CONTRACT DOCUMENTS
SUPPLEMENTAL MATERIAL SPECIFICATIONS

FOR

CUY-Main Avenue Connector TLCI

Ohio Department of Transportation PID No. 111396

Prepared for

THE OHIO DEPARTMENT OF TRANSPORTATION

In conjunction with:

THE HISTORIC WAREHOUSE DISTRICT DEVELOPMENT CORPORATION

AND

THE CITY OF CLEVELAND,

SPECIFICATIONS GROUP

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APPENDICES GROUP

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SECTION 010426 - SPECIALTY SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Providing labor, materials, tools, and equipment to furnish and install the following items:

1. Light Bar: Light Bar, including aluminum sign cabinet, internal structure, finish paint, polycarbonate lens, integrated LED lighting, dimmers, and controllers shall be measured as **LUMP SUM** furnished and installed. Payment will be made under **ITEM 690: SPECIAL – LIGHT BAR** at the contract unit price per **LUMP SUM**, which shall be compensation in full for all costs of delegated design, engineering, furnishing, and installing Light Bar, including the following items, complete in place as specified.
   a. Delegated design and engineering.
   b. Aluminum sign cabinet and internal structure as indicated in construction drawings and as specified herein and in related requirements Section 055000 "Metal Fabrications"
   c. Finish paint as indicated in construction drawings and specified in related requirements Section 099113 "Exterior Painting."
   d. Polycarbonate lens as indicated in construction drawings and specified herein.
   e. LED lighting as indicated in construction drawings.
   f. Drivers, dimmers and controllers.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for metal fabrications and assemblies.
2. Section 099113 "Exterior Painting" for finishing metal fabrications.

1.2 REFERENCES

A. ASTM Testing Standards:

1. ASTM D 5420 – Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen
2. ASTM D 638 – Standard Test Method for Tensile Properties of Plastics

B. All Testing Standards listed in Section 055000 "Metal Fabrications" for shop priming metal fabrications.

C. All Testing Standards listed in Section 099113 "Exterior Painting" for shop priming metal fabrications.

1.3 DEFINITIONS

A. Illuminated: Illuminated by lighting source integrally constructed as part of the sign unit.

1.4 COORDINATION

A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.5 ACTION SUBMITTALS

A. Make submittals in accordance with ODOT CMS Section 105.02.

B. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

C. Shop Drawings: For panel signs.

1. Include fabrication and installation layouts and details of aluminum cabinet & internal structure and attachments to other work.
2. Include fabrication and installation layouts and details of LED lighting elements.
3. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
4. Show location and means of access for lighting dimmers, drivers, and controllers.
5. Show locations of electrical service connections.
6. Include diagrams for power, signal, and control wiring.

D. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available cabinet finish and polycarbonate acrylic face.

E. Delegated-Design Submittal: For aluminum sign cabinet, internal structure, finish paint, polycarbonate lens, integrated LED lighting, dimmers, and controllers and associated assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1. Manufacturers must submit 3 references showing products of projects completed within the last 6 years within 50 miles of the project area.

B. Submit manufacturer's technical data and installation for light bar.

C. Submit shop drawings including plans, elevations, sections, and mounting details.

D. Samples: Submit samples, not less than 6" long on actual sections of steel or aluminum having the specified finish.

E. Mockups: The Owner or Owner's Representative reserves the right to request mockup portions of the Light Bar Cabinet.

F. Sample Warranty: For special warranty.

G. Maintenance Data: For signs to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator experienced in the fabrication and installation of large, illuminated specialty signage.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify locations of structural columns embedded in permanent construction by other installers by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Deterioration of finishes beyond normal weathering.
   b. Deterioration of polycarbonate lens.
   c. Separation or delamination of sheet materials and components.
   d. Deterioration or fault of lighting, drivers, dimmers, or controllers.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design Light Bar, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Owner’s Representative.

B. Structural Performance: Light Bar and supporting elements shall withstand the effects of gravity and other loads, including any incidental live loads.

C. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

D. 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.

2.2 SPECIALTY SIGNS

A. Light Bar: Sign with smooth, uniform surfaces and precisely formed lines and profiles; and as follows:

1. Illuminated Panel Sign: Backlighted construction with LED lighting including transformers, insulators, dimmers, and other accessories for operability, with provision for servicing and concealing connections to the electrical system. Use tight or sealed joint construction to prevent unintentional light leakage. Space lamps apart from each other and away from sign surfaces as needed to illuminate lens surface evenly.

a. Power: As indicated on electrical Drawings.

b. Dimmers: As necessary to tune lighting to achieve proper safe lighting levels that meets local, city, and state code requirements.
c. Weeps: Provide weep holes to drain water at lowest part of exterior signs. Equip weeps with permanent baffles to block light leakage without inhibiting drainage.

2. Hollow-Box Sign Frame: Entire perimeter framed with formed-aluminum sheet or extruded-aluminum, hollow-box-type frame with vertical edges attached to supports with aluminum fittings. Close top and bottom edges of panels with manufacturer's standard welded seams or extrusions.

a. Hollow-Box Depth: As indicated on Drawings.
b. Profile: As indicated on Drawings.

c. Corner Condition in Elevation: Square
d. Finish and Color: Baked enamel or powder coat, color as indicated on drawings.

2.3 MATERIALS

A. All metal fabrications to comply with "SECTION 055000 – METAL FABRICATIONS."

B. Aluminum Sheet and Plate: ASTM B209 alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

C. Aluminum Extrusions: ASTM B221 alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

D. Plastic-Laminate Sheet:

1. Polycarbonate Acrylic, Sign Grade (Resist SG), 0.177-inch nominal thickness.
   a. Recommended Product: ACRYLITE® LED Sign Grade
   b. Acrylite: 1796 Main Street, Sanford, ME 04073
   c. Or approved equal.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined.
1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
3. Exposed Meta-Fastener Components, General:
   a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
   b. Fastener Heads: For nonstructural connections, use screws and bolts with tamper-resistant slots unless otherwise indicated.

B. Adhesive: As recommended by sign manufacturer.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.

3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Conceal fasteners and anchors unless indicated to be exposed; locate exposed fasteners where they will be inconspicuous.
6. Internally brace signs for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
7. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

B. Light Bar: Construct sign-cabinet surfaces to be smooth and fabricate for structural performance indicated and of lengths required for installation method of light bar.

1. Increase panel thickness or reinforce with concealed stiffeners or backing materials as needed to produce surfaces without distortion, buckles, warp, or other surface deformations.
2. Continuously weld joints and seams unless other methods are indicated; grind, fill, and dress welds to produce smooth, flush, exposed surfaces with welds invisible after final finishing.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

B. Color Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.8 STEEL FINISHES

A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, and prepare for coating according to coating manufacturer's written instructions.

1. For Baked-Enamel or Powder-Coat Finish: After cleaning, apply a conversion coating compatible with the organic coating to be applied over it.

B. Factory Prime Finish: After surface preparation and pretreatment, apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer.

C. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that anchorage devices embedded in permanent construction are correctly sized and located to accommodate signs.

D. Verify that electrical service is correctly sized and located to accommodate signs.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.

2. Shim-Plate Mounting: Provide 1/8-inch thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other direct mounting methods are impractical. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach signs to plate using Through Fasteners method specified above.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 010426

SECTION 055000 – METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Providing labor, materials, tools, and equipment to furnish and install the following items:

1. Light Bar: Metal work inclusive to the Light Bar will be made under ITEM 690: SPECIAL – LIGHT BAR as outlined in SECTION 010426 – “SPECIALTY SIGNAGE.”

2. Metal Work shown on Architectural Drawings not specified as part of products specified in other sections.

B. Related Requirements

1. Section 099113 "Exterior Painting" for finishing metal fabrications.
2. Section 010426 “Specialty Signage” for panel signage.
3. Furnish all steel products in accordance with ODOT CMS Section 106.09 Steel Products Made in the United States.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 SUBMITTALS

A. Make submittals in accordance with ODOT CMS Section 105.02.

B. Product Data: Submit copies of manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions for stock products.

C. Mill Certificates: Signed by stainless steel manufacturers, certifying that products furnished comply with requirements.

D. Retain "Welding certificates" Paragraph below if retaining "Welding Qualifications" Paragraph in "Quality Assurance" Article.

E. Welding certificates.

F. Retain "Paint Compatibility Certificates" Paragraph below if primers are fully specified in this Section rather than in painting Sections.

G. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

H. Research Reports: For post-installed anchors.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with the provisions of the following, except as otherwise shown and specified:

1. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings," including "Commentary of the AISC Specifications."
2. AISC "Specification for the Design of Cold-Formed Steel Structural Members."
3. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
   a. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   b. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
   c. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of any existing elements and other construction contiguous with metal fabrications by field measurements before fabrication.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver items in a sequence as required to be incorporated into the Work without delaying the Project.

B. Keep members off the ground. Protect steel members and packaged materials from corrosion and deterioration.

C. Do not store materials on the structure in a manner that might cause distortion or damage to the members or the supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

2.2 MATERIALS

A. Steel Materials:

1. Each Should comply to the following standards:
    a. Steel Plates, Shapes and Bars: ASTM A 36 or A572, Grade 50.
    b. Steel Plates to be Bent or Cold Formed: ASTM A 283.
    c. Steel Tubing: ASTM A 501, or ASTM A 500.
    d. Hot-Rolled Structural Steel Sheets: ASTM A 570, Grade 30, unless otherwise required by design loading.
    e. Cold-Rolled Structural Steel Sheets: ASTM A 611, Grade A, unless otherwise required by Design Loading.
    f. Steel Pipe: ASTM A 53 black finish standard weight, (Schedule 40), unless otherwise indicated.

B. Aluminum:

1. Each shall comply to the following standards:
    a. Alloy and Temper: Provide alloy and temper as specified or as otherwise recommended by the aluminum producer or finisher.
    b. Sheet: Flat sheet complying with ASTM B209, alloy and temper recommended by aluminum producer and finished for the type of use and required finish and with not less than the strength and durability properties of alloy 5005-H15.
    c. Extruded Shapes and Bar: ASTM B 221.
    d. Extruded Pipe and Tube: ASTM B 429.
    e. Plate and Sheet: ASTM B 209.
    f. Drawn Seamless Tube: ASTM B 483.
    g. Castings: ASTM B 26.
    h. Forgings: ASTM B 247.
2. Or approved equal by Owner or Owner’s Representative.

C. Stainless Steel:

1. Each shall comply to the following standards:
    a. Stainless-Steel Bars and Shades: ASTM A-276, Type 316L.
    b. Stainless-Steel Strip, Plate and Flat Bars: ASTM A-666, Type 316L.
    c. Stainless-Steel Pipe: ASTM A-312/A-312M, Grade TP, 316L.
    d. Stainless-Steel Tubing: ASTM A-554, Grade MT, 316L.
2. Or approved equal by Owner or Owner’s Representative.

D. Brackets, Flanges and Anchors: Cast of the same type material and finish as supported rails tapped for concealed attachment, unless otherwise indicated.

E. Fasteners:
1. General: Provide zinc-coated fasteners, with galvanizing complying with ASTM A 153, for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required for the installation of metal items.
2. Toggle Bolts: Tumble wing type, FS FF-B-588, type, class and style as required.

F. Concrete Inserts: Threaded or wedge type as shown, galvanized ferrous castings, either malleable iron, ASTM A 47 or cast steel, ASTM A 27. Provide belts, washers and shims as required, hot-dipped galvanized, ASTM A 153.

G. Non-Shrink Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

H. Anchor Rods: ASTM F 1554, Grade 36, non-headed type, unless otherwise indicated.

I. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:

J. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A 325.

K. Steel Primer Paint (Except where specified otherwise): Chromate and lead free rust-inhibitive metal primer equal to Tnemec; 10-99G.

2.3 FABRICATION

A. Shop Assembly: Pre-assemble items in the shop to the greatest extent possible, so as to minimize field splicing and assembly of units at the Project Site. Disassemble units only to the extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Basic Fabrication:

1. Use materials of the size and thicknesses shown or, if not shown, of the required size and thickness to produce adequate strength and durability in the finished product for the intended use. Work to the dimensions shown or accepted on Shop Drawings, using proven details of fabrication and support.
2. Form exposed Work true to line and level with accurate angles and surfaces and straight, sharp edges. Ease exposed edges to a radius of approximately 1/32". Form bent metal corners to the smallest radius possible without causing grain separation or otherwise impairing the Work.
3. Weld corners and seams continuously and in accordance with the recommendations of AWS. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.

4. Form exposed connections with hairline joints which are flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of the type shown or, if not shown, use Phillips flat-head (countersunk) screws or bolts.
5. Provide for anchorage and space anchoring devices to provide adequate support for the intended use of the Work.
6. Cut, reinforce, drill and tap Metalwork indicated to receive other items.

C. Rough Hardware:

1. Furnish bent or, otherwise, custom-fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes.
2. Manufacture or fabricate items of sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

D. Miscellaneous Framing and Supports:

1. Fabricate miscellaneous units to the sizes, shapes and profiles shown or, if not shown, of the required dimensions to receive adjacent Work to be retained or supported by the framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars, of all welded construction using mitered corners, welded brackets and splice plates and a minimum of joints for field connection. Cut, drill and tap units to receive hardware and similar items to be anchored to the Work.
2. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

E. Loose Bearing and Leveling Plates: Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required.

2.4 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.

1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe.
2. Unless otherwise indicated, provide 1/2-inch baseplates with four 5/8-inch anchor bolts and 1/4-inch top plates.

D. Galvanize miscellaneous framing and supports where indicated.

E. Prime miscellaneous framing and supports with Section 099113 "Exterior Painting" where indicated.

2.5 SHOP FINISHING

A. Shop Painting:

1. Shop paint ferrous metalwork except surfaces and edges to be field welded (and those indicated to be galvanized).
2. Remove scale, rust and other deleterious materials before the shop coat of paint is applied. Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning." Clean off heavy rust and loose mill scale in accordance with SSPC SP-2 "Hand Tool Cleaning," SSPC SP-3 "Power Tool Cleaning," or SSPC SP-7 "Brush-Off Blast Cleaning." (Except clean steel that is to receive organic zinc-rich primer in accordance with SSPC-4 SP-6 “Commercial Blasting.”
3. Apply one shop coat of metal primer paint to fabricated metal items, except apply 2 coats of paint to surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.
4. Immediately after surface preparation, brush or spray on metal primer paint, applied in accordance with the manufacturer's instructions and at a rate to provide a uniform, dry film thickness of 2.0 mils for each coat (except 3.0 mils dry for zinc-rich coating). Use painting methods which will result in full coverage of joints, corners, edges and all exposed surfaces.

B. Corrosion Protection: Coat concealed surfaces which will be in contact with concrete, masonry, wood, or dissimilar metals, in exterior work and work to be built into exterior and below grade walls and decks, with a heavy coat of bituminous paint. Do not extend coating onto exposed surfaces.

PART 3 - EXECUTION

3.1 PREPARATION

A. Furnish setting drawings, diagrams, templates, instructions and directions for the installation of anchorages, such as concrete inserts, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate the delivery of such items to the Project Site.

3.2 INSTALLATION

A. Set accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.

B. Brace temporarily or anchor temporarily in formwork where Work is to be built into (concrete) and (masonry) or similar construction.

C. Anchor securely as required for the intended use, using concealed anchors wherever possible.

D. Fit exposed connections accurately together to form tight, hairline joints. Weld connections which are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Grind joints smooth and touch up shop paint coat.

E. Perform cutting, drilling and fitting required for the installation of the metal items, except cutting and drilling is not allowed on shop finish painted items. Restore finish.

F. Comply with AWS Code for the procedures of manual-shielded metal-arc welding, the appearance and quality of welds made, and the methods used in correcting welding work.

3.3 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness

2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting."
3. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055000

SECTION 061500 – THERMALLY MODIFIED WOOD DECKING SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Providing labor, materials, tools, and equipment to furnish and install the following items:

1. Thermally Modified Wood Deck Boards: Deck boards are inclusive to the Decking System and will be made under ITEM 690: SPECIAL – DECKING SYSTEM as outlined in SECTION 061533 “DECKING SYSTEM.”

2. Thermally Modified Wood Trim Boards: Trim boards are inclusive to the Decking System and will be made under ITEM 690: SPECIAL – DECKING SYSTEM as outlined in SECTION 061533 “DECKING SYSTEM.”

B. Related Requirements:

1. Section 061533 "Decking System."

1.2 REFERENCES

A. Reference Standards:

1. American Wood Protection Association (AWPA):
   a. Guidance Document N – Data Requirements for Listing Thermally Modified Wood
   b. AWPA E10-14 – Soil Block Decay Test

2. American Society for Testing and Materials (ASTM):
   a. ASTM D143 – Standard Test Methods for Small Clear Specimens of Timber.
   b. ASTM D2395 – Standard Test Methods for Density and Specific Gravity (Relative
   c. Density) of Wood and Wood-Based Materials.

1.3 SUBMITTALS

A. Make submittals in accordance with ODOT CMS Section 105.02.

B. Product Data: Manufacturer’s standard specifications and descriptive literature, including:

1. Manufacturer’s product data sheets.
2. Manufacturer’s installation instructions.
3. Material Safety Data Sheets (MSDS).

C. Samples: One 12-inch long deck board and one 12-inch long trim board sample illustrating size, profile, color, and surface finish.

D. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

E. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria, and physical requirements.

F. Product Evaluation Reports: Submit manufacturer's product evaluation reports from accredited, evaluation service.

G. Qualification Data: For installer’s experience, submit verification of evidence of work similar to the work of this section.

H. Maintenance Data: Manufacturer’s instructions on care and cleaning of thermally modified wood products.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Experienced in performing work similar to work of this Section.

B. Source Limitations: Obtain thermally modified wood decking from a single manufacturer.

C. Regulatory Requirements: Comply with requirements of authorities having jurisdiction and applicable codes at the location of the project.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in accordance with manufacturer’s written instructions.

1. Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact and product name and manufacturer clearly visible and sizes to suit project.

B. Store materials protected from exposure to harmful environmental conditions, clean, dry, frost-free and at recommended temperature and humidity levels.

1. Store thermally modified wood decking on flat, level surface, raised above floor or ground, with adequate support to prevent sagging.
2. Keep thermally modified wood decking covered and free of dirt, debris, and moisture until installation.
3. Protect materials and finish during storage, handling, and installation to prevent damage.

1.6 WARRANTY

A. Warranty: Fully executed, issued in Owner's name and registered with manufacturer, including:

1. Manufacturer's standard 15-year warranty, from date of substantial completion, covering defects in materials.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Decking and trim shall be thermally modified wood, certified conforming to AWPA Use-Class UC3B, Above Ground, Exposed (see AWPA Guidance N for required tests). Manufacturer should be able to present certification, and documentation of the quality processes used during thermal modification. Wood shall be sourced & processed entirely in the U.S.

B. Acceptable Manufacturers:

1. Arbor Wood Co., 1325 N 59th Ave. W., Duluth, MN 55807; Tel: 877.970.7877; Email: info@arborwoodco.com; Web: arborwoodco.com
2. Thermory USA, 213 Wilmette Avenue, Suite 208 Wilmette, IL 60091; Tel: 847.256.8828; Email: support@thermoryusa.com; Web: thermoryusa.com
3. Or Approved Equal

2.2 PERFORMANCE REQUIREMENTS

A. Comply with ICC-ES Report ESR-2388.

B. Composite Wood Decking: To ASTM D7032 and ASTM D1037.

C. Thermal Transmission: To ASTM C518.

D. Surface Burning Characteristics: To ASTM E84 Class C or Class III.

1. Flame spread: 100.
2. Smoke Developed: 350.

E. Ignition Characteristics: To ASTM D1929

1. Self Ignition: 741 degrees F.
2. Flash ignition: 729 degrees F.

F. Insect Resistance: To AWPA E1.

G. Comply with Federal Manufactured Home Construction and Safety Standards.

H. Flexural Properties: To ASTM D648 and ASTM D6109.

I. Hardness: To ASTM D143.

J. Abrasion Resistance: To ASTM D2394.

K. Compressive Strength: To ASTM D1621, 962 psi.

L. Heat Softening: Comply with ASTM D1525.

2.3 THERMALLY MODIFIED WOOD DECKING SYSTEM

A. Thermally Modified Wood Deck Boards

1. Wood decking attached with mechanical fastener system.
2. Species: Thermally Modified Pine
3. Grade: FAS / Select & Better
4. Size: 5/4 x 6 nominal; 1 x 5-1/2 inches, actual
5. Profile: No Groove
6. Length: 6’-0” or Longer
7. Exposed Texture: Smooth.
8. Color: Medium brown/190deg cook. Color and appearance is a natural feature of wood, and may vary slightly from one piece to another. Wood will naturally patina when left unfinished.

B. Thermally Modified Wood Trim

1. Wood decking attached with mechanical fastener system.
2. Species: Thermally Modified Pine
3. Grade: FAS / Select & Better
4. Size: 1 x 6, nominal; 3/4 x 5-1/2 inches, actual.
5. Profile: E4E or S4S without hidden fastener grooves.
6. Length: 6’-0” or Longer
7. Exposed Texture: Smooth.
8. Color: Medium brown/190deg cook. Color and appearance is a natural feature of wood, and may vary slightly from one piece to another. Wood will naturally patina when left unfinished.

2.4 ACCESSORIES

A. Mechanical Fasteners: To ASTM D1761.

1. Hot dip galvanized steel or stainless steel of length in accordance with thermally modified wood decking manufacturer’s written recommendations.

PART 3 - EXECUTION

3.1 INSTALLER

A. Use only installers who have training and experience of work similar to the work of this section.

3.2 EXAMINATION

A. Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for thermally modified wood decking installation in accordance with manufacturer's written recommendations.

1. Visually inspect substrate in presence of consultant.
2. Inform consultant of unacceptable conditions immediately upon discovery.
3. Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.
4. Starting installation of thermally modified wood decking implies substrate conditions are acceptable for Work of this Section.

3.3 PREPARATION

A. Repair substrate flaws or defects before applying decking or trim.

B. Where necessary, fur surfaces to an even plane and free from obstructions before application.

3.4 INSTALLATION

A. Install thermally modified wood decking and trim in accordance with manufacturer's written instructions at locations indicated on the Drawings.

B. Deck Design: To AWC NDS.

C. Layout and install joists at 12 inch maximum on center when decking will be installed perpendicular to joists.

1. Do not exceed maximum spans in accordance with manufacturer's written recommendations.
2. Ensure joists are level, plumb and square.

D. Do not install thermally modified decking or trim in structural or load-bearing applications.

E. Install thermally modified decking and trim plumb, level, square, and true to line.

F. Install deck boards in pattern indicated on drawings and secure with mechanical fasteners.

1. Ensure each deck board has three joist supports minimum.
   a. Use 2 minimum fasteners at each joist support.
   b. Pre-drill fastener holes closer than 1 inch from deck board edges.
2. Allow 1/4 inch side-to-side spacing between deck boards.
3. Allow 1/8 inch minimum end-to-end spacing at butt joints between deck boards.
4. Stagger butt joints on decks longer than 20 feet.
   a. Stagger butt joints in adjacent rows one support minimum.
5. Cut boards to fit around posts.
   a. Allow 1/8 inch minimum space between deck boards and posts.
6. Cut deck boards true and square to length after securing.
   a. Rasp deck board edges to finish.

3.5 ADJUSTING

A. Repair minor damages to thermally modified decking and trim in accordance with manufacturer's instructions and as approved by Owner’s Representative.

B. Remove and replace with new material, damaged thermally modified wood decking and trim that cannot be successfully repaired, as determined by Owner’s Representative.

3.6 CLEANING

A. Perform daily progress cleaning.

   1. Leave work area clean at end of each day.

B. Upon completion, remove surplus materials, rubbish, tools and equipment.

C. Collect recyclable waste and dispose of at appropriate recycling facilities.

D. Final Cleaning: Clean thermally modified wood surfaces using manufacturer’s written care instructions.

3.7 PROTECTION

A. Protect applied composite wood decking from damage during construction.

B. Repair or replace adjacent materials damaged by installation of composite wood decking.

END OF SECTION 061500

SECTION 061533 – DECKING SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Providing labor, materials, tools, and equipment to furnish and install the following items:

1. Decking System: Decking System, wood framing substructure, thermally modified wood deck boards, thermally modified wood trim boards, & appurtenances shall be measured as **LUMP SUM** furnished and installed. Payment will be made under **ITEM 690: SPECIAL – DECKING SYSTEM** at the contract unit price per **LUMP SUM**, which shall be compensation in full for all costs of furnishing, and installing Decking System, including the following items, complete in place as specified.
   a. Cut and installed thermally modified deck boards and trim boards as indicated in construction drawings and as specified herein.
   b. Support framing for elevated decks.
   c. All associated hardware and appurtenances.

B. Related Requirements:

1. Section 061500 “Thermally Modified Wood Decking System.”

1.2 DEFINITIONS

A. Boards: Lumber of less than 2 inches nominal in thickness and 2 inches nominal or greater in width.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

C. Timber: Lumber of 5 inches nominal or greater in least dimension.

D. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. RIS: Redwood Inspection Service.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

1.3 ACTION SUBMITTALS

A. Make submittals in accordance with ODOT CMS Section 105.02.

B. Product Data:

1. For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
2. For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates:

1. For lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by ALSC's Board of Review.
2. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Certificates of Inspection: Issued by lumber grading agency for exposed wood products not marked with grade stamp.

C. Evaluation Reports: For the following, from ICC-ES.

1. Preservative-treated wood products
2. Expansion anchors.
3. Metal framing anchors.
4. Decking fasteners.

D. Qualification Data: For installer’s experience, submit verification of evidence of work similar to the work of this section.

E. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Experienced in performing work similar to work of this Section.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify locations and elevations of existing curbs, sidewalks, historic wall and steps, and asphalt surfaces in permanent construction by field measurements before

fabrication. Contractor to notify owner’s representative of any discrepancies prior to construction.

B. DELIVERY, STORAGE, AND HANDLING

C. Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of foundation, wood framing, substructure, and decking systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including decay, honeycomb, knot holes, shake, splits, torn grain, and wane or other deformations.
   b. Deterioration framing and other materials beyond normal weathering.
2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Wood framing, substructure, and decking assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction. Wood framing and decking shall comply with ASTM E2266-11.

B. Structural Performance: Provide foundations, wood framing, substructure, and decking assemblies capable of withstanding the effects of the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:

1. Decking, wood framing, substructure, and all associated hardware must comply with all local, city, and state codes and support a minimum live load of 100 lbs per square foot.

2.2 LUMBER, GENERAL

A. Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by ALSC's Board of Review.

1. Factory mark each item with grade stamp of grading agency.

2. For items that are exposed to view in the completed Work, mark grade stamp on end or back of each piece.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
4. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content:

1. Boards: 19 percent.
2. Dimension Lumber: 19 percent for 2-inch nominal thickness or less; 19 percent for more than 2-inch nominal thickness.

2.3 DIMENSIONAL LUMBER FRAMING

A. Deck Framing: No. 1 grade and the following species:

1. Southern pine; SPIB

B. Deck Framing: Any species and grade with a modulus of elasticity of at least 1,300,000 psi and an extreme fiber stress in bending of at least 850 psi for 2-inch nominal thickness and 12-inch nominal width for single-member use.

2.4 POSTS

A. Dimension Lumber Posts: No. 2 grade and any of the following species:

1. Mixed southern pine; SPIB.

2.5 PRESERVATIVE TREATMENT

A. Pressure treat boards and dimension lumber with waterborne preservative according to AWPA U1; Use Category UC3b for exterior construction not in contact with the ground and Use Category UC4a for items in contact with the ground.

B. Pressure treat timber with waterborne preservative according to AWPA U1; Use Category UC4a.

1. Treatment with CCA shall include post-treatment fixation process.

C. Pressure treat poles with waterborne preservative according to AWPA U1; Use Category UC4a.

1. Treatment with CCA shall include post-treatment fixation process.

D. Preservative Chemicals: Acceptable to authorities having jurisdiction.

1. Do not use chemicals containing arsenic or chromium.

E. Use process for boards and dimension lumber that includes water-repellent treatment.

F. After treatment, redry dimension lumber to 19 percent maximum moisture content.

G. Mark treated wood with treatment quality mark of an inspection agency approved by ALSC's Board of Review.

1. For items indicated to receive a stained or natural finish, mark each piece on surface that will not be exposed.

H. Application: Treat all wood unless otherwise indicated.

2.6 THERMALLY MODIFIED WOOD DECKING

A. General: Furnish, cut, and install thermally modified wood decking performed according to SECTION 061500 “THERMALLY MODIFIED WOOD DECKING SYSTEM” and as indicated on Drawings.

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.

1. Use stainless steel fasteners with hot-dip zinc coating complying with ASTM A153/A153M or ASTM F2329 unless otherwise indicated.
2. For pressure-preservative-treated wood, use stainless steel fasteners.
3. For composite decking, use stainless steel fasteners where fasteners are exposed to view.

B. Nails: ASTM F1667.

C. Power-Driven Fasteners: ICC-ES AC70.

D. Lag, Hex, Thru Bolts and wood screws: ASME B18.2.1, ASME B18.6.1, or ICC-ES AC233.

E. Carbon-Steel Bolts: ASTM A307 with ASTM A563 hex nuts and, where indicated, flat washers all hot-dip zinc coated.

F. Stainless Steel Bolts: ASTM F593, Alloy Group 1 or 2; with ASTM F594, Alloy Group 1 or 2 hex nuts and, where indicated, flat washers.

G. Post-installed Anchors: Stainless steel, chemical or torque-controlled expansion anchors with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as

determined by testing according to ASTM E488, conducted by a qualified independent testing and inspecting agency.

1. Stainless steel bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

H. Post bases shall be adjustable 1” standoffs attached with through bolts and anchored into the concrete bases.

2.8 METAL FRAMING ANCHORS

A. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. Joist Hangers: U-shaped, with 2-inch- long seat and 1-1/4-inch- wide nailing flanges at least 85 percent of joist depth.

1. Thickness: 0.062 inch.

C. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch above base and with 2-inch- minimum side cover, socket 0.062 inch thick, and standoff and adjustment plates 0.108 inch thick.

D. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.

1. Width: 1-1/4 inches.
2. Thickness: 0.062 inch.
3. Length: 24 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify all measurements in field prior to execution of Decking System. Contractor to notify owner’s representative of any discrepancies prior to construction.

B. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Prime wood indicated to be painted, including both faces and edges. Cut to required lengths and prime ends. Comply with requirements in Section 099113 "Exterior Painting."

3.3 INSTALLATION, GENERAL

A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.

B. Framing Standard: Comply with AF&PA WCD1 unless otherwise indicated.

C. Install metal framing anchors to comply with manufacturer's written instructions.

D. Do not splice structural members between supports unless otherwise indicated.

E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

F. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of members or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

G. Apply copper naphthenate field treatment to comply with AWPA M4, to cut surfaces of preservative-treated lumber.

H. Securely attach exterior rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. ICC-ES AC70 for power-driven fasteners.
2. Retain one of two subparagraphs below, with or without subparagraph above.
3. "Fastening Schedule" in ICC's International Building Code.
4. "Fastener Schedule for Structural Members" and "Alternate Attachments" in ICC's International Residential Code for One- and Two-Family Dwellings.

I. Use common wire nails unless otherwise indicated. Select fasteners of size that do not fully penetrate members where opposite side is exposed to view. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads unless otherwise indicated.

J. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced and with adjacent rows staggered.

3.4 INSTALLATION OF ELEVATED DECK JOIST FRAMING

A. General: Install joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on concrete. Attach floor joists where framed into wood supporting members by using wood ledgers as indicated or, if not indicated, by using metal joist hangers. Do not notch joists.

B. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.

C. Lap members framing from opposite sides of beams or girders not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.

D. Provide solid blocking of 2-inch nominal thickness by depth of joist at intervals of 96 inches o.c., between joists.

END OF SECTION 061533

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following exterior substrates:

1. Steel and iron.
2. Galvanized metal.
3. Aluminum (not anodized or otherwise coated).
4. Wood.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for shop priming metal fabrications.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.3 CLOSEOUT SUBMITTALS

B. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used,

product data pages, material safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 3 gal. of each material and color applied.

1.5 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Owners Representative will select one surface to represent surfaces and conditions for application of each paint system.

a. Vertical and Horizontal Surfaces: Provide samples of at least 2 sq. ft.
b. Other Items: Owners Representative will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Owners Representative at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owners Representative specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacture’s label with the following information:

1. Product name and type (description).
2. Batch date.
3. Color number.
4. VOC content.
5. Environmental handling requirements.
6. Surface preparation requirements.

7. Application instructions.

B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Sherwin-Williams Company, The; 101 W. Prospect Avenue, Cleveland, OH 44115; Phone: (800) 321-8194, (216) 566-2000; Website: www.sherwin-williams.com.

B. Benjamin Moore & Co.; 101 Paragon Drive, Montvale, NJ 07645; Phone: (866) 708-9180; Email: info@benjaminmoore.com; Website: www.benjaminmoore.com.

C. Or approved Equal

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: For field applications, provide paints and coatings that complies with VOC content limits of authorities having jurisdiction.

D. Colors: As indicated on drawings and specifications. Where finish color is unspecified, contractor shall confirm with Owner's Representative which color to apply.

1. Fire Orange:

a. Color Match RAL 3028 "Pure Red"
b. Sherwin-Williams "Fireworks" (SW6867)
c. Benjamin Moore "Orange" (2011-10)
d. Or approved equal.

2. Finish Grey:

a. Color Match RAL 7011 "Iron Grey"
b. Sherwin-Williams "Mount Etna" (SW7625)
c. Benjamin Moore "Stonecutter" (2135-20)
d. Or approved equal.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The Contractor shall review the product manufacturer's special instructions for surface preparation, application, temperature, re-coat times, and product limitations.

B. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

G. Aluminum Substrates: Remove loose surface oxidation.

H. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

3. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint undercoats same color as topcoat but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Ferrous Metal, Galvanized-Metal, and Aluminum Substrates:

1. Water-Based Light Industrial Coating System, semi-gloss:

a. Prime Coat: Primer, water based.
   1) S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, 5.0 to 10.0 wet, 2.0 to 4.0 mils dry.
   2) Benjamin Moore Ultra Spec HP Acrylic DTM Semi-Gloss Enamel HP29 (45 g/L), MPI # 141, X-Green 141, 153, X-Green 153, 5.0 to 10.0 wet, 2.0 to 4.0 mils dry
   3) Or approved equal.

b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.

a. Topcoat: Light industrial coating, exterior, water based, semi-gloss.
   1) S-W Pro Industrial Acrylic Semi-Gloss Coating, B66-650 Series, at 2.5 to 4.0 mils dry, per coat.
   2) Benjamin Moore Ultra Spec HP Acrylic DTM Semi-Gloss Enamel HP29 (45 g/L), MPI # 141, X-Green 141, 153, X-Green 153, at 2.5 to 4.0 mils dry, per coat.
   3) Or approved equal.

C. Wood Substrates: Including exposed wood items not indicated to receive shop-applied finish.

1. Latex System:

a. Prime Coat: Primer, latex for exterior wood.
   1) S-W Exterior Latex Primer, B42, at 4.0 mils wet, at 1.4 mils dry, per coat.
   2) Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, at 1.4 mils dry, per coat.
   3) Or approved equal.

b. Intermediate Coat: Latex, exterior, matching topcoat.

c. Topcoat: Latex, exterior, flat:
   1) S-W A-100 Exterior Latex Flat, A6 Series, at 4.0 mils wet, 1.2 mils dry, per coat.
   2) Benjamin Moore Floor & Patio Latex Enamel Low Sheen N122 (45 g/L), at 1.2 mils dry, per coat.
   3) Or approved equal.

END OF SECTION 099113

SECTION 321726 – TACTILE WARNING SURFACE

PART 1 - GENERAL

1.1 SUMMARY

A. Providing labor, materials, tools, and equipment to furnish and install the following items:

1. Tactile Warning Studs: Stainless-Steel Detectable Warning Studs, including accessories and adhesive, shall be measured as **LUMP SUM** furnished and installed. Payment will be made under **ITEM 690: SPECIAL – TACTILE WARNING STUDS** at the contract unit price per **LUMP SUM**, which shall be compensation in full for all costs of furnishing and installing Tactile Warning Studs, including the following items, complete in place as specified.
    a. Surface-applied detectable warning studs

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for metal fabrications and assemblies.
2. Section 608.03 of ODOT CMS “Concrete Walks” for concrete walkways serving as substrates for tactile warning surfacing.
3. Furnish all steel products in accordance with ODOT CMS Section 106.09 Steel Products Made in the United States.

1.2 COORDINATION

A. Furnish templates for placement of Tactile Warning Studs.

1.3 ACTION SUBMITTALS

A. Product Data: Submit manufacturer’s literature describing products, installation procedures and routine maintenance.

B. Samples for Verification Purposes: Submit one (2) full size sample of the kind proposed for use.

1.4 INFORMATIONAL SUBMITTALS

A. Shop drawings are required for products specified showing product details.

B. Samples: Submit samples, not less than 6” long on actual sections of steel or aluminum having the specified finish.

C. Sample Warranty: For special warranty.

D. Maintenance Instructions: Submit copies of manufacturer's specified installation and maintenance practices for each type of studs/bars and accessories as required.

1.5 QUALITY ASSURANCE

A. Provide Stainless Steel Detectable Warning Surface Studs and accessories as produced by a single manufacturer with a minimum of three (3) years' experience.

B. Installer's Qualifications: Engage an experienced installer who has successfully completed installations similar in material, design, and extent to that indicated for project.

C. Provide Stainless Steel Detectable Warning Surface Studs which are in compliance with:
1. Americans with Disabilities Act (Title III Regulations, 28 CFR Part 36 ADA STANDARDS FOR ACCESSIBLE DESIGN, Appendix A, Section 4.29.2 DETECTABLE WARNINGS ON WALKING SURFACES).
2. California Code of Regulations (CCR): Provide only approved DSAAC detectable warning products as provided in the California Code of Regulations (CCR) Title 24, Part 2, Section 205 definition of "Detectable Warning". Section 1117A.4 and 1127B.5 for "Curb Ramps" and Section 1133B.8.5 for "Detectable Warnings at Hazardous Vehicular Areas".

D. Stainless Steel Detectable Warning Surface Studs shall be manufactured from grade 316 stainless steel and have an integral non-slip surface on the top of the Studs. The Studs shall have measurements of nominal 0.2 inch in height, 0.9 inch base diameter and 0.45 inch top diameter. The Bars shall have measurements of nominal 0.2 inch in height, 1.0 inch wide and 11.0 inch in length. "Advantage One Tactile Dome/Bar Systems" as manufactured by Advantage Tactile Systems Inc. (1-800-679-4022).

E. Stainless Steel Detectable Warning Surface Studs material shall meet the following ASTM specifications:
1. A182, A193, A276, A313, A314, A320, A479, A493 and A580.
2. Chemical properties shall be: C 0.08%, Cr 17%, Fe 65%, Mn 2%, Mo 2.5%, Ni 12%, P 0.045%, S 0.03%, Si 1%.
3. Mechanical properties shall be:
4. T ensile Strength > 79,800 psi,
5. Yield Strength >34,800 psi,
6. Elongation at Break (in 50 mm) > 60%,
7. Rockwell B Hardness < 80,
8. Brinell Hardness < 149,
9. Izod Impact > 95.1 ft-lb.
10. Slip Resistance when tested by ASTM C 1028-96 the combined Wet and Dry Static Co-Efficients of Friction not to be less than 0.80 on top of studs/bars.
11. Chemical Stain Resistance when tested by ASTM D 543-95 (re approved 2001) to withstand without discoloration or staining - saturated calcium chloride, red enamel spray paint, red lipstick, red wax crayon, black liquid ink, chewing gum, mustard, ketchup, urine, coffee, asphalt, tobacco juice, hydraulic oil and used motor oil.

12. Abrasive Wear when tested by BYK – Gardener Tester ASTM D 2486-00 with reciprocating linear motion of 37± cycles per minute over a 10" travel. The abrasive medium, a 40 grit Norton Metallite sand paper, to be fixed and leveled to a holder. The combined mass of sled, weight and wood block is to be 3.2 lb. Average wear depth shall not exceed 0.04" after 1,000 abrasion cycles when measured on the top surface of the dome/bar representing the average of three measurement locations per sample.
13. Abrasive Wear when tested by Taber Tester ASTM C 501-84 and US Specifications SS-T- 308b with H22 coarse Calibrade Wheels with each testing coupon weighed to the nearest 0.01 gram. Average wear index shall be a minimum of 480 after 1,000 abrasion cycles with ASTM C 501-84 parameters and 210 with SS-T-308b parameters when measured on the top surface of the dome/bar representing the average of four sample measurements.
14. Salt and Spray Performance when tested to ASTM B 117-03 not to show any deterioration or other defects after 100 hours of exposure.
15. AASHTO HB-17 single wheel HS20-44 loading "Standard Specifications for Highways and Bridges". The Directional Tactile Detectable Warning Tactile Studs and Bars shall be mounted on a platform then subjected to the specified maximum load of 10,400 lbs., corresponding to an 8,000 lb individual wheel load and a 30% impact factor. The Studs shall exhibit no visible damage at the maximum load of 10,400 lbs.

1.6 FIELD CONDITIONS

A. Environmental Conditions: Maintain a suitable temperature as per manufacturer's requirements.

1.7 WARRANTY

1. Stainless Steel Detectable Warning Surface Studs shall be guaranteed in writing for a period of five (5) years from date of final completion of project. Product is guaranteed from defective material and breakage.

2. Installer must provide a two (2) year installation warranty. Product must be guaranteed from defective work and loosening of Stainless-Steel Detectable Warning Surface Studs.

PART 2 - PRODUCTS

2.1 TACTILE WARNING DOMES

A. Manufacturer

1. Advantage Tactile Systems, Inc., 241 Main Street, Suite 100, Buffalo, NY 14203. Phone: (800) 679-4022. Website: www.advantagetactile.com
   a. Advantage ONE Stainless Steel Domes

2. Kent Stainless, 11 Apex Drive, Suite 300A, Marlborough, MA 01752. Phone: (781) 374 7391. Website: www.kentstainless.com.

a. Tactile Warning Multi Groove Stainless Steel Stud

3. Or approved equal.

B. Existing engineered and field-tested products which have been in successful service for a period of three (3) years, and are subject to compliance with requirements, may be incorporated in the work provided they meet or exceed the specified test criteria and characteristics.

2.2 ACCESSORIES

A. Adhesive: As recommended by manufacturer for adhering tactile warning surface studs to pavement.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions. Verify that installation of tactile warning surfacing will comply with accessibility requirements upon completion.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Select correct drill bit size for peg diameter of dome/bar. Ensure you use correct drill bit for corresponding surface/substrate. Mark drill bit to gauge depth or add a depth limiter which corresponds to overall peg length. DO NOT MEASURE FROM TIP OF DRILL BIT. This will allow dome hole to be slightly deeper than the length of the peg.

B. Lay the template down (purchased from manufacture) on working surface. Check alignment of holes, studs placement look best when holes are centered in field of work. Use weights/pressure to help secure template on surface while drilling first hole. Use a dowel and insert in newly drilled hole to secure the template. Repeat same procedure to opposite corner.

C. Drill out remaining holes in template as needed. Move template through field of work using pegs (more may be needed) to align template with previous drilled holes. (There will be 25 holes per square foot.)

D. Clean loose debris from holes, using shop vac or similar means that suits your surface/substrate.

E. Inject adhesive into drilled holes. (Quarter filled should be sufficient.) DO NOT OVER FILL HOLES. Once Stainless-Steel Detectable Warning Surface Studs are inserted and if adhesive spills out, clean immediately with appropriate manufactures recommended cleaning agent.

F. Refer to the adhesive manufacture's installation instructions for correct guidelines for that adhesive.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed studs that do not comply with specified requirements.

B. Protect tactile warning surfacing from damage and maintain free of stains, discoloration, dirt, and other foreign material.

END OF SECTION 321726

SECTION 323300 - SITE FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Providing labor, materials, tools, and equipment to furnish and install the following items:

1. Bench Swing & Connections: Bench Swing, Suspension Unit, & Connections shall be measured as **EACH** furnished and installed. Payment will be made under **ITEM 690: SPECIAL – BENCH SWINGS & CONNECTIONS** at the contract unit price per **EACH**, which shall be compensation in full for all costs of furnishing and installing Bench Swings, Suspension Units, & Connections, including the following items, complete in place as specified.
   a. Two (2) Bench Swings
   b. Two (2) Swing Suspension Kits, including suspension hanger, vertical bolt clamp, and installation hardware.

1.2 REFERENCES

A. ASTM Testing Standards:

1. ASTM B 117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.
2. ASTM D 522 – Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.
3. ASTM D 523 – Standard Test Method for Specular Gloss.
4. ASTM D 2247 – Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
5. ASTM D 2794 – Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
6. ASTM D 3359 – Standard Test Methods for Measuring Adhesion by Tape Test.
7. ASTM D 3363 – Standard Test Method for Film Hardness by Pencil Test.
8. ASTM G 155 – Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.

B. ISO Testing Standards:

1. ISO 1520 – Paints and Varnishes – Cupping Test.
2. ISO 2815 – Paints and Varnishes – Buchholz Indentation Test.

1.3 ACTION SUBMITTALS

A. Product Data: Submit manufacturer’s product data, storage, and handling requirements and recommendations, installation methods, and available colors, styles, patterns, and textures.

B. Samples: Submit manufacturer's samples of materials, finishes, and colors.

C. Shop Drawings: Submit manufacturer's shop drawings, including plans and elevations, indicating overall dimensions.

D. Warranty: Manufacturer's standard warranty.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage: Store materials in clean, dry area in accordance with manufacturer's instructions. Keep materials in manufacturer's original, unopened containers and packaging until installation.

C. Handling: Protect materials and finish during handling and installation to prevent damage.

1.5 WARRANTY

A. Warranty Information:

1. Products will be free from defects in material and/or workmanship for a period of three years from the date of invoice.

PART 2 - PRODUCTS

2.1 BENCH SWINGS

A. Manufacturer

1. Landscape Forms, Inc., 7800 E. Michigan Ave, Kalamazoo, Michigan 49048. Phone: (800) 521-2546. Fax (269) 381-3455. Website www.landscapeforms.com E-mail: specify@landscapeforms.com
2. Forms + Surfaces, 30 Pine Street, Pittsburgh, PA 15223. Phone: (800) 451-0410. Website: www.forms-surfaces.com. Email: sales@ www.forms-surfaces.com
3. Or approved equal.

B. Benches

1. Landscape Forms "Austin" Backed Arms Bench with "Austin" Swing Suspension Kit
   a. Length: 72"
   b. Bench insert: Aluminum
   c. Bench Arm Option: End and center arms
   d. Suspension Clamp Style: Vertical bolt

e. Suspension Hanger Length: ±102 3/4", to be confirmed with field measurements to meet 18" required seat height per manufacturer's recommendations.

2. Forms + Surfaces "Trio" Backed Bench with custom configuration to convert to swing unit
   a. Length: 72"
   b. Bench slats: Aluminum
   c. Bench Arm Option: Integral end and center armrests
3. Or approved equal.

C. Materials

1. Seat and back panels:
   a. Aluminum: Extruded aluminum boards for the face and interior seats are clear anodized (202-R1) and powder coated.
2. Frame, Legs, and Arms:
   a. End caps, back straps and arm rests: 319 cast aluminum. End frames are welded to ¾" Aluminum 6061 plate. Suspension arms bolt to seat with 3/8-16 x 1-1/4" hex head screws, high-strength grade 8 steel zinc-aluminum coated bolts and 3/8" washers.
      1) Center arm required as needed to limit the max seat width to 4-feet or less.
3. Suspension arms:
   a. Solid round bar, CR1018, 1in diameter, with 5/16" thick A36 steel plate spacers welded to arms. Arm assembly is welded to ¾" thick A36 steel plate at top and 3/8" thick A36 steel plate for seat attachment.
   b. Clamp: steel components. Includes neoprene bumper, high-load sealed ball bearings, 303 stainless steel bearing shaft. Hardware is included.
4. Accessories
   a. Clamp Bolts:
      1) Vertical bolt (C) style: ½-13 x 2" hex head screws, galvanized, with ½-13 galvanized nylon locknut, and ½" galvanized washers.
5. Fabrication
   a. Assembly: Shop assembled benches.

D. Finishes

1. Finish on Metal:
   a. Primer: Rust inhibitor
   b. Topcoat: Thermosetting TGIC polyester powder coat. UV, chip, and flake resistant.
2. Finish must meet the following test results:
   a. Gloss Consistency, Gardner 60 Degrees, ASTM D 523: Plus or minus 5 percent from standard.
   b. UV Resistance, Color and Gloss, ASTM G 155, Cycle 7: Delta E less than 2 at 2.0 mils and less than 20 percent loss.
   c. Cross-Hatch Adhesion, ASTM D 3359, Method B: 100 percent pass.
   d. Flexibility Test, Mandrel, ASTM D 522: 3 mm at 2 mils.
   e. Erichsen Cupping, ISO 1520: 8 mm.
   f. Impression Hardness, Buchholz, ISO 2815: 95.

g. Impact Test, ASTM D 2794: 60 inch-pounds at 2.5 mils.
h. Pencil Hardness, ASTM D 3363: 2H minimum.
i. Corrosion Resistance, 1,500-Hour Test, ASTM B 117: Max. undercutting 1 mm.
j. Humidity Resistance, 1,500-Hour Test, ASTM D 2247: Max. blisters 1 mm.

3. Color:
   a. Bench color: Landscape Forms “Flambe’ Orange,” RAL 3028 “Pure Red,” or approved equal.
   b. End caps and Arms color: RAL 7024 “Graphite Grey,” or approved equal.
   c. Suspension color: RAL 7024 “Graphite Grey,” or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.

B. Verify that substrates are stable and cable of supporting the weight of items covered under this section.

C. Verify that substrates have been adequately prepared to securely anchor those that will be surface mounted.

D. Notify Owner’s Representative of conditions that would adversely affect installation or subsequent use.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.

3.3 ADJUSTING

A. Finish Damage: Repair minor damages to finish in accordance with manufacturer’s instructions and as approved by Owner’s Representative.

B. Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Owner's Representative.

3.4 CLEANING

A. Clean site furnishings promptly after installation in accordance with manufacturer's instructions.

B. Do not use harsh cleaning materials or methods that could damage finish.

3.5 PROTECTION

A. Protect installed products to ensure that, except for normal weathering, products will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 323300

CONTRACT DOCUMENTS

APPENDICES TO THE SUPPLEMENTAL MATERIAL SPECIFICATIONS

FOR

CUY-Main Avenue Connector TLCI

Ohio Department of Transportation PID No. 111396

Prepared for

THE OHIO DEPARTMENT OF TRANSPORTATION

In conjunction with:

THE HISTORIC WAREHOUSE DISTRICT DEVELOPMENT CORPORATION

AND

THE CITY OF CLEVELAND,

Infrastructure Consulting Engineers

1100 Superior Avenue • Suite 2020 • Cleveland • Ohio • 44114

REPORT ON GEOTECHNICAL INVESTIGATION

PROPOSED LIGHTBAR AND SWING STRUCTURE AT THE ARCHER BUILDING
WAREHOUSE DISTRICT LIGHTHOUSE STREETSCAPE PROJECT
CLEVELAND, OHIO

Prepared for:

WSP USA, Inc.
1660 West 2nd Street, Suite 820
Cleveland, Ohio 44113

January 29, 2019
2018104A

Somat Engineering of Ohio, INCORPORATED

Somat Engineering of Ohio, INCORPORATED

January 29, 2019
2018104A

Mr. Stephen J. Gage, P.E.
WSP USA, Inc.
1660 West 2nd Street, Suite 820
Cleveland, Ohio 44113

Re: Report on Geotechnical Investigation
Proposed Light Bar and Swing Structure at the Archer Building
Warehouse District Lighthouse Streetscape Project
Cleveland, Ohio

Dear Mr. Gage:

We have completed the geotechnical investigation for the proposed Lighthouse Streetscape project along West 9th Street at the Archer Building in Cleveland, Ohio. This report presents the results of our field and laboratory testing, our interpretation of the subsurface conditions at this site, and geotechnical design and construction considerations based on the soil and groundwater conditions encountered.

The soil samples collected during our field investigation and tested in-house will be retained in our laboratory for 90 days from the date of the final geotechnical investigation report, at which time they will be discarded unless otherwise directed by you.

Upon your review, if you should have any questions please contact us. It is a pleasure working with you on this project.

Sincerely,
Somat Engineering, Inc.

Ali Parsipour, P.E.
Senior Project Manager

JSS/CRH/AP/mi

REPORT ON GEOTECHNICAL INVESTIGATION
PROPOSED LIGHT BAR AND SWING STRUCTURE AT THE ARCHER BUILDING
WAREHOUSE DISTRICT LIGHTHOUSE STREETSCAPE PROJECT
CLEVELAND, OHIO

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REPORT ON GEOTECHNICAL INVESTIGATION
PROPOSED LIGHT BAR AND SWING STRUCTURE AT THE ARCHER BUILDING
WAREHOUSE DISTRICT LIGHTHOUSE STREETSCAPE PROJECT
CLEVELAND, OHIO

1.0 INTRODUCTION

1.1 GENERAL

Upon authorization from WSP USA, Inc. (WSP), Somat Engineering, Inc. (Somat) has conducted a geotechnical investigation for the proposed landscape structure along West 9th Street at the Archer Building within the City of Cleveland, Ohio. The new structure is being constructed as part of the overall Ohio Department of Transportation (ODOT) Local Public Agency (LPA) Warehouse District Streetscape Project. This geotechnical investigation was performed in accordance with Somat Proposal No. P180301 (dated September 11, 2018).

The following sections of this report will provide our understanding of the proposed geotechnical aspects of the new structure, a description of our field investigation, the results of the field and laboratory tests, the logs of test borings obtained for this structure during our investigation, and our geotechnical recommendations for the foundations based on the soil and groundwater conditions encountered in our investigation.

1.2 PROJECT INFORMATION

This project site is located outside of The Archer building in the Warehouse District of Cleveland. The Archer building is located at 1220 West 9th Street. As we understand, landscape improvements are being planned along the sidewalk adjacent to The Archer building parking lot along West 9th Street.

As part of the design, a new light bar and swings are proposed to be constructed. Within this area, there are four concrete columns that were left in place and were part of some structure at one time. There are no drawings or plans indicating how they were constructed or how they are being supported. Reuse of these columns for support of the new light bar and swings is desired,

however, with no information on their structural capacity or integrity, additional columns will need to be constructed for support of new structures. These existing columns could be left in place and incorporated into the design, provided new foundations are constructed to support all of the new loading.

1.3 SITE CONDITIONS

The new landscape project is located in the West 9th Street right-of-way adjacent to the Archer Building parking lot. An existing sidewalk runs through this area and is separated from the parking lot by a landscape bed with mulch and decorative plants. The existing concrete columns are located within this landscape bed.

This area of the warehouse district is elevated above the lower "flats" area near the Cuyahoga River. We estimate the ground surface elevation in the area of the project is approximately 645 feet, while the river elevation is about 570 feet, about 1,000 feet to the west. Therefore, we anticipate the presence of urban fill soils and debris within this parcel.

2.0 SUBSURFACE INVESTIGATION

2.1 FIELD EXPLORATION

The subsurface investigation for the new structure consisted of performing two (2) soil borings, each extending to a depth of about 30 feet below existing grade.

The number of soil borings were designated by WSP, and the depth and location were determined by Somat. Somat staked the boring locations in the field, taking into consideration the locations of the utilities (underground and overhead) as well as physical access for the drill rig. The ground surface elevation at the boring locations were not determined for this project. A soil boring location diagram is presented in Appendix A for reference.

2.1.1 FIELD OPERATIONS

The field operations for this project took place on October 17, 2018. The soil borings were drilled using a trailer mounted Diedrich D-25 drill rig. The soil borings were advanced using hollow stem augers to termination depth. Upon completion of the borings, the boreholes were backfilled with cuttings. The resulting soil cuttings that could not be placed back into the borehole were spread out in in the landscaped areas.

2.1.2 Standard Penetration Test (SPT)

Soil samples collected during the field portion of the subsurface exploration were labeled with the soil boring designation and a unique sample number. Soil samples were obtained from the soil boring by Standard Penetration Tests in general accordance with ASTM D-1586 procedures, whereby a conventional 2-inch O.D. split-spoon sampler is driven into the soil with a 140-pound hammer repeatedly dropped through a free-fall distance of 30 inches. The sampler was generally driven three successive 6-inch increments, with the blows for each 6-inch increment being recorded. The number of blows required to advance the sampler through 12 inches after an initial penetration of 6 inches is termed the Standard Penetration Test resistance (N-value) and is presented graphically on the individual Logs of Test Borings. As added information, the number of blows for each 6-inch increment is also presented on the boring log.

2.1.3 Sampling

Soil boring samples were recovered using split-spoon sampling procedures in general accordance with ASTM Standard D-1586 ("Standard Method for Penetration Tests and Split Barrel Sampling of Soils"). Samples were obtained at a regular interval of 2½ feet to 10 feet then every 5 feet to the bottom of the boring. The split spoon samples were sealed in glass jars in the field to protect the soil and maintain the soil's natural moisture content.

All soil samples were transported to Somat's laboratory for further analysis and testing. The geotechnical soil samples collected for this investigation will be retained in our laboratory for a period of 90 days from the date of the final geotechnical investigation report, after which they will be discarded unless we are notified otherwise.

2.1.4 Groundwater Level Observation Procedures

Whenever possible, groundwater level observations were made during the drilling operations and are shown on the individual Logs of Test Borings. During drilling, the depth at which free water was observed, where drill cuttings became saturated or where saturated samples were collected, was indicated as the groundwater level during drilling. In granular, pervious soils, the indicated water levels are considered relatively reliable when solid or hollow-stem augers are used for drilling. However, in cohesive soils, groundwater observations are not necessarily indicative of the static water table due to the low permeability rates of the soils, and due to the sealing off of natural paths of groundwater flow during drilling operations.

It should be noted that seasonal variations and recent rainfall conditions may influence the level of the groundwater table significantly. Groundwater observation wells are generally used if precise groundwater table information is needed, however the installation of wells was not included in the scope for this project. For the purposes of this investigation and the scope of the project, our experience with the soil and groundwater conditions in this area should provide for reasonable approximation of the groundwater level.

2.2 LABORATORY TESTING

All soil samples were classified in general accordance with the Unified Soil Classification System (USCS). Representative cohesive soil samples were subjected to laboratory tests consisting of moisture content and hand penetrometer strength tests. In the hand penetrometer test, the unconfined compressive strength of a cohesive soil sample is estimated by measuring the resistance of the sample to the penetration of a small, calibrated spring-loaded cylinder. The maximum capacity of the penetrometer is 4.5 tons per square foot. Grain size analyses (consisting of sieves and wash loss) were also performed on selected granular soils in order to determine the distribution of grain sizes within the soil sample.

The results of all of the soil classifications and the test results are included on their respective log of test boring in Appendix B and/or tabulated or graphed in Appendix C. All laboratory tests were performed in accordance with their applicable ASTM procedures.

2.3 LIMITATIONS

The scope of our services did not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater or air, on, below or around this site.

3.0 SUBSURFACE CONDITIONS

3.1 SOIL STRATIFICATION

Soil conditions encountered at the boring locations have been evaluated and are presented in the form of Logs of Test Borings. The Logs of Test Borings presented in Appendix B include approximate soil stratification with detailed soil descriptions and selected physical properties for each stratum encountered in the test boring. In addition to the observed subsoil stratigraphy, the Logs of Test Borings present information related to sample data, Standard Penetration Test results, groundwater conditions observed in the borings, personnel involved, and other pertinent data. For information, and to aid in understanding the data as presented on the boring logs, General Notes defining nomenclature used in soil descriptions are presented immediately following the logs in Appendix B. It should be noted that the Logs of Test Borings included with this report have been prepared on the basis of laboratory classifications and testing as well as field logs of the soils encountered. A generalized description of the soils encountered in borings SB-01 and SB-02 is provided below:

Fill/ Possible Fill Soils

2 inches of topsoil, placed for the landscaping bed in this area, was encountered at the surface of each boring. Below the topsoil, apparent sand fill soils were encountered and extended to depths of about 2.5 to 6 feet below existing grade. These soils consisted of poorly graded sand and sand with clay. This fill was found to contain debris, including asphalt and brick pieces. The apparent density of the granular fill soils varied from medium dense to dense.

Below the fill soils in each boring, possible fill soils consisting of silty sand were encountered

and extended to a depth of about 18.5 feet below existing grade. The apparent density of these soils was very loose to loose.

Sand and Clay Layers

Below the cleaner (possible fill) sands, the soil profile in both borings consisted of layers of both sand and clay. These layers consisted of poorly graded fine sand, silty fine sand, lean clay, and sandy lean clay. The clay was very stiff to hard in consistency. These layers were encountered to the explored depth of each soil boring, about 30 feet below existing grade.

It is emphasized that the stratification and layer lines discussed above and shown on the Logs of Test Borings are approximate indications of change from one soil type to another at the location of the borehole. The actual transition from one stratum to the next may be gradual, and may vary within the area represented by the test borings. Please refer to the individual logs for specific details.

3.2 GROUNDWATER LEVEL OBSERVATIONS

During the drilling process, groundwater was observed at a depth of approximately 23.5 feet below existing grade at both locations. Observations were not obtainable after completion of drilling, as the hole caved in immediately upon auger removal.

Oftentimes, a change in color from brown to gray in cohesive soils is a good indication of the long term groundwater level (indicating oxidation). An apparent color change was observed at a depth of about 18.5 feet below existing grade. Based on our experience in this area and the information obtained by our soil boring, we estimate the long-term groundwater level at this site is situated at a depth between about 20 and 25 feet below the existing grade.

It should be noted that the elevation of a perched or natural groundwater table is likely to vary throughout the year depending on the amount of precipitation, runoff, evaporation and percolation in the area, as well as on the water level in the Cuyahoga River and Lake Erie and any other surface water bodies in the vicinity affecting the groundwater flow pattern.

4.0 ANALYSIS AND RECOMMENDATIONS

4.1 FOUNDATION RECOMMENDATIONS

As we understand, new columns will be constructed to support the new landscape structure, which generally consists of a light bar and swings. We understand structural *service* loads are expected to be a maximum of about 35 kips for vertical loading and lateral and moment loads to be about 6.5 kips and 96.3 kip-ft., respectively. *Factored* structural loads are expected to be a maximum of about 39 kips for vertical loading with lateral and moment loads at 9.4 kips and 133.2 kip-ft, respectively.

We anticipate each of these new columns will be supported on drilled shaft foundations, as overturning movements will likely be the driving factor in the design. A spread foundation would need to be sufficiently wide enough to provide resistance to overturning movements, which would likely be prohibitive in this small landscaped area.

4.1.1 Drilled Shaft Design Recommendations

All drilled shafts should be embedded deep enough to resist the overturning moment and shear at the base of the drilled shaft. The vertical compression loads will be resisted primarily by end bearing at the bottom of the drilled shaft. However, we anticipate the overturning and shear forces will control the design of these foundations.

We have developed a general soil profile based on the information obtained in borings SB-01 and SB-02 and tabulated general engineering properties of each soil layer/strata to be used in the design for drilled shafts. This information is presented below:

	Sand fill	Very loose/loose silty sand (possible fill)	Very stiff clay	Medium dense to dense silty sand
Recommended Max. Allowable Bearing Pressure for Vertical Compression Loads (using FS = 3)	N/A	2,000 psf	3,000 psf	4,000 psf
Unit Weight [A]	125 pcf	120 pcf	130 pcf	125 pcf
Cohesion	0 psf	0 psf	1,500 psf	0 psf
Lateral modulus of subgrade reaction, k_h	25 tcf/ft	75 tcf/ft	150 tcf	150 tcf/ft
Skin Friction [B]	250 psf	1,000 psf	2,000 psf	1,000 psf
Friction Angle	28º	30º	0º	32º

[A] For materials below the long-term groundwater level, the buoyant unit weight applies (subtract 62.4 pcf).

[B] The skin friction values provided are ultimate values and are for uniform rectangular distribution, and assume direct contact between the concrete and the soil. If permanent steel casing is used, these values are not applicable.

In general, we recommend neglecting any contribution in strength from the top of the drilled shaft down to a depth equal to the diameter of the shaft. Also, the above values are based on the assumption that the drilled shafts will be in direct contact with the native soils. If a permanent casing is used, then the skin friction values will be significantly reduced to reflect the behavior between the steel casing and the surrounding soils. This reduction would be 70% of the skin friction along the zone with casing (though with the anticipated light loading, this may not be a significant concern).

For vertical compression loads, we recommend the maximum allowable end bearing pressures as indicated in the soil parameter table above. It may be possible to utilize skin friction along the drilled shafts for vertical load design; however, we anticipate the vertical load will not control the design of the drilled shaft foundations. The recommended soil bearing pressures are for drilled shafts having embedment of at least three times the diameter of the shaft. The values provided in the soil parameter table include a factor of safety of 3.

We estimate total settlement for the drilled shaft foundations using the recommended allowable soil bearing pressures and the anticipated axial loads should be less than 1 inch, provided the drilled shaft bearing soils are not significantly disturbed. If the drilled shaft bearing surfaces are significantly disturbed during drilled shaft construction operations, the drilled shaft settlements could be more than 1 inch. These estimates are based on the soil conditions disclosed by the boring, assumed light vertical loading conditions, and our experience with similar soils. This settlement is independent from any creep considerations discussed above.

For overturning considerations, the maximum soil pressure at the toe of the drilled shaft base should not exceed the maximum net allowable soil pressures. Although, if codes allow, it may be possible to increase the allowable bearing pressures by 33 percent for short term wind loading conditions.

4.1.2 Drilled Shaft Construction Considerations

In order to construct the drilled shaft foundations through the existing fill and loose sand soils, it will be necessary to install temporary steel casings in the drilled shaft excavations. An alternative would be to drill the shaft under a slurry to prevent cave-in of the sidewalls, if the awarded contractor has experience doing so.

Further, temporary casing would also prevent perched groundwater from infiltrating into the excavation, though the most significant groundwater would likely come from granular layers below the long term water level, which may or may not be encountered based on the final design depth of the drilled shaft. Based on the significant depth of loose sand in these two soil borings, the contractor should be prepared to use a full-length casing.

The drilled shaft operations should be observed by a qualified geotechnical engineer to verify proper bearing material has been reached and that the bearing surface has been properly cleaned.

If the drilled shaft is constructed in the “dry” (i.e. no more than 2 inches of water covering the base of the shaft excavation), the concrete may be placed by the free-fall method. This method

consists of using a vertical section of concrete chute to direct the concrete flow out of the truck in a vertical stream of concrete with a relatively small diameter. The stream is directed to avoid hitting the sides of the drilled shaft excavation or the reinforcing cage which could cause concrete segregation. This method is applicable to drilled shafts constructed using temporary casing to seal off groundwater seepage.

Significant water seepage in the drilled shaft excavation may necessitate the concrete be placed using the "wet" method" (tremie procedures). If the drilled shaft is constructed using this "wet" method, a tremie pipe connected either to a hopper or concrete pump should be used to displace the water in the drilled shaft excavation upwards as the concrete is placed. If this method is used, detailed procedures should be submitted by the contractor for review and approval by the engineer.

We recommend concrete with a 5 to 7 inch slump or self-compacting concrete be used for all drilled shaft concrete in order to reduce the potential for arching of the concrete, and to provide a workable material. A positive head of concrete, relative to water trapped outside the temporary casing, should always be maintained within the casing to prevent water and/or soil from infiltrating the shaft.

To reduce lateral movement of the drilled shaft and allow the development of adhesion of the upper soils to the sides of the drilled shaft, it is necessary to place concrete in intimate contact with the soil. Any voids or enlargements in the drilled shaft due to over-excavation or caving soil conditions must be filled with concrete at the time the drilled pier concrete is placed. If any casing is left in place permanently (rather than being removed after the concrete is poured), then the concrete would not be in direct contact with the soils. In this case, there would be a significant reduction in skin friction and the design will need to reflect this.

In association with the construction of drilled shafts, the time of construction must be considered. We recommend the construction methods assure the drilled shaft excavation is not left open overnight prior to placing of concrete.

Although obstructions were not encountered during the drilling operations at this site, the contractor should be prepared to deal with this problem, if it occurs, especially considering this area of Cleveland is historically known to have areas of significant fill soils. Boulders and cobbles or other large debris in the fill soils may occur randomly. Because the location of boulders or debris cannot be predicted nor even detected ahead of time, the problems they cause in drilled shaft construction operations has to be dealt with at the time of occurrence. In general, the contractor encountering these obstructions is compensated for the delay caused by the presence and the removal of the boulder. Removal of the boulder (or other obstruction) can typically be achieved by two methods: 1) the boulder can be cored, or 2) the boulder can be broken up by dropping the Kelly bar from the drilled shaft rig onto the boulder. The remaining smaller pieces can then be brought to the surface by the auger.

In general, any excavations should be performed in accordance with published OSHA guidelines. All regulatory requirements must be followed and adequate protection provided for workers. Construction traffic, stockpiles of soil and construction materials should be kept away from the edges of the excavations for a distance equal to the depth of the excavation. If such clearances cannot be maintained, the resulting surcharge loads should be considered.

Care should be exercised when excavating near existing utilities, structures, and pavement to protect them from damage. The contractor should be aware of the existing utility locations before excavating and be prepared to support or brace them, as required.

5.0 GENERAL QUALIFICATIONS

All earthwork and below-grade construction activities (including testing and observation of bearing soils and materials for foundations and verification of proper construction techniques) should be monitored by a qualified engineering inspector, under the direction of a qualified geotechnical engineer, to verify conditions are as presented in this report. Because Somat

performed the geotechnical investigation and provided design assistance based on our interpretation of the subsurface conditions, ideally, we should be retained for construction oversight as it relates to the construction of these foundations. Earthwork operations around the proposed project area and in the vicinity of existing structures should also be closely monitored.

This report and the attached Logs of Test Borings are instruments of service, which have been prepared in accordance with generally accepted soil and foundation engineering practices. We make no warranties either expressed or implied as to the professional advice included in this report.

The contents of this report have been prepared in order to aid in the evaluation of expected subsoil properties to assist the engineer in the design of *this* project at the site specified herein. The contents of this report should not be relied upon for other projects or purposes. In the event that any changes are made in the geotechnically related aspects of this project, however slight, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the conclusions of this report are modified in writing by our office.

Since the information obtained from the soil borings is specific to the exact test locations, soil and water conditions could be different from those occurring at other locations of the site. This report does not reflect variations which may occur between the soil borings. The nature and extent of these variations may not become evident until the time of construction. If significant variations become evident, it may be necessary for us to re-evaluate the recommendations provided in this report.

This report and the associated Logs of Test Borings should be made available to bidders prior to submitting their proposals and to the successful contractor and subcontractors for their information only, and to supply them with facts relative to the subsurface investigation, laboratory tests, etc.

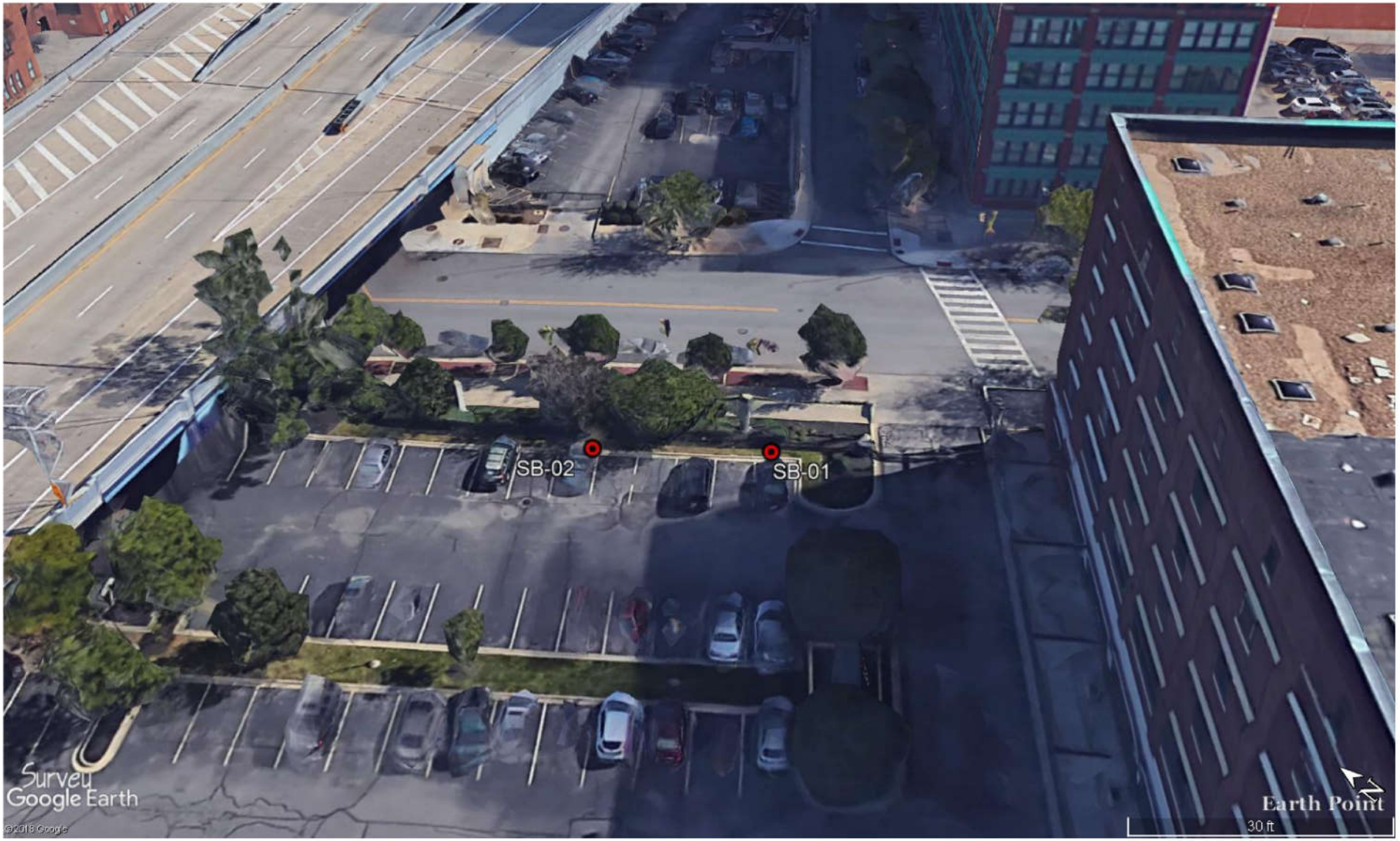
Somat is not responsible for failure to provide services that other project participants, apart from our client, have assigned to Somat either directly or indirectly. Somat is not responsible for failing to comply with the requirements of design manuals or other documents specified by other project participants, that impart responsibilities to the geotechnical engineer without our knowledge and written consent. We are not liable for services related to this project that are not outlined in our scope of services, detailed in our project proposal.

The discussions and recommendations submitted in this report are based on the soil information contained in the Logs of Test Borings and test results appended to this report. We expect that the Logs of Test Borings included in this report along with our discussions and conclusions will assist you in the design of the proposed project. If you have any questions regarding this report, please contact us.

Please review the important information regarding geotechnical reports included in Appendix D.

APPENDIX A

SOIL BORING LOCATION DIAGRAM



Adapted from GoogleEarth satellite imagery

Legend:

Approximate Soil Boring Locations

Somat Engineering, INCORPORATED

Somat Project No.: *2018104A*

Date: *10/22/2018*

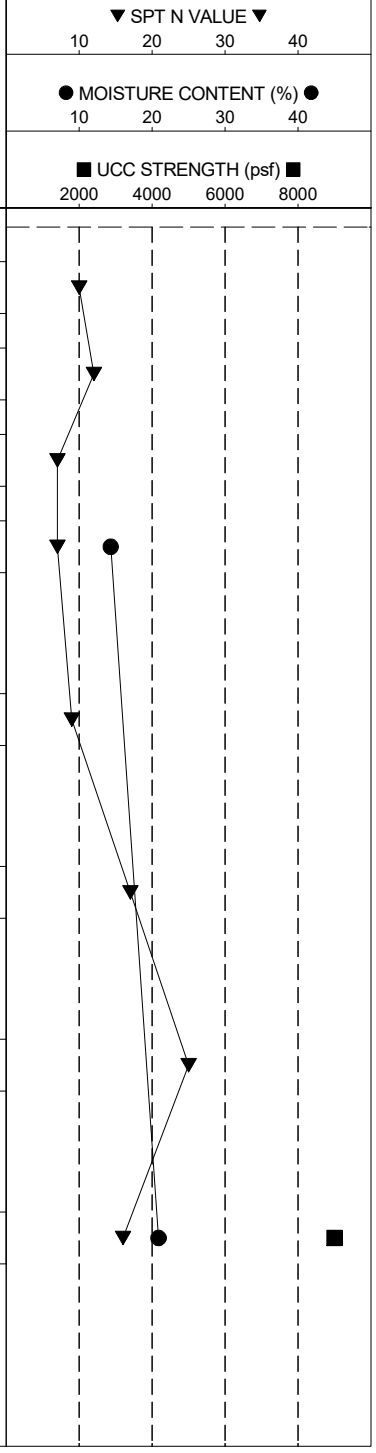
Soil Boring Location Diagram
Proposed Lightbar and Swing Structure
at The Archer Building
Warehouse District Lighthouse
Streetscape Project
Cleveland, Ohio

APPENDIX B

LOGS OF TEST BORINGS AND GENERAL NOTES

PROJECT NO. 2018104A **DATE** 10/17/2018 **LOG OF TEST BORING** **SB-01**

ELEVATION ft	Depth	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 630 ft	0										
629.8	2 inches of TOPSOIL 0.2											
	FILL - Medium dense poorly graded fine sand with clay, trace brick fragments, trace asphalt millings, black and brown, moist (SP-SC)		SS1	4-4-6	10	2.5						
			SS2	3-4-8	12	5.0						
624.0	6.0	5										
	(occasional clay seams at 8.5 feet)		SS3	4-3-4	7	7.5						
			SS4	4-3-4	7	10.0		14.3				40
	Loose SILTY FINE SAND, few gravel, trace clay, brown, moist (SM) (possible fill)	10										
			SS5	4-4-5	9	15.0						
611.5	18.5	15										
	Medium dense SILTY FINE SAND, gray, moist to wet (SM)		SS6	4-8-9	17	20.0						
		20										
			SS7	10-14-11	25	25.0						
601.5	28.5	25										
600.0	Hard LEAN CLAY, frequent silt seams, gray (CL) 30.0		SS8	4-6-10	16	30.0	9000+*	20.9				
	End of Boring at 30ft.	30										
		35										



BORING COORDINATES

GROUNDWATER READINGS

First Encountered: 23.5 feet
Upon Completion: N/A

Remarks:
Surface Elevation approximated from Google Earth.

Drilling Company: Ohio TestBor, Inc.
Drill Rig: Diedrich D-25 Trailer
Engineer on Rig: NJO
Drilling Method: 2 1/4 inch HSA
Hammer Type: Auto
Backfilled With: Cuttings
Date Started: 10-17-18
Date Completed: 10-17-18
Checked By: SAP

Torvane
* Pocket Penetrometer
<> Disturbed Sample

Somat Engineering, Inc.

Light Bar & Swing Structure at The Archer Building
Warehouse District Streetscape Project
Cleveland, Ohio

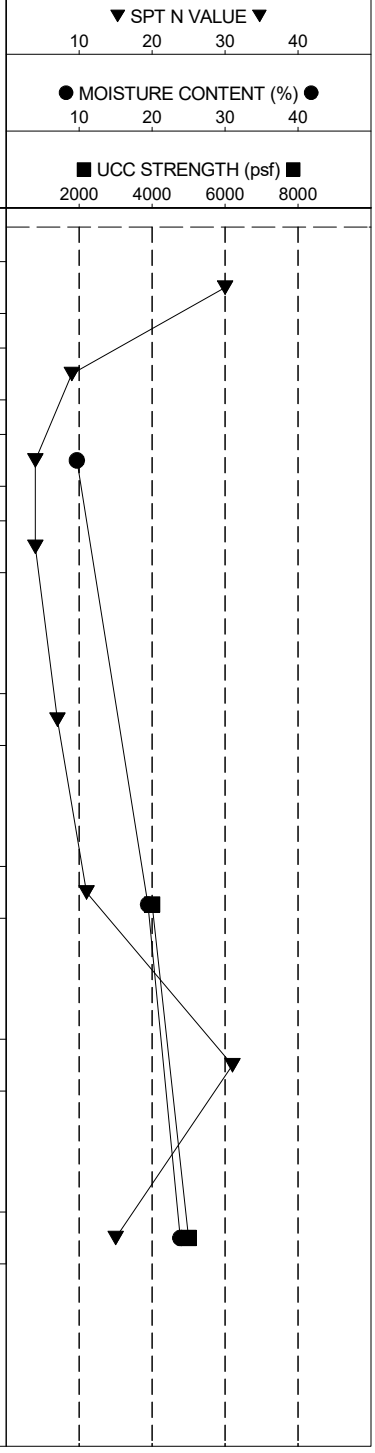
PROJECT NO. 2018104A **BORING NO.** SB-01 **PAGE 1 of 1**

LOG OF TEST BORING THE ARCHER LIGHTHOUSE STREETSCAPE.GPJ SOMAT.GDT 1/29/19

1/29/19

PROJECT NO. 2018104A **DATE** 10/17/2018 **LOG OF TEST BORING** **SB-02**

ELEVATION ft	Depth	Material Description	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
629.8		Ground Surface Elevation 630 ft	0										
	0.2	2 inches of TOPSOIL											
627.6	2.4	FILL - Dense poorly graded fine to coarse sand, trace silt, trace brick fragments, brown, moist (SP)		SS1	22-17-13	30	2.5						
			5	SS2	4-5-4	9	5.0						
				SS3	3-2-2	4	7.5		9.7				17
		Very loose to loose SILTY FINE SAND, few gravel, brown, moist (SM) (possible fill)	10	SS4	2-1-3	4	10.0						
		(at 14.5 feet becomes reddish brown)	15	SS5	3-3-4	7	15.0						
611.5	18.5												
610.4	19.6	POORLY GRADED FINE SAND, trace silt, dark gray, moist (SP)	20	SS6	6-7-4	11	20.0	4000*	19.4				
		Very stiff SANDY LEAN CLAY, gray, moist (CL)											
606.5	23.5												
		Dense SILTY FINE SAND, frequent clay seams, wet (SM)	25	SS7	9-11-20	31	25.0						
601.5	28.5												
600.0	30.0	Very stiff LEAN CLAY, frequent fine sand seams, gray (CL)	30	SS8	5-7-8	15	30.0	5000*	23.9				
		End of Boring at 30ft.	35										



BORING COORDINATES

GROUNDWATER READINGS

First Encountered: 23.5 feet
Upon Completion: N/A

Remarks:
Surface Elevation approximated from Google Earth.

Drilling Company: Ohio TestBor, Inc.
Drill Rig: Diedrich D-25 Trailer
Engineer on Rig: NJO
Drilling Method: 2 1/4 inch HSA
Hammer Type: Auto
Backfilled With: Cuttings
Date Started: 10-17-18
Date Completed: 10-17-18
Checked By: SAP

Torvane
* Pocket Penetrometer
<> Disturbed Sample

Somat Engineering, Inc.

Light Bar & Swing Structure at The Archer Building
Warehouse District Streetscape Project
Cleveland, Ohio

PROJECT NO. 2018104A **BORING NO.** SB-02 **PAGE 1 of 1**

LOG OF TEST BORING THE ARCHER LIGHTHOUSE STREETSCAPE.GPJ SOMAT.GDT 1/29/19

1/29/19

GENERAL NOTES

Unified Soil Classification System (USCS)
ASTM D2488 (Modified)

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon – 1 3/8" I.D., 2" O.D. (standard)
S :	Split Spoon – non-standard size, as noted
ST:	Thin-Walled Tube – 3" O.D., (unless otherwise noted)
LS:	Liner Sample
PA:	Power Auger
HA:	Hand Auger
AU:	Auger Sample
BS:	Bulk Sample
HSA:	Hollow Stem Auger
DP:	Direct Push
PS:	Piston Sample
PT:	Pitcher Sample
WS:	Wash Sample
RC:	Rock Core with diamond bit, NX size, (unless otherwise noted)
RB:	Rock Bit/Roller Bit
WR:	Wash Rotary
NR:	No Recovery
VS:	Vane Shear Test

Standard Penetration Test Resistance, N-Value: Sum of 2nd and 3rd 6-inch increments, in blows per foot of a 140-pound hammer falling 30 inches and driving an 18-inch to 30-inch long, 2-inch OD split spoon.

WATER LEVEL MEASUREMENT:
Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. In pervious soils, the indicated levels may reflect the location of a groundwater table. In low permeability soils (clays and silts), the accurate determination of groundwater levels may not be possible with only short-term observations. Groundwater levels at times and locations other than when and where individual borings were performed could vary.

DESCRIPTIVE SOIL CLASSIFICATION:
Soil classification is based on the Unified Soil Classification (USC) System and ASTM Standards D-2487 and D-2488. Coarse-grained soils have more than 50% of their dry weight retained on a #200 sieve; they are described as: gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are generally described as: clays, if they are plastic, and silts, if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their apparent in-place density and fine-grained soils on the basis of their apparent in-place density (silty soils) or consistency (clayey soils).

DESCRIPTORS OF MINOR CONSTITUENTS

Primary Constituent	Fine-Grained (Silt & Clay)	Coarse-Grained (Sand & Gravel)	
Descriptor of Other Constituents	Relative Portion of Coarse Grained Soils as a % of Dry Weight	Relative Portion of Fine Grained Soils as a % of Dry Weight	Relative Portion of Coarse Grained Soils as a % of Dry Weight
Trace	<5%	<5%	<5%
Few	≥5% - <15%	N/A	≥5% - <15%
With	≥15% - <30%	≥5% - 12%	≥15%
Modifier	≥30%	>12%	N/A

FINE-GRAINED SOILS **COARSE-GRAINED SOILS**

Unconfined Compressive Strength Qu, psf	Consistency	N-Value	Apparent Density
< 500	Very Soft	0 – 4	Very Loose
500 - <1,000	Soft	5 – 9	Loose
1,000 - <2,000	Medium	10 – 29	Medium Dense
2,000 - <4,000	Stiff	30 – 49	Dense
4,000 - <8,000	Very Stiff	50 – 80	Very Dense
≥ 8,000	Hard	>80	Extremely Dense

DEFINITIONS OF PAVEMENT CONDITION

Condition		Description
Good	ACC	Very slight or no raveling, surface shows some traffic wear. Longitudinal cracks and Transverse cracks (open ¼ inch). No patching or very few patches in excellent condition.
	PCC	Moderate scaling in several locations. A few isolated surface spalls. Shallow reinforcement causing cracks. Several corner cracks, tight or well sealed. Open (¼ inch wide) longitudinal or transverse joints.
Fair	ACC	Severe surface raveling. Multiple longitudinal and transverse cracking with slight raveling. Longitudinal cracking in wheel path. Block cracking (over 50% of surface). Patching in fair condition. Slight rutting or distortions (½ inch deep or less).
	PCC	Severe polishing, scaling, map cracking, or spalling over 50% of the area. Joints and cracks show moderate to severe spalling. Pumping and faulting of joints (½ inch with fair ride). Several slabs have multiple transverse or meander cracks with moderate spalling.
Poor	ACC	Alligator cracking (over 25% of surface). Severe distortions (over 2 inches deep) Extensive patching in poor condition. Potholes.
	PCC	Extensive slab cracking, severely spalled and patched. Joints failed. Patching in very poor condition. Severe and extensive settlement or frost heaves.

DEFINITIONS OF STRUCTURAL AND DEPOSITIONAL FEATURES

Term	Definition
Parting	≤ 1/16 inch (1.6 mm) thick
Seam	> 1/16 inch (1.6 mm) → ½ inch (12.7 mm) thick
Layer	> ½ inch (12.7 mm) to ≤ 12 inches (305 mm) thick
Pocket	Small, erratic deposits of limited lateral extent
Lens	Lenticular deposit
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay
Varved	Alternating partings or seams (1 mm – 12 mm) of silt and/or clay and sometimes fine sand
Stratified	Alternating layers of varying material or color with layers ≥ 6 mm thick
Laminated	Alternating layers of varying material or color with layers < 6 mm thick
Fissured	Contains shears or separations along planes of weakness
Slickensided	Shear planes appear polished or glossy, sometimes striated
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Homogeneous	Same color and appearance throughout
Occasional	One or less per foot (305 mm) of thickness
Frequent	More than one per foot (305 mm) of thickness
Interbedded	Applied to strata of soil lying between or alternating with other strata of a different nature

GRAIN SIZE TERMINOLOGY

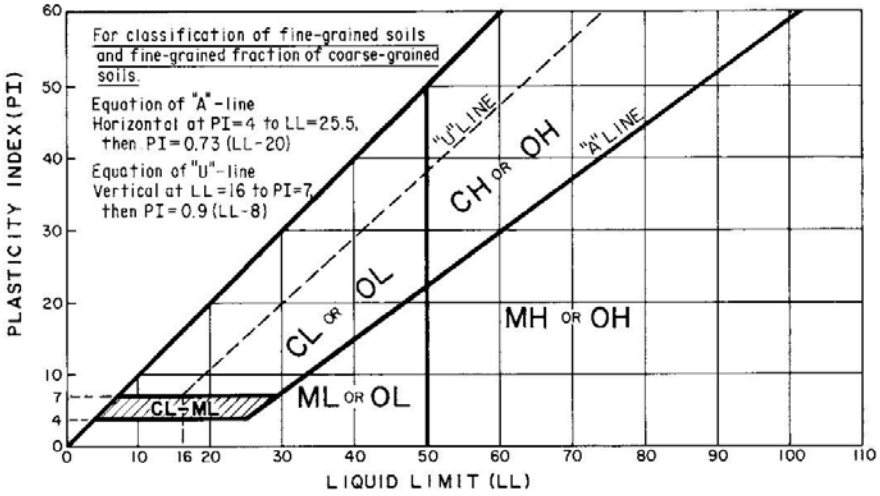
Major Component of Sample	Size Range
Boulders	≥ 12" (300 mm)
Cobbles	< 12" - 3" (300 mm – 75 mm)
Gravel - Coarse	< 3" - ¾" (75 mm – 19 mm)
Gravel – Fine	< ¾" - #4 (19 mm – 4.75 mm)
Sand – Coarse	< #4 - #10 (4.75 mm – 2 mm)
Sand – Medium	< #10 - #40 (2 mm - 0.425 mm)
Sand – Fine	< #40 - #200 (0.425 mm -0 .074 mm)
Silt	< 0.074 mm - 0.005 mm
Clay	<0 .005 mm

GENERAL NOTES

Unified Soil Classification System (USCS)
ASTM D2487

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification	
				Group Symbol	Group Name [B]
COARSE-GRAINED More than 50 % retained on No. 200 sieve	**Gravels** (More than 50 % of coarse fraction retained on No. 4 sieve)	**Clean Gravels**	Cu ≥ 4 and 1 ≤ Cc ≤ 3[D]	GW	Well-graded gravel [E]
		(Less than 5% fines [C])	Cu < 4 and/or [Cc < 1 or Cc > 3][D]	GP	Poorly graded gravel [E]
		Gravels with Fines	Fines classify as ML or MH	GM	Silty gravel [E,F,G]
		(More than 12 % fines [C])	Fines classify as CL or CH	GC	Clayey gravel [E,F,G]
	Sands (50 % or more of coarse fraction passes No. 4 sieve)	**Clean Sands**	Cu ≥ 6 and 1 ≤ Cc ≤ 3 [D]	SW	Well-graded sand [I]
		(Less than 5 % fines [H])	Cu < 6 and/or [Cc < 1 or Cc > 3] [D]	SP	Poorly graded sand [I]
		Sands with Fines	Fines classify as ML or MH	SM	Silty sand [F,G,I]
		(More than 12 % fines [H])	Fines classify as CL or CH	SC	Clayey sand [F,G,I]
FINE-GRAINED SOILS 50 % or more passes the No. 200 sieve	**Silts and Clays** Liquid limit less than 50	**inorganic**	PI > 7 and plots on or above "A" line [J]	CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K,L,M]
		organic	(Liquid Limit - oven dried) / (Liquid Limit - not dried) < 0.75	OL	Organic clay [K,L,M,N]
					Organic silt [K,L,M,O]
	Silts and Clays Liquid limit more than 50	**inorganic**	PI plots on or above "A" line	CH	Fat clay [K,L,M]
			PI plots below "A" line	MH	Elastic silt [K,L,M]
		organic	(Liquid Limit - oven dried) / (Liquid Limit - not dried) < 0.75	OH	Organic clay [K,L,M,P]
					Organic silt [K,L,M,Q]
HIGHLY ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor			Pt	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve.
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12 % fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay
[D] $Cu = D_{60}/D_{10}$ $Cc = (D_{30})^2/(D_{10} \times D_{60})$
[E] If soil contains ≥15 % sand, add "with sand" to group name.
[F] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[G] If fines are organic, add "with organic fines" to group name.
[H] Sands with 5 to 12 % fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay
[I] If soil contains ≥15 % gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.
[K] If soil contains 15 to <30 % plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains ≥30 % plus No. 200, predominantly sand, add "sandy" to group name.
[M] If soil contains ≥30 % plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] PI ≥ 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.



Order of Classification: 1) Consistency or Apparent Density, 2) Type of Soil, 3) Minor Soil Type(s), 4) Inclusions, 5) Layered Soils, 6) Color, 7) Water Content, 8) USCS Symbol, 9) Geological Name

APPENDIX C

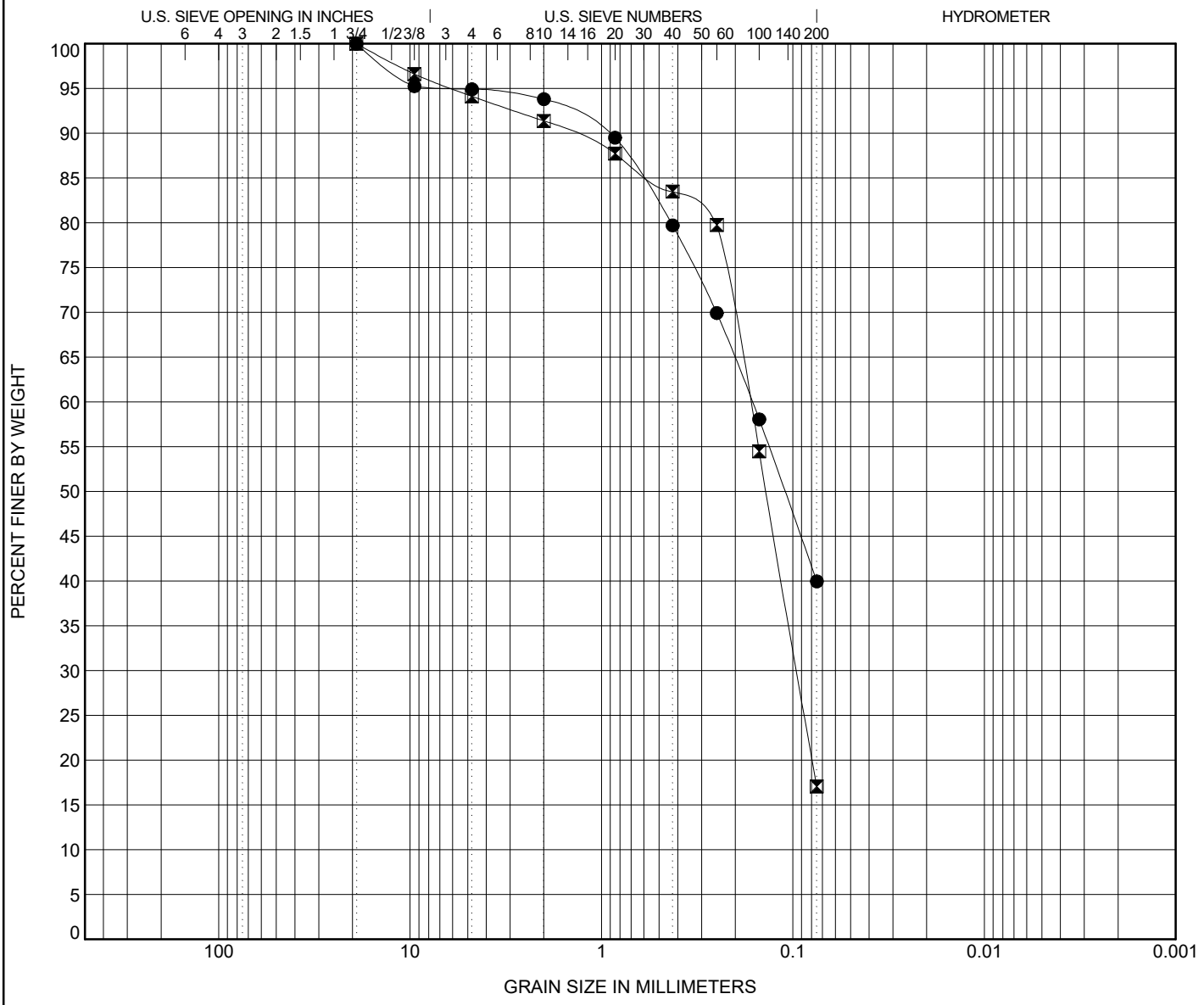
GEOTECHNICAL LABORATORY RESULTS

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

Light Bar & Swing Structure at The Archer Building
Warehouse District Streetscape Project
Cleveland, Ohio

PROJECT NO. 2018104A



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**SB-01**	**8.5**						
⧓	**SB-02**	**6.0**						

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**SB-01**	**8.5**	**19.1**	**0.163**			**5.1**	**54.9**	**40.0**	
⧓	**SB-02**	**6.0**	**19.1**	**0.168**	**0.095**		**5.9**	**77.1**	**17.0**	

GRAIN SIZE THE ARCHER LIGHTHOUSE STREETSCAPE.GPJ SOMAT.GDT 1/29/19

APPENDIX D

GBA MESSAGE
"IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL-ENGINEERING REPORT"

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled*. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed*. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

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