# BUS SHELTER

**From Springfield CMG PARK(32)

xx. DESCRIPTION OF WORK. This work shall consist of furnishing and installing a bus shelter at the location shown in the Plans and as directed by the Engineer.

xx. MATERIALS. Materials shall meet the requirements of the following Subsections:

Structural Lumber and Timber.....709.01
Structural Steel.....714.02

(a) Framing. Timber framing shall be fabricated from appearance grade white oak (No. 1) timber. Joints shall be mortised and tenoned in traditional timber framing methods.

Roof sheathing shall be No. 1 or No. 2 SPF, sized as specified in the Plans.

Bench framing and seat shall be Appearance grade white oak.

MDO plywood exposed surfaces shall be primed and painted with a durable exterior latex green paint as shown in the Plans and to the satisfaction of the Engineer. The paint shall be a green color approved by the Engineer.

All exposed wood surfaces shall be finished with a transparent penetrating oil sealer as shown in the Plans and to the satisfaction of the Engineer. Acceptable finishing products include:

Penofin Log-On
Manufacturer: Performance Coating, Inc.
Ukiah, California 95418

WoodPro-UV
Manufacturer: Heartwood Corporation
Portland, Oregon 97201

Land Ark Wood Finish
231 Tawnes Road
North Augusta, SC 29860

(b) Roofing.

(1) General. This Section includes specifications for standing-seam metal roof panels to be used for this project.

Conduct pre-installation conference at location determined by VTrans.

(2) Submittals.

a. Action Submittals.

1. Product Data. For each type of product.

2. Fabrication Drawings. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

3. Samples. For each type of metal panel indicated.

b. Information Submittals.

1. Product test reports.

2. Warranties. Sample of special warranties.

(3) Quality Assurance.

a. Installer Qualifications. An entity that employs installers and supervisors who are trained and approved by manufacturer.

b. UL-Certified, Portable Roll-Forming Equipment. UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

(4) Warranty.

a. Special Warranty. Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Warranty Period. Two years from date of Substantial Completion.

b. Special Warranty on Panel Finishes. Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period. 20 years from date of Substantial Completion.

c. Special Weathertightness Warranty. Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period. 20 years from date of Substantial Completion.

(5) Products.

a. Performance Requirements.

1. Wind-Uplift Resistance. Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

i. Uplift Rating = UL 90.

2. Thermal Movements. Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

i. Temperature Change (Range) = 120°F (67°C), ambient.

b. Standard Seam Metal Roof Panel.

1. General. Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

i. Steel Panel Systems. Unless more stringent requirements are indicated, comply with ASTM E 1514.

2. Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels. Formed with vertical ribs at panel edges and a flat pan between ribs; designed for sequential installation by mechanically attaching

panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and snapping panels together.

i. 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:

Architectural Metal Systems.
Eufaula, AL 36027

CENTRIA Architectural Systems.
Moon Township, PA 15108–2944

Ryerson, Inc.
Chicago, IL 60608

ii. Metallic-Coated Steel Sheet. Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 coating designation, Preprinted by the coil-coating process to comply with ASTM A 755/A 755M.

Nominal Thickness: 0.0359 inch (20 gage).

Exterior Finish: Two-coat fluoropolymer.

Color: Green. Final approval shall be by VTrans from manufacturer's full range.

iii. Clips. One-piece fixed to accommodate thermal movement.

Material: 0.064-inch- (1.63-mm-) nominal thickness, zinc-coated (galvanized) steel sheet.

iv. Panel Coverage. 12 inches.

v. Panel Height. 1.0 inch (25 mm).

c. Underlayment Materials.

1. Felt Underlayment. ASTM D 226/D 22M, Type II (No. 30), asphalt-saturated organic felts.

2. Slip Sheet. Manufacturer's recommended slip sheet, of type required for application.

d. Miscellaneous Materials.

1. Miscellaneous Metal Subframing and Furring. ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

2. Panel Accessories. Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

i. Closures. Provide closures at eaves and ridges, fabricated of same metal as metal panels.

ii. Backing Plates. Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

iii. Closure Strips. Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1 inch (25 mm) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

3. Flashing and Trim. Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

4. Panel Fasteners. Self-tapping screws designed to withstand design loads.

5. Panel Sealants. Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

i. Sealant Tape. Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

ii. Joint Sealant. ASTM C 920; as recommended in writing by metal panel manufacturer.

iii. Butyl-Rubber-Based, Solvent-Release Sealant. ASTM C 1311.

(6) Fabrication.

a. General. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

b. On-Site Fabrication. Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

c. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

d. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

e. Sheet Metal Flashing and Trim. Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply

to design, dimensions, metal, and other characteristics of item indicated.

(7) Finishes.

a. Panels and Accessories. Two-Coat Fluoropolymer; Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.

(c) Windows. Windows shall be single panel, fixed unit. All frame and sash extruded sections shall be constructed from controlled aluminum alloys suitable for the finish selected. The hardware components shall be of non-ferrous, non-magnetic metals or stainless steel.

Frames shall be sized to accommodate ½ inch thick glass lights.

Glass shall be ½ inch thick polycarbonate plastic sheet that is impact, abrasive, and UV resistant with high light transmission. An acceptable product is LEXAN MR10 by General Electric or equivalent. Color shall be “clear”. Sheets should be virtually unbreakable.

Windows shall have the finish and color selected by the Engineer.

(d) Joint Sealants. Elastomeric joint sealants shall be installed to establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates. Joint sealants, backings, and other related materials shall be compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience. The color of the joint sealants shall be as indicated by the manufacturer’s designations.

Elastomeric sealants shall comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

(1) Stain-Test-Response Characteristics. Elastomeric sealants shall be nonstaining to porous substrates. The Contractor shall provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for the project.

(2) Single Component Neutral-Curing Silicone Sealant. Subject to compliance with the requirements of these specifications, the following products may be

incorporated into the work for joints in exterior vertical and soffit surfaces:

790 Silicone Sealant
Manufacturer: Dow Corning Corporation
Midland, MI 48686

SilPruf LM SCS2700
Manufacturer: GE Silicones

Spectrem 1
Manufacturer: Tremco Commercial Sealants & Waterproofing
Beachwood, OH 44122
Pecora 864
Manufacturer: Pecora Corporation
Harleysville, PA 19438

(3) Latex Sealant. Latex sealants shall comply with ASTM C 834, Type P, Grade NF. Subject to compliance with the requirements of these specifications, the following products may be incorporated into the work:

Chem-Calk 600
Manufacturer: Bostik Findley
Wauwatosa, WI 53226

AC-20+
Manufacturer: Pecora Corporation
Harleysville, PA 19438

Sonolac
Manufacturer: Sonneborn, Division of ChemRex Inc.

Tremflex 834
Manufacturer: Tremco Commercial Sealants & Waterproofing
Beachwood, OH 44122

The Contractor shall provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by the sealant manufacturer based on field experience and laboratory testing.

(e) Post-Installed Concrete Anchor Adhesive System.

(1) Fasteners and Anchors.

a. Carbon and Alloy Steel Nuts. ASTM A563.

b. Carbon Steel Washers. ASTM F436.

c. Carbon Steel Threaded Rod. ASTM A36; or ASTM A193 Grade B7; or ISO 898 Class 5.8.

d. Zinc Plating. ASTM B633.

e. Hot-Dip Galvanizing. ASTM A153.

(2) Drilled-in anchors shall be installed by a Contractor with at least three years of experience performing similar installations.

(3) Cartridge Injection Adhesive Anchors. Hot dipped galvanized threaded steel rod, complete with nuts, washers, polymer or hybrid mortar adhesive injection system, and manufacturer's installation instructions. Type and size as indicated on Drawings.

Subject to compliance with the requirements of these specifications, the following products may be incorporated in the Work for anchor adhesive:

Hilti RE 500
Manufacturer: Hilti, Inc
West Hartford, CT 06119

Powers T308+
Manufacturer: Powers Fasteners
Brewster, NY 10509

Sure Anchor I (J-51)
Manufacturer: Dayton Superior Corporation
Kansas City, KS 66106

xx. GENERAL FABRICATION REQUIREMENTS. Fabrication Drawings shall be submitted in accordance with Section 105.

Prior to performing any work under this Section, the Fabricator shall have received approval for all Fabrication Drawings and shall have notified the Engineer a minimum of seven (7) days prior to beginning fabrication. The Contractor shall bear full responsibility for costs of all materials ordered, raw materials stockpiled, and for work performed prior to approval of the Fabrication Drawings or written authorization from the Engineer.

xx. INSTALLATION. Installation shall meet the following requirements:

(a) Roofing.

(1) Preparation.

Miscellaneous Supports. Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

(2) Underlayment Installation.

Felt Underlayment. Apply at locations indicated below, in shingle fashion to shed water, and with

lapped joints of not less than 2 inches (50 mm). Apply over the entire roof surface.

Slip Sheet. Apply slip sheet over underlayment before installing metal roof panels.

Flashings. Install flashings to cover underlayment to comply with industry standards.

(3) Metal Panel Installation.

a. Standing-Seam Metal Roof Panel Installation. Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.

1. Install clips to supports with self-tapping fasteners.

2. Install pressure plates at locations indicated in manufacturer's written installation instructions.

3. Snap Joint. Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.

4. Seamed Joint. Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.

5. Watertight Installation.

i. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommended in writing by manufacturer as needed to make panels watertight.

ii. Provide sealant or tape between panels and protruding equipment, vents, and accessories.

iii. At panel splices, nest panels with minimum 6 inch (152 mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

b. Accessory Installation. Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal

expansion. Coordinate installation with flashings and other components.

c. Flashing and Trim. Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

(4) Cleaning and Protection. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

(b) Windows.

(1) General Requirements. The Contractor shall submit to the Engineer shop drawings of the window units. Each set shall contain all sections, details, instructions, and installation recommendations for the full description of the units and full explanation of proper receipt, handling, storage, and installation for all sizes, shapes, and types called for.

The Contractor shall submit four (4) sets of color samples to the Engineer for color selection.

Comply with manufacturer’s specifications and recommendations for the installation of window units, hardware, operators, and other components of the work.

Set units plumb, level, and true to line, without warp or rack of frames or sash. Anchor securely in place. Separate aluminum, zinc coated, and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

Clean metal surfaces promptly after installation of windows, exercising care to avoid damage to the protective coating (if any). Remove excess glazing and sealant compounds, dirt, or other substances.

Advise Contractor of protective treatment and other precautions required through the remainder of the construction period to ensure that window units will

be without damage or deterioration at the time of acceptance.

(c) Joint Sealant.

(1) General Requirements. Joint sealants shall not be installed under the following conditions:

a. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40°F.

b. When joint substrates are wet.

c. Where joint widths are less than or greater than those allowed by joint-sealant manufacturer for applications indicated.

d. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

e. When substrates have not cured sufficiently.

(2) Surface Cleaning of Joints. Joints shall be cleaned out immediately prior to installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

a. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

b. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include concrete, masonry, and unglazed surfaces of ceramic tile.

c. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include metal, glass, porcelain enamel, and glazed surfaces of ceramic tile.

(3) Joint Priming. Masking tape shall be used where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Masking tape shall be removed immediately after tooling without disturbing joint seal.

This work shall comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

(4) Installation. Sealant backings of type indicated shall be installed to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability. The following requirements shall be met:

a. Do not leave gaps between ends of sealant backings.

b. Do not stretch, twist, puncture, or tear sealant backings.

c. Remove excess material.

d. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

Bond-breaker tape shall be installed behind sealants where sealant backings are not used between sealants and backs of joints.

Sealants shall be installed using proven techniques that comply with the following and at the same time backings are installed:

a. Place sealants so they directly contact and fully wet joint substrates.

b. Completely fill recesses in each joint configuration.

c. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

d. Install in uniform continuous ribbons without gaps or air pockets.

(5) Tooling of Nonsag Sealants. Immediately after sealant application and before skinning or curing

begins, sealant shall be tooled according to the requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

a. Remove excess sealant from surfaces adjacent to joints.

b. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

c. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

Damaged or deteriorated joint sealants shall be removed immediately in order that installations with repaired areas are indistinguishable from original work.

Excess sealant or sealant smears adjacent to joints shall be cleaned off as the work progresses by methods and with cleaning materials approved in writing by the manufacturers of joint sealant and of products in which joints occur.

(d) Post-Installed Concrete Anchor Adhesive System.

(1) Drilled-In Anchors.

a. Drill holes with rotary impact hammer drills using carbide-tipped bits. Drill bits shall be of diameters as specified by the anchor manufacturer. Unless otherwise shown on the Drawings, all holes shall be drilled perpendicular to the concrete surface.

1. Embedded Items. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in drilling to avoid damaging existing reinforcing or embedded items. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling.

2. Base Material Strength. Unless otherwise specified, do not drill holes in concrete until concrete has achieved full design strength.

b. Perform anchor installation in accordance with manufacturer instructions.

c. Cartridge Injection Adhesive Anchors. Clean all holes per manufacturer instructions to remove loose material and drilling dust prior to installation of adhesive. Inject adhesive into holes proceeding from the bottom of the

hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive. Follow manufacturer recommendations to ensure proper mixing of adhesive components. Sufficient adhesive shall be injected in the hole to ensure that the annular gap is filled to the surface. Remove excess adhesive from the surface. Shim anchors with suitable device to center the anchor in the hole. Do not disturb or load anchors before manufacturer specified cure time has elapsed.

d. Observe manufacturer recommendations with respect to installation temperatures for cartridge injection adhesive anchors and capsule anchors.

(2) Remove and replace misplaced or malfunctioning anchors. Fill empty anchor holes and patch failed anchor locations with high-strength non-shrink, nonmetallic grout. Anchors that fail to meet proof load or installation torque requirements shall be regarded as malfunctioning.

(3) Testing. All 4 drilled-in anchors shall be proof loaded by the independent testing laboratory. Adhesive anchors shall not be torque tested. If any of the tested anchors fail to achieve the specified proof load within the limits as defined on the Drawings, all anchors of the same diameter and type as the failed anchor shall be tested, unless otherwise instructed by the Engineer.

a. Tension testing should be performed in accordance with ASTM E488.

b. Proof loads shall be applied with a calibrated hydraulic ram. The proof load for the bus shelter anchors is 2,000 lbs. Displacement of adhesive and capsule anchors at proof load shall not exceed D/10, where D is the nominal anchor diameter.

xx. METHOD OF MEASUREMENT. The quantity of Special Provision (Bus Shelter) to be measured for payment will be each bus shelter installed in the complete and accepted work.

xx. BASIS OF PAYMENT. The accepted quantity of Special Provision (Bus Shelter) will be paid for at the Contract unit price for each. Payment shall be full compensation for furnishing and installing a bus shelter as specified and for furnishing all labor, materials, tools, equipment, and incidentals necessary to complete the work.

Payment will be made under:

| Pay Item | Pay Unit |
| --- | --- |
| 900.645 Special Provision (Bus Shelter) | Lump Sum |