section 232213 "Steam and Condensate Heating Piping" and Section 232216 "Steam and Condensate Heating Piping Specialties."

Install shutoff valve on inlet; install strainer, steam trap, and shutoff valve on outlet.

* + - * 1. Install control valves as required by Section 230923.11 "Control Valves."
        2. Install piping adjacent to finned-tube radiation heaters to allow service and maintenance.

Retain two paragraphs below for electric finned-tube radiation heaters.

* + - * 1. Ground electric finned-tube radiation heaters according to Section 260526 "Grounding and Bonding for Electrical Systems."
        2. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
      1. FIELD QUALITY CONTROL
         1. Perform the following field tests and inspections:

Retain "Leak Test" subparagraph below for hot-water or steam finned-tube radiation heaters.

Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

Retain "Operational Test" subparagraph below for electric finned-tube radiation heaters.

Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.

Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

* + - * 1. Units will be considered defective if they do not pass tests and inspections.
        2. Prepare test and inspection reports.

END OF SECTION 238236