CITY OF NILES
TRUMBULL COUNTY, OHIO

MUNICIPAL STORAGE BUILDING

ADDENDUM #03

MAY 21, 2021

THRASHER PROJECT #101-060-10128

TO WHOM IT MAY CONCERN:

The following are clarifications and responses to questions posed by contractors for the above-referenced project. This addendum clarifies and supersedes any prior addenda.

A. GENERAL

1. **Meeting information for the Virtual Bid Opening can be obtained from the City of Niles by contacting Allison King:**
   i. aking@thecityofniles.com

2. **State prevailing wage rates for anticipated skilled worker classifications are attached to this addendum. Contractor is responsible for ensuring State prevailing wage rates are being adhered to for all applicable labor classifications. Wage rates may be viewed at the website below, or by contacting the Ohio Department of Commerce.**
   i. https://wagehour.com.ohio.gov/w3/webwh.nsf/wrview?openform&260EA73A56A23AD2852586B9006C809A

B. SPECIFICATIONS

ADD Section 133419 – METAL BUILDING SYSTEMS

C. DRAWINGS

None

D. QUESTIONS AND RESPONSES

QUESTION

1. What is the Owner's construction budget for this project?

RESPONSE

The construction budget for this project is $500,000.00

QUESTION

2. What is the building type; pre-engineered metal building or conventional structural steel framing? If the building is intended to be a PEMB, will a specification be provided?

RESPONSE

The building is intended to be a pre-engineered metal building. **A specification is attached to this addendum.**

QUESTION

3. There doesn't seem to be a PEMB spec, but you have roof and wall panel specs. Those panels usually come as part of the PEMB package. Is that acceptable? Your roof spec also does not select a gauge or finish. Your wall spec calls for aluminum—is that what you want?

RESPONSE

Roof and wall panels may be supplied as part of the PEMB package. This is acceptable. A PEMB specification has been attached to this addendum and specifies materials for wall and roof panels.

QUESTION

4. Are you aware of current lead times for PEMBs? The schedule in the advertisement is not doable with the current lead times. Will consideration be given to adjusting the construction schedule to suit current market conditions?

RESPONSE

The construction schedule will remain 180 calendar days from the date when the Contract Times commence to run, as stated in the Advertisement for Bids.

QUESTION

5. Can a detail for bollards please be provided?

RESPONSE

<u>A typical bollard detail is attached to this addendum.</u>

QUESTION

6. Drawing S1.00, Paragraph - Foundation and Soil Preparation….., Has a Geotech Report been prepared for this site? Is it known if poor soil conditions exist as subsurface conditions at areas of foundation excavation. If poor soil conditions are encountered, how will removal and replacement of suitable soils be addressed?

RESPONSE

The Geotechnical Report has been attached to this addendum.

QUESTION

7. Per Addendum 2, "Site work is being provided by the Owner. Will the Owner bring the building pad up to subgrade elevation and address poor subsurface soil conditions?

RESPONSE

The extent of the Owner's site work will terminate 5'-0" outside the building footprint. The Contractor will be responsible for bringing the building pad up to subgrade and addressing possible poor subsurface soil conditions.

QUESTION

8. Is the owner responsible for digging the footers as part of the site work package?

RESPONSE

The Contractor shall be responsible for digging footers as part of this contract.

QUESTION

9. When you say the contractor will be responsible for only fine grading, we're assuming that means the owner's site contractor will bring the site up to subgrade. Please confirm.

RESPONSE

Refer to Response to Question 7 above.

QUESTION

10. Will we be responsible for the stone under the concrete slabs??

RESPONSE

Yes, contractor will be responsible for providing stone under the concrete slabs.

QUESTION

11. Regarding question 14 in addendum 2, after talking with our manufacturer's rep, if the intent is just to secure them for tipping purposes then they can attach to the girts with no additional consideration. If the intent is for the building to take any load off of the shelving, then we need more detail ASAP so that they have the time to calculate that before bid day. The drawings are not clear that they are to be attached to the PEMB, and the answer to the question in addendum 2 does not clear that up. This is what we found from Republic:

    "If the shelving is attached to the building structure, the vertical and horizontal forces imposed by the shelving on the building must be calculated. The shelving user, building owner or their agents should be informed of these forces and their location."

    So please clarify the purpose, because the shelving manufacturers can't and won't engineer that?

RESPONSE

The intent is just to secure the shelving for tipping purposes as stated above. The intent is not for the building to take any loading off the shelving.

QUESTION

12. Also, is the liquid floor treatment (hardener) specified in the concrete spec required?

RESPONSE

Yes, the liquid floor treatment is required per the specification.

QUESTION

13. If possible can you confirm …. The Architect intends for the exterior panels to be smooth .125 Aluminum Plate as specified??

RESPONSE

Panels shall be as specified in the PEMB spec attached to this addendum.

QUESTION

14. Do you have more detail on the metal shelving? Height, Depth, etc.??

RESPONSE

Shelving units indicated on the plans are 2'D x 6'W x 10'H.

E. CLARIFICATIONS

None

If you have any questions or comments, please feel free to contact me at your earliest convenience. As a reminder, bids will be received until 2:00 p.m. on Thursday, May 27, 2021 at the City of Niles Auditor's Office, 34 West State Street, Niles, Ohio 44446. Good luck to everyone and thank you for your interest in the project.

Sincerely,

THE THRASHER GROUP, INC.

Josh Lyons
Architect

SECTION 133419 - METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural-steel framing.
2. Metal roof panels.
3. Metal wall panels.
4. Thermal insulation.
5. Accessories.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of metal building system component.

B. Shop Drawings: Indicate components by others. Include full building plan, elevations, sections, details and attachments to other work.

C. Samples: For units with factory-applied finishes.

D. Delegated-Design Submittal: For metal building systems.

1. Include analysis data indicating compliance with performance requirements and design data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:

1. Name and location of Project.
2. Order number.
3. Name of manufacturer.
4. Name of Contractor.
5. Building dimensions including width, length, height, and roof slope.

6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
7. Governing building code and year of edition.
8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
10. Building-Use Category: Indicate category of building use and its effect on load importance factors.

C. Material test reports.

D. Source quality-control reports.

E. Field quality-control reports.

F. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer.

1. Accreditation: Manufacturer's facility accredited according to the International Accreditation Service's AC472, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems."
2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.

B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

1.7 WARRANTY

A. Special Warranty on Metal Panel Finishes: Manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

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

B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. A&S Building Systems, Inc.; a division of NCI.
2. ACI Building Systems, Inc.
3. All American Systems; a division of NCI Building Systems, Inc.
4. American Buildings Company; a Nucor Company.
5. Butler Manufacturing Company; a division of BlueScope Buildings North America, Inc.
6. Kirby Building Systems; a Nucor Company.
7. Mesco Building Solutions; a division of NCI Building Systems, Inc.
8. Mid-West Steel Building Company; an NCI company.
9. Nucor Corporation, Nucor Buildings Group.
10. Ruffin Building Systems, Inc.
11. Star Building Systems; a division of NCI Building Systems, Inc.
12. Steel Systems; a division of NCI Building Systems, Inc.
13. Trident Building Systems, Inc.
14. Varco-Pruden Buildings; a division of BlueScope Buildings North America, Inc.
15. Vulcan Steel Structures, Inc.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal building system.

B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."

1. Design Loads: As indicated on Drawings.

2. Deflection and Drift Limits: Design metal building system assemblies to withstand serviceability design loads without exceeding deflections and drift limits recommended in AISC Steel Design Guide No. 3 "Serviceability Design Considerations for Steel Buildings."
3. Deflection and Drift Limits: No greater than the following:

   a. Purlins and Rafters: Vertical deflection of 1/240 of the span.
   b. Girts: Horizontal deflection of 1/120 of the span.
   c. Metal Roof Panels: Vertical deflection of 1/120 of the span.
   d. Metal Wall Panels: Horizontal deflection of 1/180 of the span.
   e. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
   f. Lateral Drift: Maximum of 1/200 of the building height.

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

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

D. Fire-Resistance Ratings: Where assemblies are indicated to have a fire-resistance rating, provide metal panel assemblies identical to those of assemblies tested for fire resistance per ASTM E119 or ASTM E108 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory," FM Global's "Approval Guide," or from the listings of another qualified testing agency.

E. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

F. Structural Performance for Metal Roof and Wall Panels: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:

1. Wind Loads: As indicated on Drawings.

G. Air Infiltration for Metal Roof Panels: Air leakage of not more than 0.04 cfm/sq. ft. when tested according to ASTM E1680 or ASTM E283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft..

H. Air Infiltration for Metal Wall Panels: Air leakage of not more than 0.04 cfm/sq. ft. when tested according to ASTM E283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft..

I. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E1646 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft..

J. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft..

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

1. Uplift Rating: UL 90.

L. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.

1. Fire/Windstorm Classification: Class 1A- 90.
2. Hail Resistance: MH.

M. Energy Star Listing: Roof panels that are listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

N. Thermal Performance for Opaque Elements: Provide the following maximum U-factors and minimum R-values when tested according to ASTM C1363 or ASTM C518:

1. Roof:

   a. U-Factor: 0.055.
   b. R-Value: R-13 + R-13.

2. Walls:

   a. U-Factor: 0.069.
   b. R-Value: R-13 + R-5.6 c.i.

2.3 STRUCTURAL-STEEL FRAMING

A. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings."

B. Bolted Connections: Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

C. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

D. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafters and rake beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.

1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.

    a. Variations in span and spacing may be acceptable if necessary to comply with manufacturer's standard, as approved by Architect.

2. Frame Configuration: Single gable.
3. Exterior Column: Uniform depth or Tapered.
4. Rafter: Uniform depth or Tapered.

E. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following: (missing something)

F. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating, to comply with the following: (missing something)

2.4 METAL ROOF PANELS

A. Exposed Fastener, Tapered-Rib, Metal Roof Panels: Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.

1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.024-inch nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.

    a. Exterior Finish: Two-coat fluoropolymer.
    b. Color: As selected by Architect from manufacturer's full range of standard colors.

2. Major-Rib Spacing: 12 inches o.c.
3. Panel Coverage: 36 inches.
4. Panel Height: 1.25 inches.

2.5 METAL WALL PANELS

A. Exposed-Fastener, Tapered-Rib, Metal Wall Panels: Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.

1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.024-inch nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.

    a. Exterior Finish: Two-coat fluoropolymer.
    b. Color: As selected by Architect from manufacturer's full range.

2. Major-Rib Spacing: 12 inches o.c.
3. Panel Coverage: 36 inches.
4. Panel Height: 1.25 inches.

2.6 THERMAL INSULATION

A. Faced Metal Building Insulation: ASTM C991, Type II, glass-fiber-blanket insulation; 0.5-lb/cu. ft. density; 2-inch-wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.

B. Retainer Strips: For securing insulation between supports, 0.025-inch nominal-thickness, formed, metallic-coated steel or PVC retainer clips colored to match insulation facing.

C. Vapor-Retarder Facing: ASTM C1136, with permeance not greater than 0.10 perm when tested according to ASTM E96/E96M, Desiccant Method.

2.7 ACCESSORIES

A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.

1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.

D. Flashing and Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match adjacent metal panels.

E. Gutters: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch-long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."

1. Gutter Supports: Fabricated from same material and finish as gutters.
2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.

F. Downspouts: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot-long sections, complete with formed elbows and offsets.

1. Mounting Straps: Fabricated from same material and finish as gutters.

G. Roof Ventilators: Gravity type, complete with hardware, flashing, closures, and fittings.

1. Continuous or Sectional-Ridge Type: Factory-engineered and -fabricated, continuous unit; Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match metal roof panels. Fabricated in minimum 10-foot-long sections. Provide throat size and total length indicated, complete with side baffles, ventilator assembly, end caps, splice plates, and reinforcing diaphragms.

   a. Bird Screening: Galvanized steel, 1/2-inch-square mesh, 0.041-inch wire; or aluminum, 1/2-inch-square mesh, 0.063-inch wire.
   b. Dampers: Manually operated, spring-loaded, vertically rising type; chain and worm gear operator; with pull chain of length required to reach within 36 inches of floor.
   c. Throat Size: 9 inches or 12 inches, as standard with manufacturer, and as required to comply with ventilation requirements.

2.8 FABRICATION

A. General: Design components and field connections required for erection to permit easy assembly.

1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.

B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.

C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.

D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll forming or break forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.

E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

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

2.9 SOURCE QUALITY CONTROL

A. Special Inspection: Owner will engage a qualified special inspector to perform source quality control inspections and to submit reports.

1. Accredited Manufacturers: Special inspections will not be required if fabrication is performed by an IAS AC472-accredited manufacturer approved by authorities having jurisdiction to perform such Work without special inspection.

B. Product will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ERECTION OF STRUCTURAL FRAMING

A. Erect metal building system according to manufacturer's written instructions and drawings.

B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.

C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.

D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.

F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.

1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt type and joint type specified.

   a. Joint Type: Snug tightened or pretensioned as required by manufacturer.

G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.

1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
2. Locate and space wall girts to suit openings such as doors and windows.
3. Provide supplemental framing at entire perimeter of openings, including doors, windows, ventilators, and other penetrations of roof and walls.

H. Steel Joists: Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders," joist manufacturer's written instructions, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Joist Installation: Bolt joists to supporting steel framework using carbon-steel bolts unless otherwise indicated.
5. Joist Installation: Bolt joists to supporting steel framework using high-strength structural bolts unless otherwise indicated. Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for high-strength structural bolt installation and tightening requirements.

6. Joist Installation: Weld joist seats to supporting steel framework.
7. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

I. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.

1. Tighten rod and cable bracing to avoid sag.
2. Locate interior end-bay bracing only where indicated.

J. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.

K. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.2 METAL PANEL INSTALLATION, GENERAL

A. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.

   a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.

2. Install metal panels perpendicular to structural supports unless otherwise indicated.
3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Locate metal panel splices over structural supports with end laps in alignment.
6. Lap metal flashing over metal panels to allow moisture to run over and off the material.

B. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.

1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.

1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.

3.3 METAL ROOF PANEL INSTALLATION

A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.

1. Install ridge caps as metal roof panel work proceeds.
2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.

B. Lap-Seam Metal Roof Panels: Fasten metal roof panels to supports with exposed fasteners at each lapped joint, at location and spacing recommended by manufacturer.

1. Provide metal-backed sealing washers under heads of exposed fasteners bearing on weather side of metal roof panels.
2. Provide sealant tape at lapped joints of metal roof panels and between panels and protruding equipment, vents, and accessories.
3. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps and on side laps of nesting-type metal panels, on side laps of ribbed or fluted metal panels, and elsewhere as needed to make metal panels weatherproof to driving rains.
4. At metal panel splices, nest panels with minimum 6-inch end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.

C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

3.4 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. When two rows of metal panels are required, lap panels 4 inches minimum.
4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.

5. Rigidly fasten base end of metal wall panels and allow eave end free movement for thermal expansion and contraction. Predrill panels.
6. Flash and seal metal wall panels with weather closures at eaves and rakes, and at perimeter of all openings. Fasten with self-tapping screws.
7. Install screw fasteners in predrilled holes.
8. Install flashing and trim as metal wall panel work proceeds.
9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated on Drawings; if not indicated, as necessary for waterproofing.
10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.

3.5 THERMAL INSULATION INSTALLATION

A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.

1. Set vapor-retarder-faced units with vapor retarder toward warm side of construction unless otherwise indicated. Do not obstruct ventilation spaces except for firestopping.
2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to the surrounding construction to ensure airtight installation.
3. Install factory-laminated, vapor-retarder-faced blankets straight and true in one-piece lengths, with both sets of facing tabs sealed, to provide a complete vapor retarder.

B. Blanket Roof Insulation: Comply with the following installation method:

1. Two-Layers-between-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Install layer of filler insulation over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.

   a. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.

2. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

C. Blanket Wall Insulation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal wall panels fastened to secondary framing.

1. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

3.6 DOOR AND FRAME INSTALLATION

A. General: Install doors and frames plumb, rigid, properly aligned, and securely fastened in place according to manufacturers' written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each door frame with elastomeric sealant used for metal wall panels.

B. Personnel Doors and Frames: Install doors and frames according to NAAMM-HMMA 840.

1. At fire-rated openings, install frames according to, and doors with clearances specified in, NFPA 80.

C. Door Hardware:

1. Install surface-mounted items after finishes have been completed at heights indicated in DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
3. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
4. Set thresholds for exterior doors in full bed of sealant complying with requirements for concealed mastics specified in Section 079200 "Joint Sealants."

3.7 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.

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

1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.

2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

D. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.

1. Provide elbows at base of downspouts to direct water away from building.

E. Continuous Roof Ventilators: Set ventilators complete with necessary hardware, anchors, dampers, weather guards, rain caps, and equipment supports. Join sections with splice plates and end-cap skirt assemblies where required to achieve indicated length. Install preformed filler strips at base to seal ventilator to metal roof panels.

3.8 FIELD QUALITY CONTROL

A. Product will be considered defective if it does not pass tests and inspections.

B. Prepare test and inspection reports.

END OF SECTION 133419

NOTES:

GENERAL: Mount all bollard sleeves flush with the bikeway pavement.

CONCRETE ENCASEMENT: Sleeve encasement shall be square as shown, in concrete pavement, but may be square or round in flexible pavement. Round encasement should be 1'-0" diameter.

PREFORMED EXPANSION JOINT FILLER: Shall meet the provisions of CMS 705.11, and is required when bollards are set in concrete pavement.

STEEL PIPE: ASTM A 53 Schedule 40.

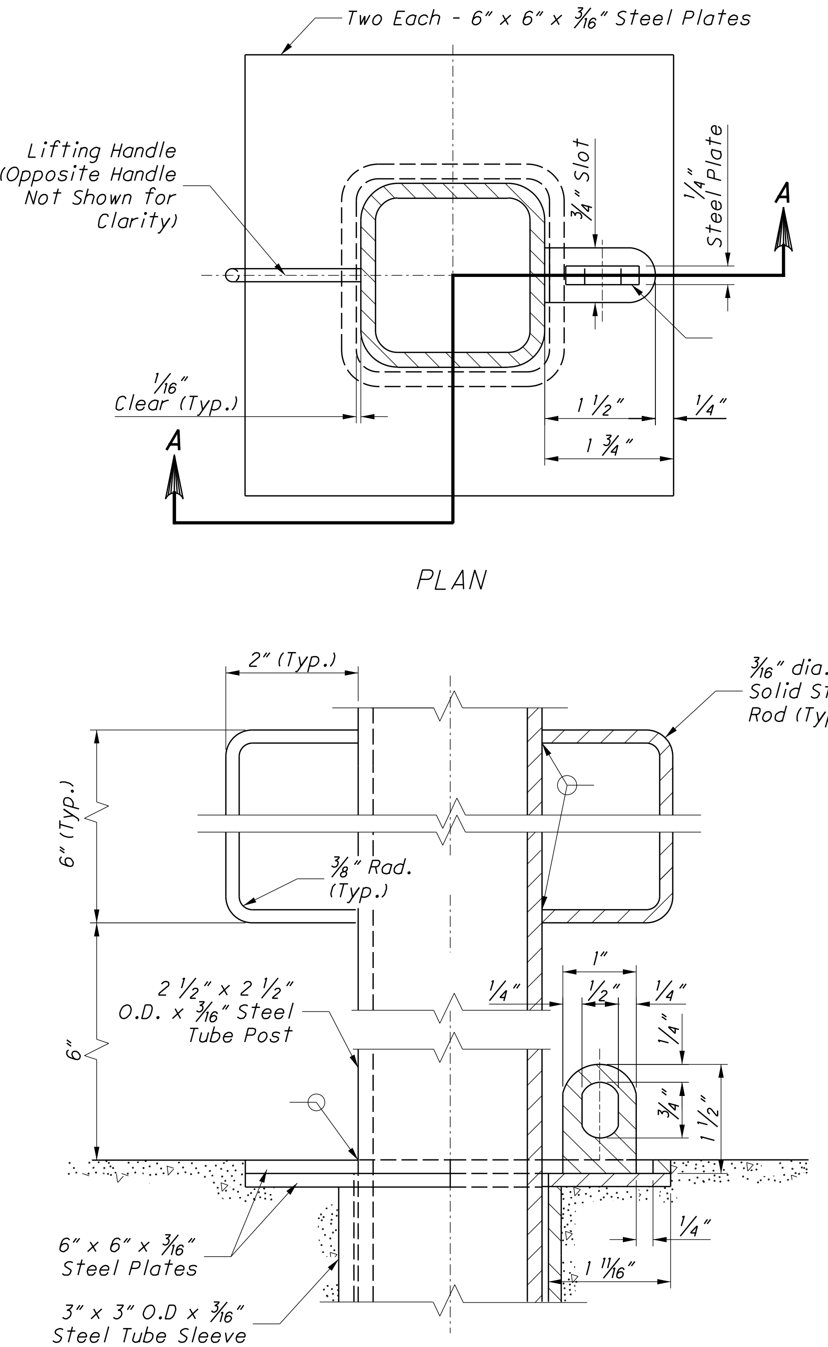
CONCRETE: Use Class C concrete as specified in CMS 499 and CMS 511.

REFLECTIVE SHEETING: Shall meet the provisions of CMS 730.19.

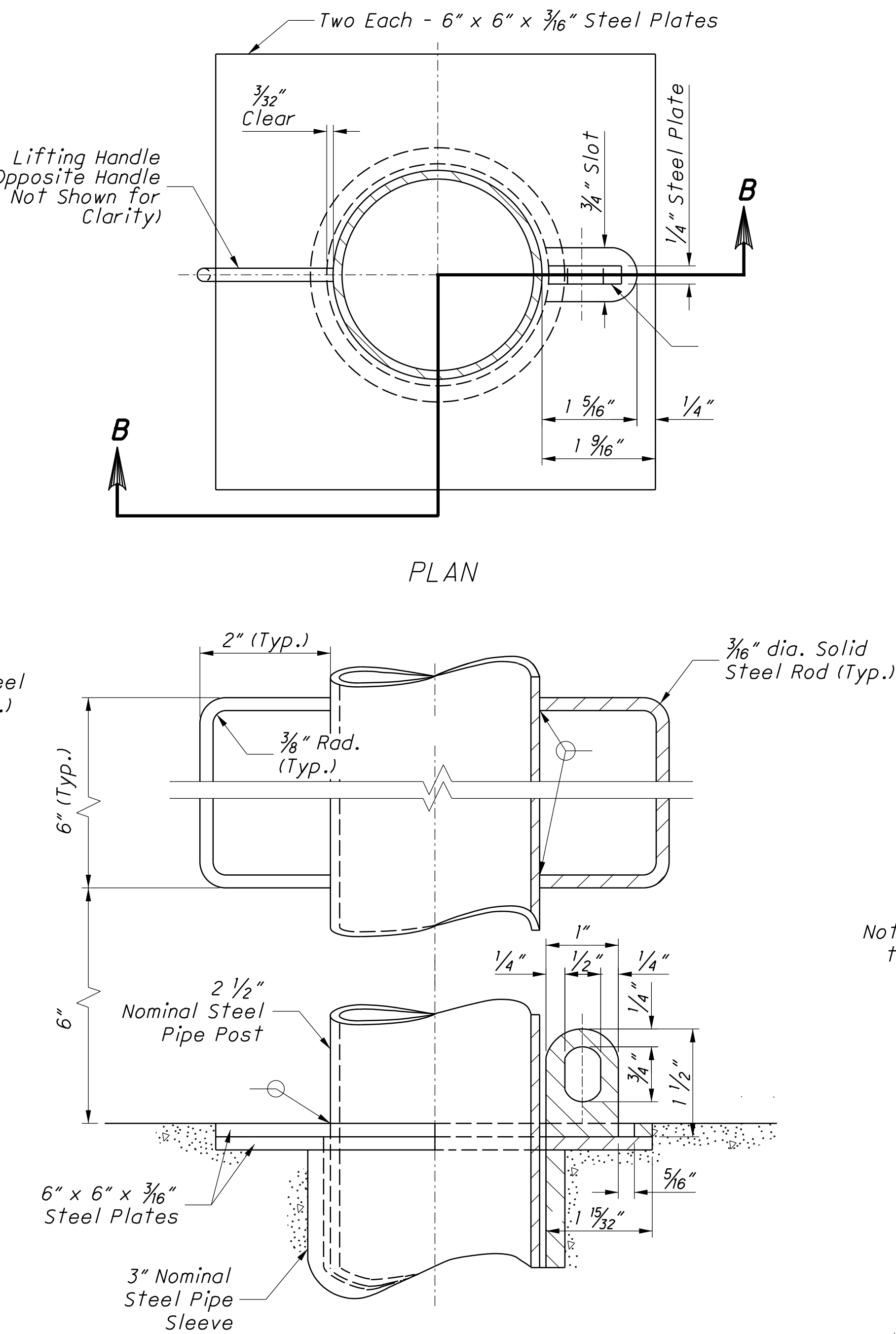
GALVANIZING: After fabricating, hot-dip galvanize all steel parts, including steel pipe, as specified in ASTM A 123.

ALUMINUM: All steel components may be replaced by aluminum components meeting the following ASTM Specifications: B 209 (plate), B 210 or B 241 (drawn seamless tubes & plates), B 211 (rods), and F 901 (bolts).

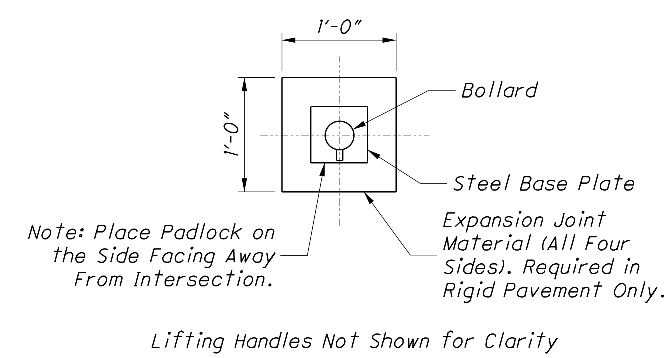
PERMANENT BOLLARDS: Permanent Bollards shall be the same as Removable Bollards, except that the steel plates, sleeves and lifting handles shall be omitted. Encase posts directly in concrete.



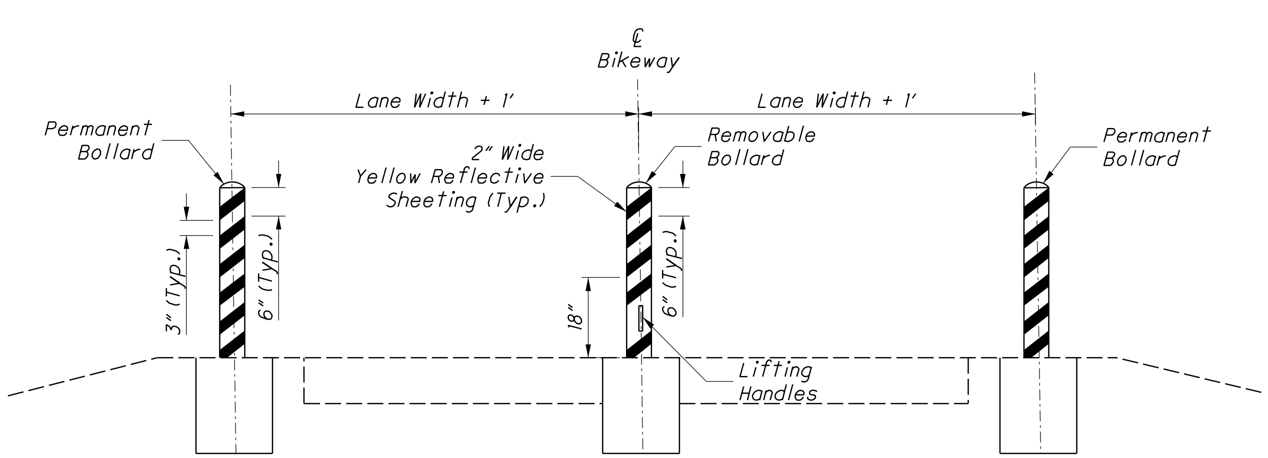
REMOVABLE SQUARE BOLLARD



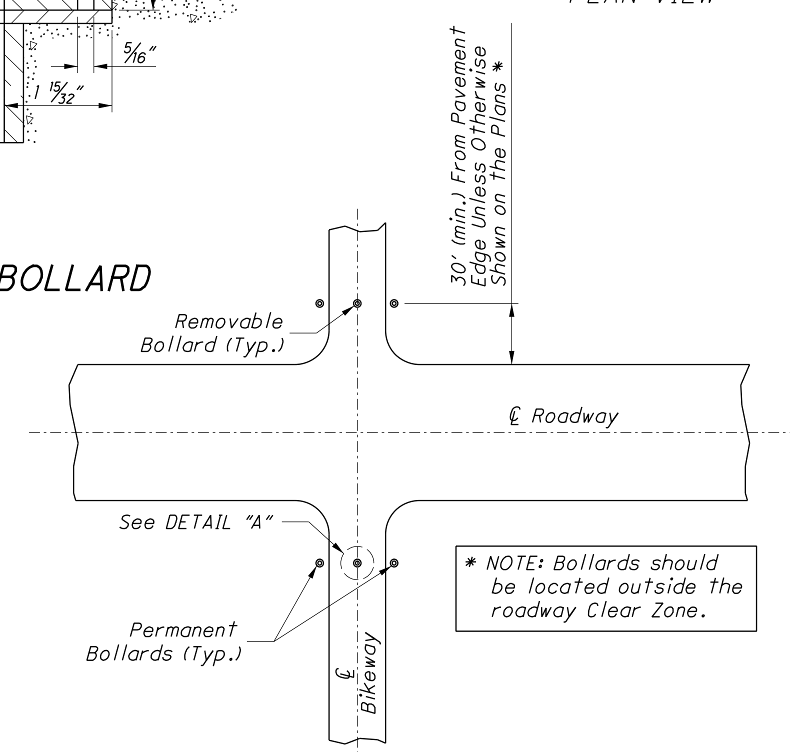
REMOVABLE ROUND BOLLARD



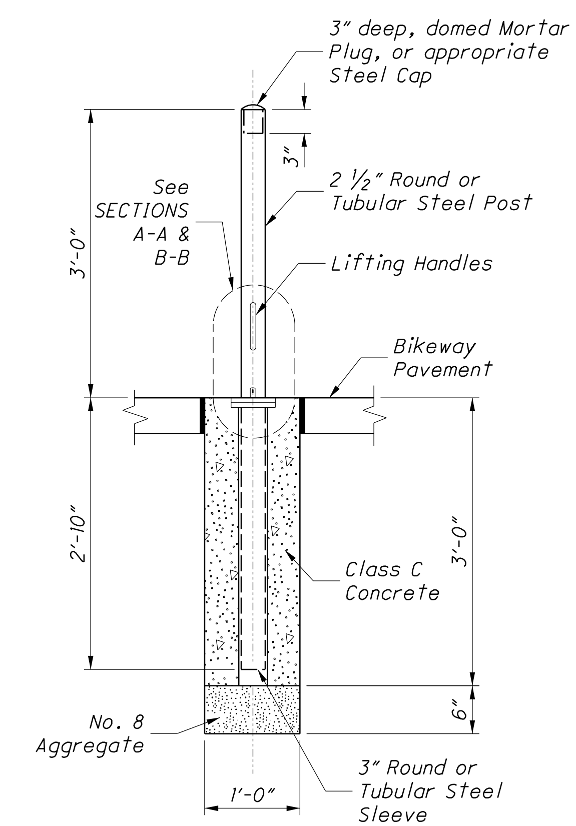
DETAIL "A"
PLAN VIEW



ELEVATION VIEW
BOLLARD PLACEMENT



PLAN VIEW
BOLLARD PLACEMENT



DETAIL "A"
ELEVATION VIEW
REMOVABLE BOLLARD

THIS DRAWING REPLACES RM-5.1 DATED 04-18-2003.

REVISION DATE 7-18-2014

STATE OF OHIO DEPARTMENT OF TRANSPORTATION ADMINISTRATOR Reynaldo Stargell

STDS. ENGINEER M. Ruppe

OFFICE OF ROADWAY ENGINEERING

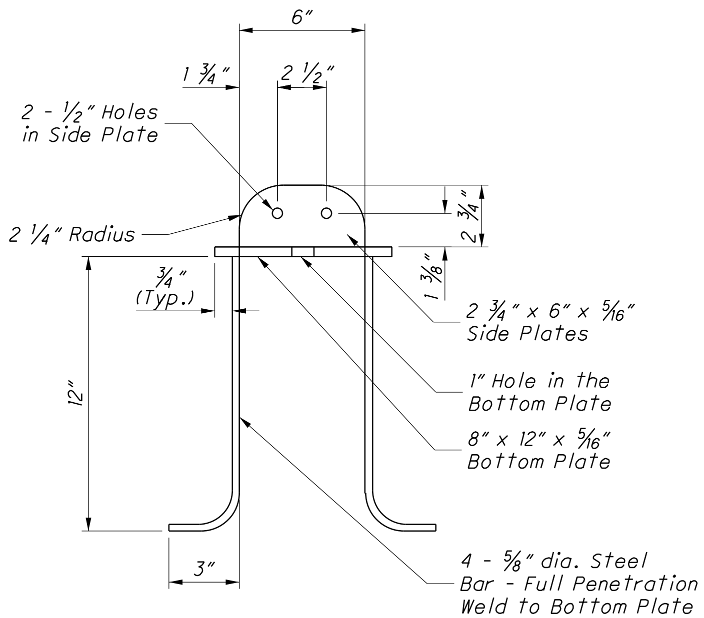
STANDARD ROADWAY CONSTRUCTION DRAWING
STEEL BOLLARDS

SCD NUMBER RM-5.1

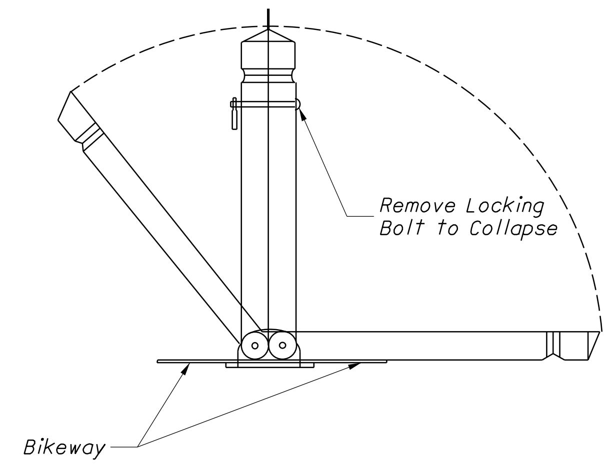
NOTES:

MATERIALS: In order to ensure that the bollard stays plumb and in place, make the fittings as tight as possible. If made of wood, construct the bollard using CCA pressure treated Southern Yellow Pine. Pressure treat as specified in CMS 712.06. Hot-dip galvanize any hardware and steel used for the bollard.

PAYMENT: Payment for the bollard shall be **Item Special - Bollard, Misc., Hinged**.

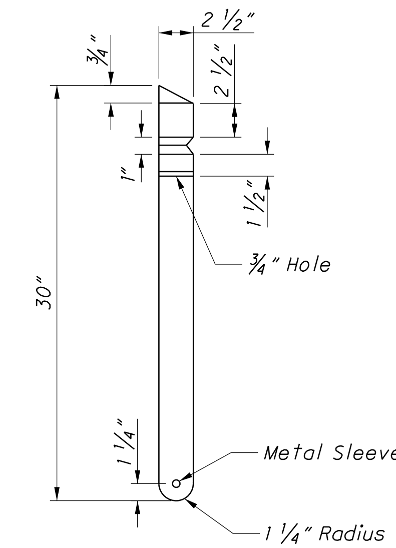


SECTION

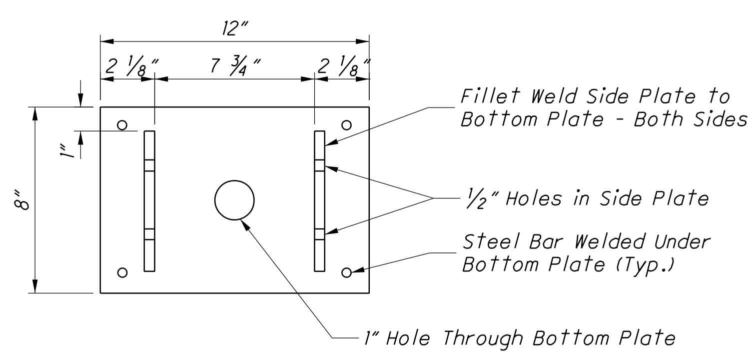


Orientate Bollard to Open Parallel to Centerline of Path

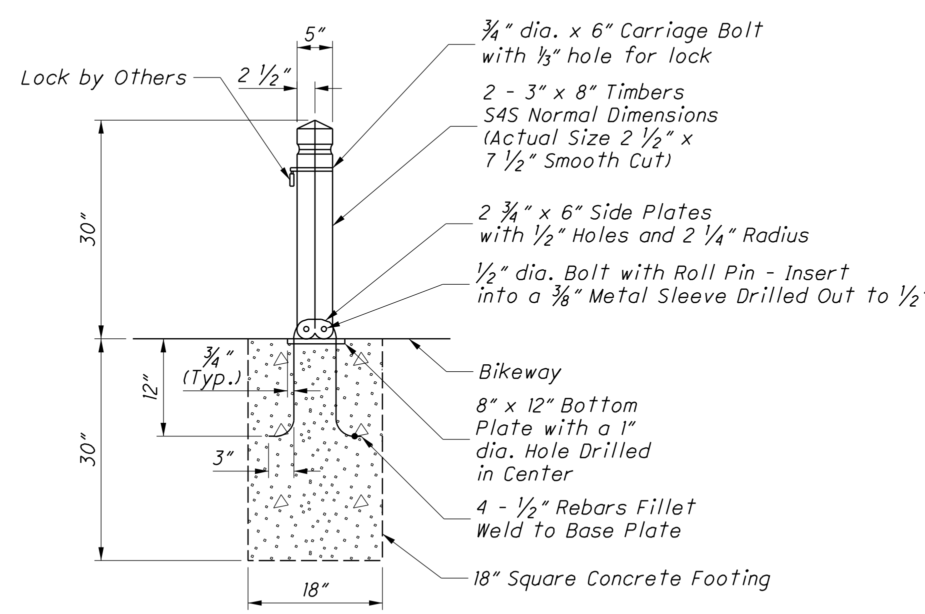
BOLLARD DETAIL



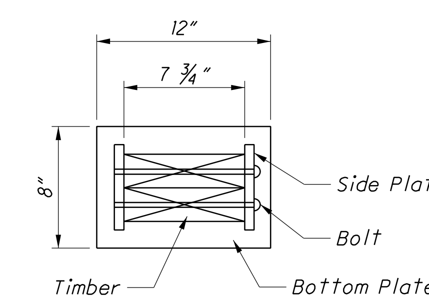
DETAIL OF TIMBER



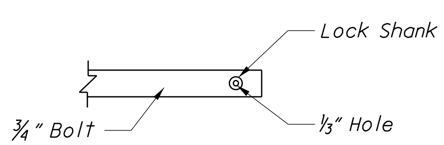
PLAN



SECTION



PLAN



DETAIL OF HOLE FOR LOCK

THIS DRAWING REPLACES RM-5.1 DATED 04-18-2003.

REVISION DATE 7-18-2014

STATE OF OHIO DEPARTMENT OF TRANSPORTATION ADMINISTRATOR Reynaldo Stargell

STDS. ENGINEER M. Ruppe

OFFICE OF ROADWAY ENGINEERING

STANDARD ROADWAY CONSTRUCTION DRAWING

STEEL BOLLARDS

SCD NUMBER RM-5.1

Professional Service Industries, Inc.
1280 Trumbull Avenue, Girard, OH 44420
(330) 759.0288 (P)

February 18, 2021

The Thrasher Group
400 3rd Street SE
Canton, Ohio 44702

Attention: Mr. Joshua Lyons, NCARB, AIA

Re: Geotechnical Engineering Exploration Report
Proposed Electrical Equipment Building
Olive Street
Niles, Trumbull County, OH
PSI Project No. 01393403

Dear Mr. Lyons,

Per your request, Professional Service Industries, Inc. (PSI) is pleased to submit this Geotechnical Engineering Services Report for the above referenced project. Included in this presentation are the results of the subsurface exploration and recommendations concerning the design and construction of the proposed Electrical Equipment Building located on Olive Street, Niles, Trumbull County, Ohio.

After the plans and specifications are complete, PSI should review the final design and specifications in order to verify that the earthwork and recommendations are properly interpreted and implemented. **It is considered imperative that the geotechnical engineer and/or its representative be present during earthwork operations and foundation installations to observe the field conditions with respect to the design assumptions and specifications. PSI will not be held responsible for interpretations and field quality control observations made by others.**

Respectfully submitted,
PROFESSIONAL SERVICE INDUSTRIES, Inc.

Scott Hynes
Branch Manager

A. Veeramani, P.E.
Director/Principal Consultant

Subsurface Exploration Report

For the Proposed

Proposed Electrical Equipment Building
Olive Street
Niles, Trumbull County, OH

Prepared for

The Thrasher Group, Inc.
400 3rd Street SE
Canton, Ohio 44702

Prepared by

Professional Service Industries, Inc.
1280 Trumbull Avenue
Girard, OH 44420

PSI Project No. 01393403

Scott Hynes
Branch Manager

A. Veeramani, P.E.
Director/Principal Consultant

TABLE OF CONTENTS

1 PROJECT INFORMATION

1.1 PROJECT AUTHORIZATION

This report presents the results of a geotechnical subsurface exploration and evaluation conducted for The Thrasher Group, Inc. in connection with the proposed Electrical Equipment Building located on Olive Street, in Niles, Trumbull County, Ohio. PSI's services for this project were performed in accordance with PSI Proposal No. 0139-332531, dated January 22, 2021, authorization by Mr. Joshua Lyons, Architect with The Thrasher Group, Inc. on January 25, 2021.

1.2 PROJECT DESCRIPTION

Based on the available information, the proposed electrical equipment building structure will be pre-engineered steel framed, metal clad building, with a concrete slab-on-grade floor, measuring approximately 80-feet by 100-feet in plan dimension. No loading information was available at the time of this report. However, it is assumed that the anticipated maximum column and floor loads will be 50 kips and 100 psf, respectively.

No topographic and grading plans were provided at the time of this report. Based on the visual site observations, the sites for proposed Electrical Equipment building is relatively flat with elevation difference of approximately 2 feet within the proposed development area. However, there is a mound of mixed soil located at the east end of the proposed building footprint. The mound extends approximately 4-feet above the surrounding area. Therefore, it is assumed that maximum cut/fill operations of less than 4 feet will be necessary for the proposed development.

The geotechnical recommendations presented in this report are based on the available project information, the proposed building location and orientation of the building on the site and the subsurface materials described in this report. If any of the information we have been given or have assumed is incorrect, please contact us so that we may amend the recommendations presented accordingly. PSI will not be responsible for the implementation of its recommendations when it is not notified of changes in the project.

1.3 PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to explore the subsurface conditions at the site and to prepare recommendations for foundations, floor slab construction, site preparation, and other construction considerations. Our scope for this service included a project site reconnaissance, drilling and sampling three (3) test borings, completing a laboratory testing program, and submitting an engineering analysis and evaluation of the surface materials.

The scope of services for the geotechnical exploration did not include an environmental assessment for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors, colors or unusual or suspicious items or conditions are strictly for the information of the client. PSI's scope also did not include any service to investigate or detect the presence of moisture, mold or other biological contaminants in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence or the amplification of the same. The Client should be aware that mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. The Client should also be aware that site conditions are outside of PSI's control, and that mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, PSI cannot and shall not be held responsible for the occurrence or reoccurrence of mold amplification.

2 SITE AND SUBSURFACE CONDITIONS

2.1 SITE LOCATION AND DESCRIPTION

The proposed electrical equipment building structure will be located on the east side of 865 Summit Avenue and north side of Olive Street, in Niles, Trumbull County. The site Latitude and Longitude is approximately 41.17218°N and 80.73974°W, respectively. Specifically, the new structure will be located in an open area in the center of the site.

The site is predominantly an open gravel storage yard, and grass area. Based on the available topographic information and site observations, the overall site is relatively flat with elevation differences less than 2 feet within the proposed development area. However, there is a mound of mixed soil, about 4-feet in height, located at the east end of the proposed building structure footprint. The mound appears to have been dumped on the site some time ago. We recommend that any existing utility lines be checked and marked prior to construction activities.

2.2 SUBSURFACE CONDITIONS

The subsurface conditions at the site were explored with a total of three (3) test borings. The test borings were drilled to depths of approximately 20-feet each below the existing surface grades. The approximate boring locations are shown on the Boring Location Plan presented in the *Appendix* of this report. The boring locations and depths were determined by PSI and reviewed by the client prior to drilling. PSI personnel staked the borings in the field using a measuring wheel, the preliminary site plan provided, and the existing site features as references. PSI recommends that the surface elevations at the boring locations be determined by an Ohio licensed surveyor prior to construction activities.

The borings were advanced utilizing 3¼ inch inside diameter, hollow-stem auger drilling methods. Soil samples were routinely obtained during the drilling process. Selected soil samples were later tested in the laboratory to obtain soil material properties for the foundation, floor slabs and pavement recommendations. Drilling, sampling, and laboratory testing was accomplished in general accordance with ASTM procedures.

The types of subsurface materials encountered in the test borings have been visually classified. The results of the visual classifications, Standard Penetration tests, moisture contents and water level observations are presented on the boring logs in the *Appendix* of this report. Representative samples of the soils were placed in sample jars, and are now stored in the laboratory for further analysis, if requested. Unless notified to the contrary, all samples will be disposed of after 60 days following the date of this report.

The surface of the site at test boring location B-1 and B-2 was covered with layer of asphalt grindings and slag measuring approximately 6 to 12 inches in thickness. The surface at test boring B-3 was covered with fill soil consisting of dark gray silt with organics measuring approximately 4.5-feet thick. The thickness and composition of the surface materials will vary throughout the building area.

Underlying the surface cover at all three boring locations, B-1, B-2, and B-3, fill soils consisting of Sandy Silty Clay, Sandy Silt, and Silty Sand, all with varying amounts of gravel, were encountered to depths of 3 to 5.5-feet below existing surface grades.

Beneath the surface cover and fill soils in all three test boring locations, natural soils were encountered to the planned terminal depth of 20-feet below surface grades. The natural soils were classified as Silty Clay (CL-ML), Sandy Silty Clay (CL-ML), Silty Sand, SM), and Silty Clayey Sand (SC-SM) in general accordance with the Unified Soil Classification System (USCS). The standard penetration N-values generally indicate consistencies of stiff to very stiff within the cohesive soils, and loose to very stiff compactness within the granular soils.

The subsurface description is of a generalized nature provided to highlight the major strata encountered. The boring logs included in the Appendix should be reviewed for specific information at the individual boring locations. The stratifications shown on the boring logs represent the conditions only at the actual test positions. Variations may occur and should be expected between the boring locations. The stratifications represent the approximate boundary between the subsurface materials, and the transition may be gradual or not clearly defined.

2.3 GROUNDWATER LEVEL MEASUREMENTS

Groundwater was encountered in test boring location B-3 at an approximate depth of 18-feet below existing surface grades. No groundwater was encountered in test borings B-1 and B-2 during or at the completion of drilling operations. Please note that the granular observed at this site can discharge significant quantities of groundwater into excavations for foundations and utilities. Cave-in depths of about 16.5 to 17-feet were reported during drilling operations. It should also be noted that the groundwater levels at this site, as well as perched water levels and volumes, will fluctuate significantly based on variations in rainfall, snowmelt, evaporation, surface run-off and other related hydrogeologic factors. The groundwater levels in boreholes are often not representative of the actual groundwater level because the boreholes remained open for a relatively short time. The water level measurements presented in this report are the levels that were measured at the time of PSI's field activities.

3 EVALUATION AND RECOMMENDATIONS

3.1 SITE PREPARATION AND EARTHWORK CONSTRUCTION

Prior to placing engineered fill on this site, general site area clearing should be carried out. All asphalt grindings, slag, **fill soils,** as well as any topsoil, grass, roots, excessively wet soils, highly organic soils, and soft/loose or obviously compressible materials, should be completely removed from the proposed construction areas. The precise extent of required cut and fill should be determined in the field by a representative of PSI following observation of the exposed subgrades and proof-rolling operations. In view of the proposed construction, the encountered fill soils should be completely removed from the bottom of footer elevation, and twelve (12)inches below designed subgrade elevation for the floor slab, specifically all obvious organic-laden materials, and replaced with approved structural fill per section 3.2 Engineered Fill section of this report. It should be stressed that there is a risk of potentially excessive settlement of unremoved FILL.

Following the site clearing, stripping and undercutting, and prior to placing engineered fill, the exposed subgrades should be critically proof rolled with a loaded 20-ton tandem-axle dump truck until the grade offers a relatively unyielding surface. Areas of excessive yielding, as observed by a PSI representative, should be excavated and backfilled with compacted engineered fill and/or the unstable soils can be stabilized by choking the exposed bearing surface with crushed limestone or similar coarse aggregate. After the existing subgrade materials are excavated to design grade, proper control of subgrade compaction and the placement and compaction of new fill materials should be observed and tested by a representative of PSI.

It is recommended that the site preparation, proof-rolling and earthwork activities should be performed during a period of dry weather, which can significantly reduce the required extent of soil stabilization, drainage and surface repairs.

During site preparation, fill piles, burn pits, trash pits or other isolated disposal areas may be encountered. All too frequently such buried material occurs in isolated areas outside boring locations. Any such material encountered during site work, or foundation or floor slab construction should be excavated, removed from the site, and backfilled with compacted structural fill.

3.2 ENGINEERED FILL

Materials selected for use as structural fill should not contain more than 5 percent by weight of organic matter, waste construction debris, or other deleterious materials. Fill materials should have a standard Proctor maximum dry density of greater than 110 pounds per cubic foot (pcf), an Atterberg Liquid Limit of less than 40, a Plasticity Index of less than 15, and a maximum particle size of 3 inches or less. Structural fill should consist of non-expansive materials. Pyritic and/or potentially expansive materials, such as mine tailings, shales and slag should not be used as structural fill.

Based on the results of the boring explorations, the on-site soils are suitable for reuse as engineered fill. If the on-site soils are used for fill, close moisture content control will be required to achieve the recommended degree of compaction. PSI anticipates that disking and aerating the soils during a warm, dry period may be necessary to lower the moisture content. If engineered fill placement must proceed during a wet or cool time of the year, it may likely be infeasible to re-use the on-site soils as engineered fill, and imported fill materials would be required. If wet or cool season earthwork is necessary, we recommend the use of imported fill materials such as ODOT No. 304 or 411 crushed aggregate.

Fill materials should be placed and compacted in individual lifts of 8 inches or less loose measurement. Within small excavations such as in utility trenches, around manholes, or behind retaining walls, we recommend the use of smaller, hand or remote-guided equipment. Loose lift thicknesses of 4 inches or less are recommended when using such equipment.

We recommend that structural fill be compacted to a minimum of 98 percent of the maximum dry density and within $\pm$2% of the optimum moisture content, as determined by ASTM D-698. The upper 24 inches of floor slab subgrade soils should be compacted to at least 100 percent of the maximum dry density and within $\pm$2% of the optimum moisture content, as determined by ASTM D-698. A representative of PSI should observe fill placement operations and perform density tests concurrently to indicate if the specified compaction is being achieved.

3.3 FOUNDATION RECOMMENDATIONS

Considering the subsurface conditions and the proposed construction, the proposed pre-engineered metal building structure can be founded on conventional shallow bearing isolated and/or continuous spread footing members.

Foundations supporting the proposed building structure can bear on the areas soil formation, and can be designed utilizing a maximum allowable soil bearing pressure of **2,500 psf**. All footings must be placed at a minimum depth of 42 inches below the finished grade in order to protect against frost action.

Footing bearing surfaces evaluations should be performed by a representative of the geotechnical engineer prior to placement of reinforcing steel and concrete. The foundation areas should be critically inspected and tested to verify consistency and compatibility with subsurface exploration data, and to assure that the recommended bearing capacity is being achieved. Any unsuitable, excessively soft/loose or wet soils encountered during foundation excavation and construction should be removed and replaced with lean concrete. A representative of PSI should be present at the site during foundation excavation and construction in order to determine the extent of remedial measures that may become necessary should unsuitable soils be encountered.

Based on the assumed structural loads, it is anticipated that total and differential foundation settlements will be less than 1-inch and ½-inch, respectively. However, actual settlements will be dependent upon the depth of the foundations, column spacing, structural loads and other related factors. The structural and architectural design should include provisions for liberally spaced, vertical control joints to minimize the effects of potential settlement.

After opening, footings should be evaluated, and concrete placed immediately to avoid exposure of the footing bottoms to wetting and drying. If it is required that footing excavations be left open for more than one day, they should be protected to reduce evaporation or entry of soil moisture.

3.4 FLOOR SLAB SUPPORT RECOMMENDATIONS

The floor slab can be grade supported on the naturally occurring cohesive soils or properly compacted low plasticity structural fill in areas where unstable or weak soils are removed. Proof-rolling, as discussed earlier in this report, should be performed to identify soft or unstable soils that should be removed from the floor slab area prior to fill placement and/or floor slab construction. These soils should be replaced with properly compacted structural fill as described earlier in this report. PSI recommends that a minimum 6-inch thick free-draining granular material be placed beneath the floor slab to enhance drainage. The soil surface shall be graded to drain away from the building without low spots that could trap water prior to placing the granular drainage layer.

For subgrade prepared as recommended and properly compacted fill, a modulus of subgrade reaction, *k* value, of 100 pounds per cubic inch (pci) may be used in the grade slab design based on correlation to values typically resulting from a 12-inch diameter plate load test. However, depending on how the slab load is applied, the value will have to be geometrically modified. The value should be adjusted for larger areas using the following expression for cohesive and cohesionless soil:

Modulus of Subgrade Reaction; $k_s = \left(\frac{k}{B}\right)$ for cohesive soil and

$$k_s = k\left(\frac{B+1}{2B}\right)^2 \text{ for cohesionless soil}$$

where: k_s = coefficient of vertical subgrade reaction for loaded area,
k = coefficient of vertical subgrade reaction for 1 square foot area, and
B = effective width of area loaded, in feet

The precautions listed below should be followed for construction of slab-on-grade pads. These details will not reduce the amount of movement but are intended to reduce potential damage should some settlement of the supporting subgrade take place. Some increase in moisture content is inevitable as a result of development and associated landscaping. However, extreme moisture content increases can be largely controlled by proper and responsible site drainage, building maintenance, and irrigation practices.

- Cracking of slab-on-grade concrete is normal and should be expected. Cracking can occur not only as a result of heaving or compression of the supporting soil and/or bedrock material, but also as a result of concrete curing stresses. The occurrence of concrete shrinkage crack, and problems associated with concrete curing may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement, finishing, and curing, and by the placement of crack control joints at frequent intervals, particularly where re-entrant slab corners occur. PSI also recommends that the slab be independent of the foundation walls. Using fiber reinforcement in the concrete can also control shrinkage cracking.
- The American Concrete Institute (ACI) recommends a maximum panel size (in feet) equal to approximately three times the thickness of the slab (in inches) in both directions. For example, joints are recommended at a maximum spacing of 12 feet based on having a 4-inch thick slab.
- Areas supporting slabs should be properly moisture conditioned and compacted. Backfill in all interior and exterior utility line trenches should be properly compacted to reduce the shear stress in the concrete extending over these areas.

Exterior slabs should be isolated from the building, should not be structurally connected to the building or foundation, and should be reinforced to function as independent units. Movement of these slabs should not be transmitted to the building foundation or superstructure.

3.5 EARTHQUAKE AND SEISMIC DESIGN CONSIDERATIONS

Please note that the project site is located within a municipality that employs the Ohio Building Code (OBC), 2017 edition. As part of this code, the design of structures must consider dynamic forces resulting from seismic events. These forces are dependent upon the magnitude of the earthquake event as well as the properties of the soils that underlie the site.

Part of the OBC code procedure references ASCE 7 to evaluate seismic forces and requires the evaluation of the Seismic Site Class, which categorizes the site based upon the characteristics of the subsurface profile within the upper 100 feet of the ground surface.

To define the Seismic Site Class for this project, and as proposed, PSI has interpreted the results of our soil test borings drilled within the project site and estimated appropriate soil properties below the base of the borings to a depth of 100 feet. The estimated soil properties were based upon borings drilled on this site, data available in published geologic reports, ODNR water well data base, as well as our experience with subsurface conditions in the general site area. For this site the depth to bedrock is estimated to be greater than 100 feet.

Based on the depth to rock and the (**estimated shear strength of cohesive soil) or (standard penetration test values of granular soil)** at the boring locations, **Site Class "D"** is recommended. The USGS-NEHRP probabilistic ground motion values near latitude 41.17218° N and longitude 80.73974° W were determined by accessing the Structural Engineers Association of California Office of Statewide Health Planning and Development website Seismic Design Maps to determine site coefficients and parameters for seismic design. The use of this tool requires the input of the building "Risk Category". For estimating purposes, PSI has used a Risk Category III. The structural engineer should determine the actual Risk Category and make changes to the seismic design coefficients and parameters as appropriate.

Period (seconds)	2% Probability of Event in 50 years * (%g)	Site Coefficients	Max. Spectral Acceleration parameters	Design Spectral Acceleration parameters	
0.2 (S_s)	17.2	F_a = 1.6	S_{ms} = 0.275	S_{Ds}= 0.184	T_0= 0.100
1.0 (S_1)	5.8	F_v = 2.4	S_{m1} = 0.139	S_{D1}= 0.092	T_s= 0.500

The Site Coefficients, F_a and F_v were interpolated from IBC 2015 Tables 1613.3.3(1) and 1613.3.3(2) as a function of the site classifications and the mapped spectral response acceleration at the short (S_s) and 1 second (S_1) periods.

3.6 UTILITY TRENCHING

Excavation for utility trenches shall be performed in accordance with OSHA regulations as stated in 29 CFR Part 1926. It should be noted that utility trench excavations have the potential to degrade the properties of the adjacent fill materials. Utility trench walls that are allowed to move laterally can lead to reduced bearing capacity and increased settlement of adjacent structural elements and overlying slabs. Backfill for utility trenches is as important as the original subgrade preparation or structural fill placed to support either a foundation or slab. Therefore, it is imperative that the backfill for utility trenches be placed and compacted to meet the project specifications for the structural fill of this project. In areas that are not accessible to construction personnel and standard compaction equipment, PSI recommends that flowable fill or lean mix concrete be utilized for utility trench backfill.

If on-site soils are placed as trench backfill, the backfill for the utility trenches should be placed in 4 to 6-inch loose lifts and compacted to a minimum of 95% of the maximum dry density achieved by the Standard Proctor test. The backfill soil should be moisture conditioned to be within 2% of the optimum moisture content as determined by the Standard Proctor test. Up to 4 inches of bedding material placed directly under the pipes or conduits placed in the utility trench can be compacted to the 90% compaction criteria with respect to the Standard Proctor. Compaction testing should be performed for every 200 cubic yards of backfill placed or each lift within 150 linear feet of trench, whichever is less. Backfill of utility trenches should not be performed with water standing in the trench. If granular material is used for the backfill of the utility trench, the granular material should have a gradation that will filter protect the backfill material from the adjacent soils. If material having this gradation is not available, a geosynthetic non-woven filter fabric should be used to reduce the potential for the migration of fines into the backfill material. Granular backfill material shall be compacted to meet the above compaction criteria. The clean granular backfill material should be compacted to achieve a relative density greater than 75% or as specified by the geotechnical engineer for the specific material used.

3.7 SILTATION CONTROL

PSI's scope of services did not include sampling and California Bearing Ratio (CBR) testing of existing subgrade soils or potential sources of imported fill for the specific purpose of a detailed pavement analysis. Instead, this report outlines recommended procedures for pavement subgrade preparation. Based on past experience with silty clay glacial soils (i.e. the type of soils encountered at this site) a minimum CBR value of 3 can likely be achieved by preparing the pavement subgrade as outlined in the Site Preparation section of this report. PSI recommends that the moisture content of the subgrade should be maintained between –2% and +3% of the optimum at the time of paving. It may require rework when the subgrade is either excessively desiccated or excessively wet. Fill material, if needed to establish the required pavement grade, must be performed in accordance with the procedures outlined in the Site Preparation section of this report. The edges of compacted fill should extend a minimum 2 feet beyond the edges of the pavement, or a distance equal to the depth of fill beneath the pavement, whichever is greater. Construction traffic should be minimized to prevent unnecessary disturbance of the pavement subgrade. Disturbed areas, as verified by PSI, should be removed and replaced with properly compacted material.

4 CONSTRUCTION CONSIDERATIONS

4.1 FILL SOILS

Undocumented FILL materials consisting of Sandy Silty Clay, Sandy Silt, Silt with organics, and Silty Sand were encountered in test boring locations B-1, B-2, and B-3 extending to depths 3 to 5.5-feet below existing surface grades. The encountered FILL materials should be completely removed from the bottom of footer elevation, and twelve (12)inches below designed subgrade elevation for the floor slab and backfilled with compacted engineered fill. It is must be stressed that the building foundations and floor slab should not be supported directly on the FILL materials.

4.2 GROUNDWATER CONTROL AND DRAINAGE

PSI recommends that the Contractor determine the actual groundwater levels at the site at the time of the construction activities to assess the impact groundwater may have on construction. Water should not be allowed to collect in the foundation excavations, on floor slab areas, or on prepared subgrades of the construction area either during or after construction. Undercut or excavated areas should be sloped toward one corner to facilitate removal of collected rainwater, groundwater, or surface runoff. Positive site drainage should be provided to reduce infiltration of surface water around the perimeter of the building and beneath the floor slabs. The grades should be sloped away from the building and surface drainage should be collected and discharged such that water is not permitted to infiltrate the backfill and floor slab areas of the building. Groundwater was encountered in test boring B-3 at a depth of approximately 18-feet below surface grades. However, discontinuous lenses of saturated granular soils are possible within glacial deposits and can discharge significant quantities of groundwater into excavations for foundations and utilities. Therefore, temporary dewatering of excavations for foundations and utilities should be anticipated. The geotechnical engineer should be consulted if excessive water seepage occurs or if the rate of seepage cannot be controlled with normal pumping techniques, such as pumping from shallow sumps along the perimeter of the excavations.

It should be noted that perched water levels and volumes will fluctuate significantly based on variations in rainfall, snowmelt, surface run-off and other related hydrogeologic factors. Please note that the free groundwater levels in the boreholes are often not representative of the actual level because the boreholes remain open for a relatively short time. To obtain longer-term measurements, it is necessary to install groundwater level observation wells or piezometers. The water level measurements presented in this report are the levels that were measured at the time of PSI's field activities. The possibility of groundwater level fluctuation should be considered when developing the design and construction plans for the project.

4.3 EXCAVATIONS

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, Part 1926, Subpart P." This document was issued to better insure the safety of workers entering trenches or excavations. It is mandated by this federal regulation that all excavations, whether they be utility trenches, basement excavations or foundation excavations, be constructed in accordance with the new OSHA guidelines. It is our understanding that these regulations are being strictly enforced. If they are not followed closely, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person" as defined in "CFR Part 1926," should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

We are providing this information solely as a service to our client. PSI is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred. If the excavations are left open and exposed to the elements for a significant length of time, desiccation of the clays may create minute shrinkage cracks which could allow large pieces of clay to collapse or slide into the excavation.

Materials removed from the excavation should not be stockpiled immediately adjacent to the excavation, inasmuch as this load may cause a sudden collapse of the embankment.

4.4 WEATHER CONSIDERATIONS

The soils encountered at this site are known to be sensitive to disturbances caused by construction traffic and to changes in moisture content. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. Care should be exercised during the grading operations at the site. Due to the fine-grained nature of the surficial soils, the traffic of heavy equipment, including heavy compaction equipment, may very well create pumping and a general deterioration of those soils in the presence of water. Therefore, the grading should, if at all possible, be performed during a dry season. A layer of crushed stone may be required to allow the movement of construction traffic over the site during the rainy season. The contractor should maintain positive site drainage and if wet/pumping conditions occur, the contractor will be responsible to over excavate the wet soils and replace them with a properly compacted engineered fill. During wet seasons, limestone stabilization may be required to place engineered fill.

5 GEOTECHNICAL RISK

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. Site exploration identifies actual subsurface conditions only at those points where samples are taken. A geotechnical report is based on conditions that existed at the time of the subsurface exploration. The analytical tools which geotechnical engineers use are generally empirical and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free and, more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as planned. The engineering recommendations presented in the preceding sections constitute PSI's professional estimate of those measures that are necessary for the proposed structure to perform according to the proposed design based on the information generated and referenced during this evaluation, and PSI's experience in working with these conditions.

6 REPORT LIMITATIONS

The recommendations submitted in this report are based on the available subsurface information obtained by PSI and design details furnished by Mr. Joshua Lyons with The Thrasher Group, Inc. If there are any revisions to the plans for the proposed fishing piers, building structures, or pavement areas, or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be retained to determine if changes in the recommendations are required. If PSI is not retained to perform these functions, PSI will not be responsible for the impact of those conditions on the geotechnical recommendations for the project.

The Geotechnical Engineer warrants that the findings, recommendations, specifications, or professional advice contained herein, have been presented after being prepared in accordance with generally accepted professional engineering practice in the fields of foundation engineering, soil mechanics and engineering geology. No other warranties are implied or expressed.

After the plans and specifications are complete, it is recommended that PSI be provided the opportunity to review the final design and specifications, in order to verify that the earthwork and recommendations are properly interpreted and implemented. At that time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of The Thrasher Group, Inc., for the specific application to the proposed Electrical Equipment Building structure, located on Olive Street, Niles, Trumbull County, Ohio.

APPENDIX

BORING LOCATION PLAN

BORING LOGS

GRAIN SIZE GRAPH

GENERAL NOTES

USCS SOIL CLASSIFICATION CHART

Professional Service Industries, Inc.

intertek psi

1280 Trumbull Avenue, Suite B, Girard, OH 44420
phone 330-759-0288 fax 330-759-0923

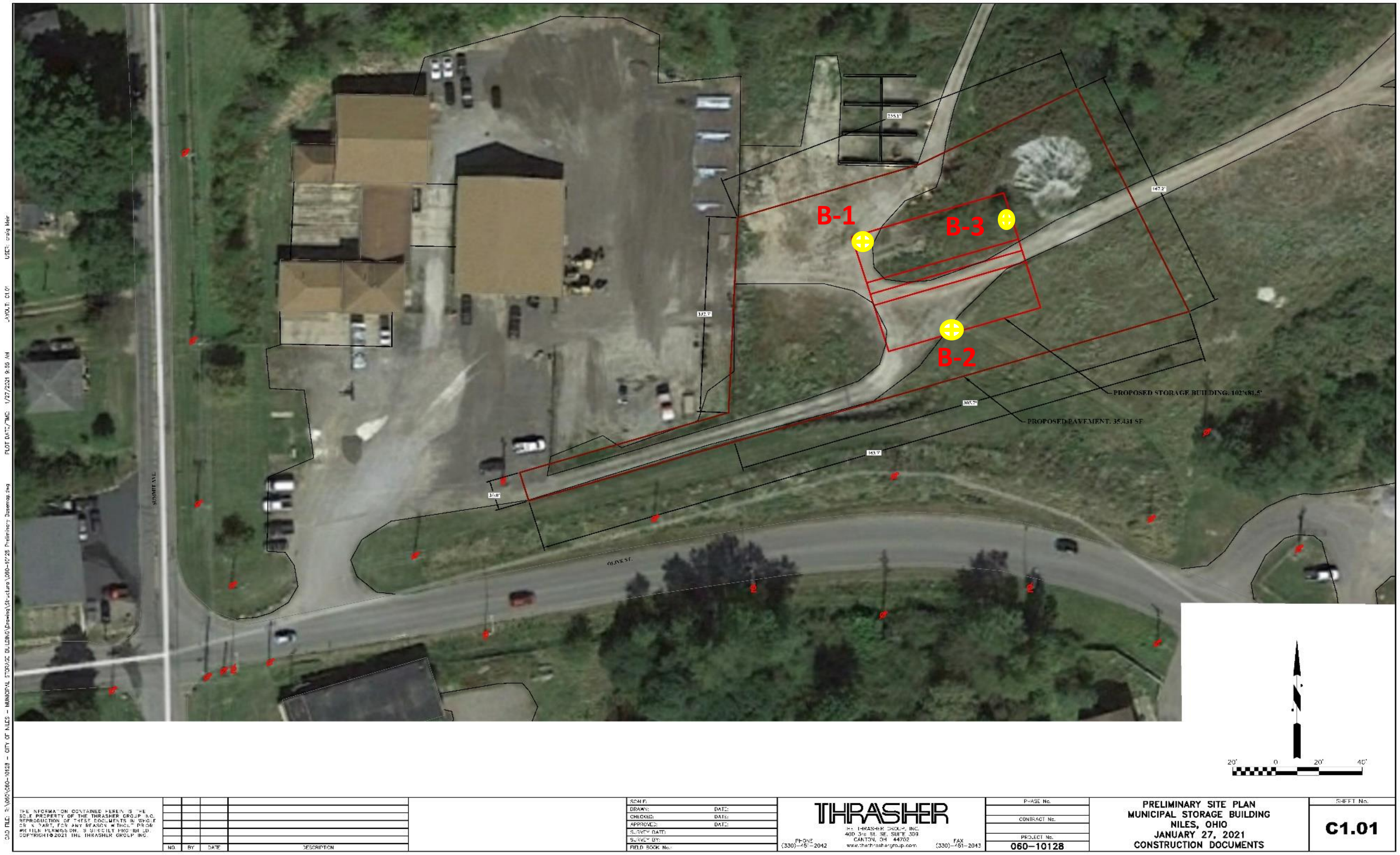
Site Vicinity Plan

PROJECT NO. : 01393403

PROJECT: Proposed Electrical Building

LOCATION: 865 Summit Ave.
Niles, OH

Professional Service Industries, Inc.



intertek psi 1280 Trumbull Avenue, Suite B, Girard, OH 44420 phone 330-759-0288 fax 330-759-0923	**Boring Location Plan**	**PROJECT NO. :** 01393403 **PROJECT:** Proposed Electrical Storage Building **LOCATION:** 865 Summit Ave. Niles, OH

BORING B-1

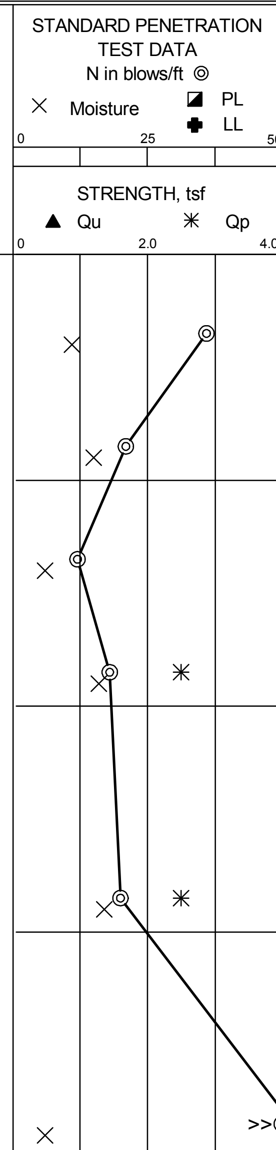
DATE STARTED:	2/11/21	**DRILL COMPANY:**	Ridgeway Drilling
DATE COMPLETED:	2/11/21	**DRILLER:** P. Simpson	**LOGGED BY:** J. Mellinger
COMPLETION DEPTH	20.0 ft	**DRILL RIG:**	Diedrich D50 Truck
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	875 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	Scott Hynes
REMARKS:			

Water

While Drilling	N/E
Upon Completion	N/E
Delay	N/A

BORING LOCATION: Proposed Building Pad

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0			6" Asphalt Grindings	Grindings			
		1	18	*Possible Fill*: Hard, moist, brown, Sandy Silty Clay, trace gravel (CL-ML)	CL-ML	16-17-19 N=36	11	
870	5	2	0	Medium Dense, moist, dark brown, Sandy Silt with organics (ML) L.O.I. @ 3.5' = 2.6% 3.5' - 5': No Split Spoon Recovery; Auger Sample Retrieved.	ML	14-10-11 N=21	15	
		3	18	Medium Dense, brown, Silty Sand with Gravel (SM)	SM	6-8-4 N=12	6	
865	10	4	18	Very Stiff, moist, brown, Silty Clay with Sand, trace gravel (CL-ML)	CL-ML	6-8-10 N=18	16	
860	15	5	18			6-9-11 N=20	17	
855	20	6	10	Very Dense, moist, brown, Silty Sand with Gravel, contains Sandstone Cobbles (SM)	SM	34-25-27 N=52	6	



End of Boring @ 20'

No Free Water Encountered
Caved @ 16.5'

Professional Service Industries, Inc.
1280 Trumbull Avenue
Girard, OH 44420
Telephone: (330) 759-0288

PROJECT NO.: 01393403
PROJECT: Electrical Storage Building
LOCATION: 865 Olive St. Niles, Ohio

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-2

DATE STARTED:	2/11/21	**DRILL COMPANY:**	Ridgeway Drilling
DATE COMPLETED:	2/11/21	**DRILLER:**	P. Simpson **LOGGED BY:** J. Mellinger
COMPLETION DEPTH	20.0 ft	**DRILL RIG:**	Diedrich D50 Truck
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	875 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	Scott Hynes
REMARKS:			

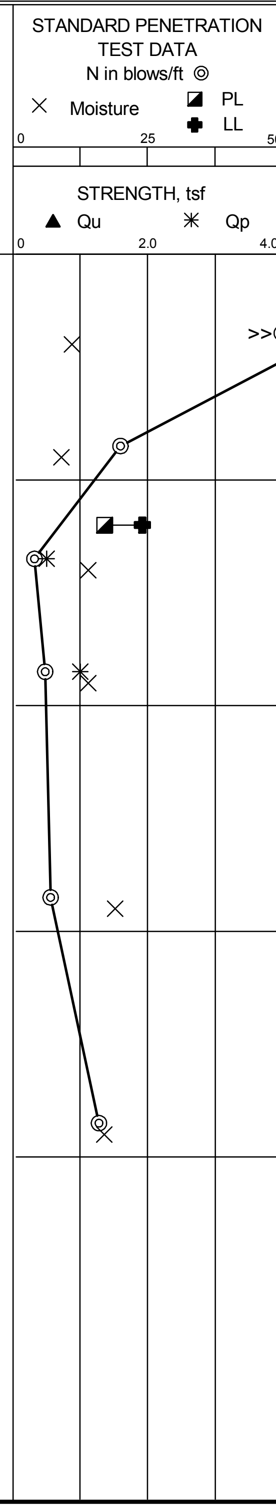
Water		
▽	While Drilling	N/E
▼	Upon Completion	N/E
▽	Delay	N/A

BORING LOCATION:
Proposed Building Pad

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
875	0			12" Slag Aggregate Base	Slag			
		1	10	*Fill*: Very Dense, moist, brown, Sandy Silt, trace gravel and slag (SM)	Fill (SM)	11-50/5"	11	
870	5	2	18	*Possible Fill*: Medium Dense, moist, brown, Sandy Silt, trace gravel (SM)	SM	11-11-9 N=20	9	
		3	18	Firm, moist, brown, Sandy Silty Clay, trace gravel (CL-ML)	CL-ML	3-2-2 N=4	14	LL = 24 PL = 17
865	10	4	10			3-2-4 N=6	14	
860	15	5	18	Loose to Medium Dense, moist, brown, Silty Clayey Sand, trace gravel (SC-SM)	SC-SM	2-3-4 N=7	19	
855	20	6	18			7-8-8 N=16	17	

End of Boring @ 20'

No Free Water Encountered
Caved @ 17'



intertek psi
Professional Service Industries, Inc.
1280 Trumbull Avenue
Girard, OH 44420
Telephone: (330) 759-0288

PROJECT NO.: 01393403
PROJECT: Electrical Storage Building
LOCATION: 865 Olive St.
Niles, Ohio

The stratification lines represent approximate boundaries. The transition may be gradual.

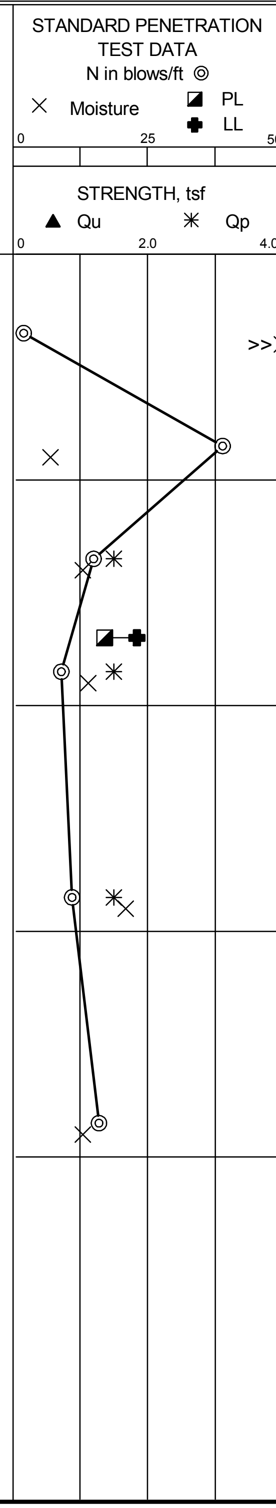
BORING B-3

DATE STARTED:	2/11/21	**DRILL COMPANY:**	Ridgeway Drilling
DATE COMPLETED:	2/11/21	**DRILLER:** P. Simpson	**LOGGED BY:** J. Mellinger
COMPLETION DEPTH	20.0 ft	**DRILL RIG:**	Diedrich D50 Truck
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	879 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	Scott Hynes
REMARKS:			

Water		
▽ While Drilling	18 feet	
▼ Upon Completion	N/E	
▽ Delay	N/A	

BORING LOCATION:
Proposed Building Pad

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0			*Fill*: Very Loose, moist, dark gray, Silt with organics (ML) *Possible Dump Pile*				
		1	18		Fill (ML)	1-1-1 N=2	60	>>
875		2	18			17-18-21 N=39	7	
	5			*Possible Fill*: Dense, moist, brown, Silty Sand with Gravel (SM)	SM			
				Stiff, moist, brown to dark gray, Sandy Silty Clay, trace gravel (CL-ML)	CL-ML			
		3	18			6-7-8 N=15	13	
870		4	18			3-4-5 N=9	14	LL = 23 PL = 17
	10							
				Stiff, moist, brown, Silty Clay with Sand (CL-ML)	CL-ML			
865		5	18			4-5-6 N=11	21	
	15							
				Medium Dense, wet, brown, Silty Sand (SM)	SM			
860		6	18			3-5-11 N=16	13	
	20			End of Boring @ 20' Water Encoutered @ 18' No Water Encountered at Completion Caved @ 17'				



Professional Service Industries, Inc.
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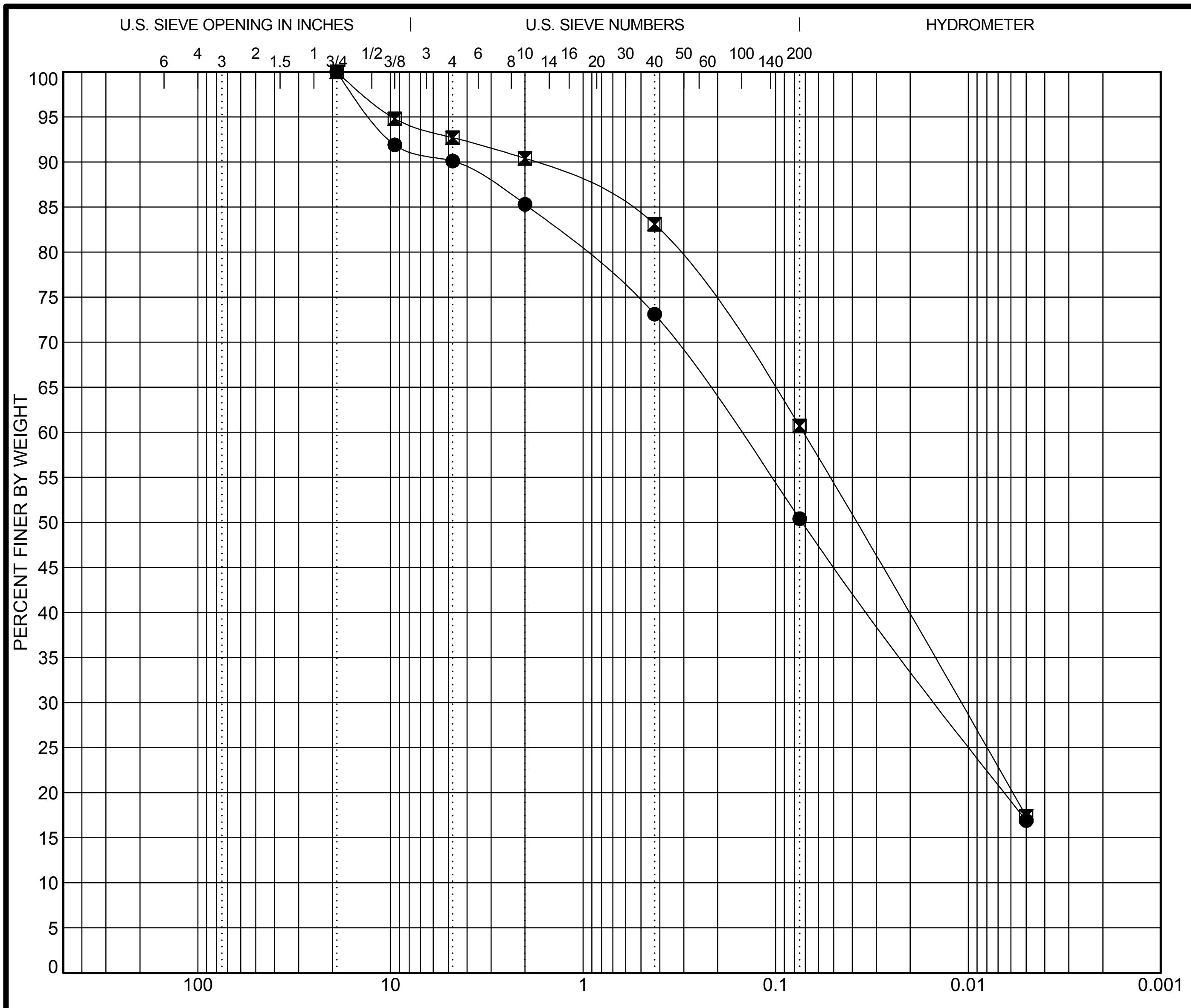
Telephone: (330) 759-0288

PROJECT NO.: 01393403
PROJECT: Electrical Storage Building
LOCATION: 865 Olive St.
Niles, Ohio

The stratification lines represent approximate boundaries. The transition may be gradual.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-2**	**6.0**	**Sandy Silty Clay (CL-ML)**	**24**	**17**	**7**		
⧗	**B-3**	**8.5**	**Sandy Silty Clay (CL-ML)**	**23**	**17**	**6**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-2**	**6.0**	**19**	**0.156**	**0.014**		**9.9**	**39.7**	**50.4**	
⧗	**B-3**	**8.5**	**19**	**0.072**	**0.011**		**7.3**	**32.0**	**60.7**	

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Professional Service Industries, Inc.
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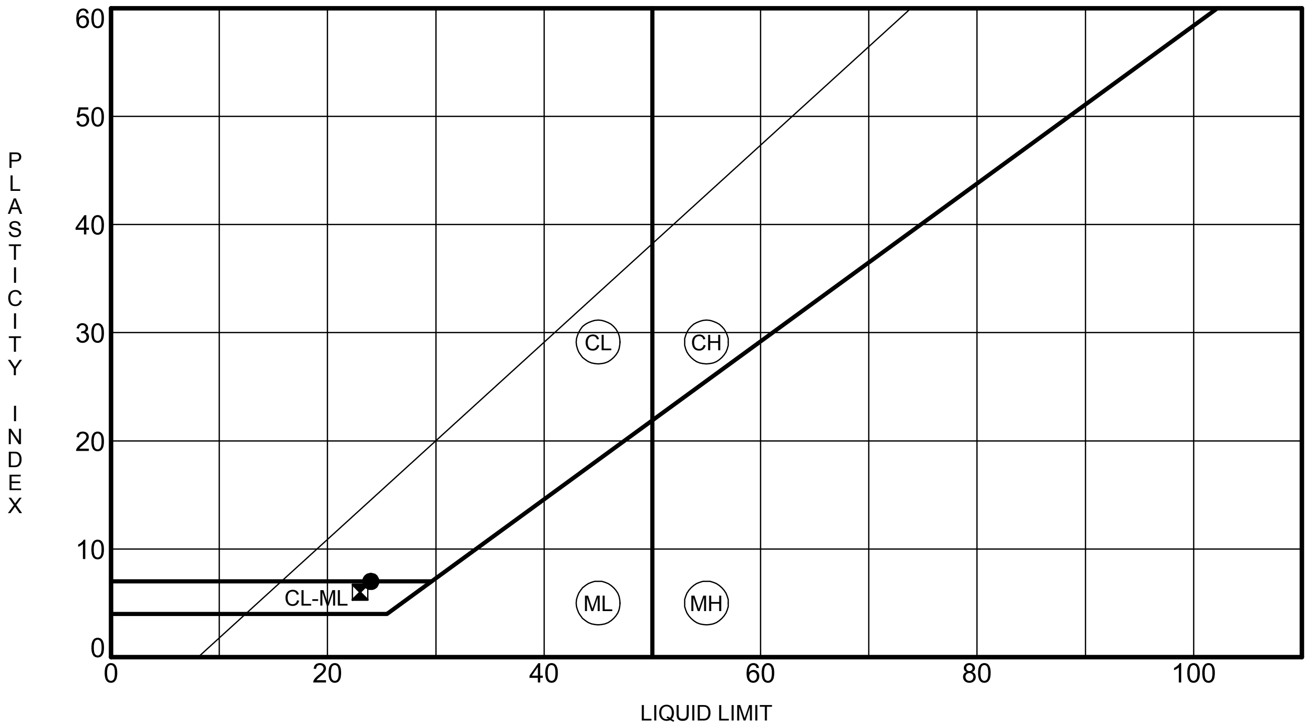
Fax: (330) 759-0923

GRAIN SIZE DISTRIBUTION

Project: Electrical Storage Building
PSI Job No.: 01393403
Location: 865 Olive St.
Niles, Ohio



	Boring	Depth (ft)	LL	PL	PI	Fines	Classification (*Visual)
●	**B-2**	**6.0**	**24**	**17**	**7**	**50.4**	**Sandy Silty Clay (CL-ML)**
⧗	**B-3**	**8.5**	**23**	**17**	**6**	**60.7**	**Sandy Silty Clay (CL-ML)**

Professional Service Industries, Inc.
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ATTERBERG LIMIT RESULTS

PSI Job No.: 01393403
Project: Electrical Storage Building
Location: 865 Olive St.
Niles, Ohio

Electrical Equipment Building

Latitude, Longitude: 41.17218, -80.73974

Date	2/18/2021, 9:50:03 AM
Design Code Reference Document	ASCE7-10
Risk Category	III
Site Class	D - Stiff Soil

Type	Value	Description
S_S	0.172	MCE_R ground motion. (for 0.2 second period)
S_1	0.058	MCE_R ground motion. (for 1.0s period)
S_{MS}	0.275	Site-modified spectral acceleration value
S_{M1}	0.139	Site-modified spectral acceleration value
S_{DS}	0.184	Numeric seismic design value at 0.2 second SA
S_{D1}	0.092	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	B	Seismic design category
F_a	1.6	Site amplification factor at 0.2 second
F_v	2.4	Site amplification factor at 1.0 second
PGA	0.095	MCE_G peak ground acceleration
F_{PGA}	1.6	Site amplification factor at PGA
PGA_M	0.152	Site modified peak ground acceleration
T_L	12	Long-period transition period in seconds
SsRT	0.172	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	0.195	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.058	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.062	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.884	Mapped value of the risk coefficient at short periods
C_{R1}	0.928	Mapped value of the risk coefficient at a period of 1 s

DISCLAIMER

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GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

DRILLING AND SAMPLING SYMBOLS

- SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.
- HSA: Hollow Stem Auger - typically 3¼" or 4¼ I.D. openings, except where noted.
- M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry
- R.C.: Diamond Bit Core Sampler
- H.A.: Hand Auger
- P.A.: Power Auger - Handheld motorized auger
- SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
- ST: Shelby Tube - 3" O.D., except where noted.
- BS: Bulk Sample
- PM: Pressuremeter
- CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings

SOIL PROPERTY SYMBOLS

- N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
- N_{60}: A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
- Q_u: Unconfined compressive strength, TSF
- Q_p: Pocket penetrometer value, unconfined compressive strength, TSF
- w%: Moisture/water content, %
- LL: Liquid Limit, %
- PL: Plastic Limit, %
- PI: Plasticity Index = (LL-PL),%
- DD: Dry unit weight, pcf
- ▼,▽,▼: Apparent groundwater level at time noted

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	N - Blows/foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50 - 80
Extremely Dense	80+

ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular:	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular:	Particles are similar to angular description, but have rounded edges
Subrounded:	Particles have nearly plane sides, but have well-rounded corners and edges
Rounded:	Particles have smoothly curved sides and no edges

GRAIN-SIZE TERMINOLOGY

Component	Size Range
Boulders:	Over 300 mm (>12 in.)
Cobbles:	75 mm to 300 mm (3 in. to 12 in.)
Coarse-Grained Gravel:	19 mm to 75 mm (¾ in. to 3 in.)
Fine-Grained Gravel:	4.75 mm to 19 mm (No.4 to ¾ in.)
Coarse-Grained Sand:	2 mm to 4.75 mm (No.10 to No.4)
Medium-Grained Sand:	0.42 mm to 2 mm (No.40 to No.10)
Fine-Grained Sand:	0.075 mm to 0.42 mm (No. 200 to No.40)
Silt:	0.002 mm to 0.075 mm
Clay:	<0.002mm to <0.005 mm depending on agency

PARTICLE SHAPE

Description	Criteria
Flat:	Particles with width/thickness ratio > 3
Elongated:	Particles with length/width ratio > 3
Flat & Elongated:	Particles meet criteria for both flat and elongated

RELATIVE PROPORTIONS OF FINES

Descriptive Term	% Dry Weight
Trace:	< 5%
With:	5% to 12%
Modifier:	>12%

GENERAL NOTES

(Continued)

CONSISTENCY OF FINE-GRAINED SOILS

Q_U - TSF	N - Blows/foot	Consistency
0 - 0.25	0 - 2	Very Soft
0.25 - 0.50	2 - 4	Soft
0.50 - 1.00	4 - 8	Firm (Medium Stiff)
1.00 - 2.00	8 - 15	Stiff
2.00 - 4.00	15 - 30	Very Stiff
4.00 - 8.00	30 - 50	Hard
8.00+	50+	Very Hard

MOISTURE CONDITION DESCRIPTION

Description	Criteria
Dry:	Absence of moisture, dusty, dry to the touch
Moist:	Damp but no visible water
Wet:	Visible free water, usually soil is below water table

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term	% Dry Weight
Trace:	< 15%
With:	15% to 30%
Modifier:	>30%

STRUCTURE DESCRIPTION

Description	Criteria
Stratified:	Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick
Laminated:	Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick
Fissured:	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided:	Fracture planes appear polished or glossy, sometimes striated
Blocky:	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed:	Inclusion of small pockets of different soils
Layer:	Inclusion greater than 3 inches thick (75 mm)
Seam:	Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample
Parting:	Inclusion less than 1/8-inch (3 mm) thick

SCALE OF RELATIVE ROCK HARDNESS

Q_U - TSF	Consistency
2.5 - 10	Extremely Soft
10 - 50	Very Soft
50 - 250	Soft
250 - 525	Medium Hard
525 - 1,050	Moderately Hard
1,050 - 2,600	Hard
>2,600	Very Hard

ROCK BEDDING THICKNESSES

Description	Criteria
Very Thick Bedded	Greater than 3-foot (>1.0 m)
Thick Bedded	1-foot to 3-foot (0.3 m to 1.0 m)
Medium Bedded	4-inch to 1-foot (0.1 m to 0.3 m)
Thin Bedded	1¼-inch to 4-inch (30 mm to 100 mm)
Very Thin Bedded	½-inch to 1¼-inch (10 mm to 30 mm)
Thickly Laminated	1/8-inch to ½-inch (3 mm to 10 mm)
Thinly Laminated	1/8-inch or less "paper thin" (<3 mm)

ROCK VOIDS

Voids	Void Diameter
Pit	<6 mm (<0.25 in)
Vug	6 mm to 50 mm (0.25 in to 2 in)
Cavity	50 mm to 600 mm (2 in to 24 in)
Cave	>600 mm (>24 in)

GRAIN-SIZED TERMINOLOGY

(Typically Sedimentary Rock)

Component	Size Range
Very Coarse Grained	>4.76 mm
Coarse Grained	2.0 mm - 4.76 mm
Medium Grained	0.42 mm - 2.0 mm
Fine Grained	0.075 mm - 0.42 mm
Very Fine Grained	<0.075 mm

ROCK QUALITY DESCRIPTION

Rock Mass Description	RQD Value
Excellent	90 -100
Good	75 - 90
Fair	50 - 75
Poor	25 -50
Very Poor	Less than 25

DEGREE OF WEATHERING

Slightly Weathered:	Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.
Weathered:	Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.
Highly Weathered:	Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

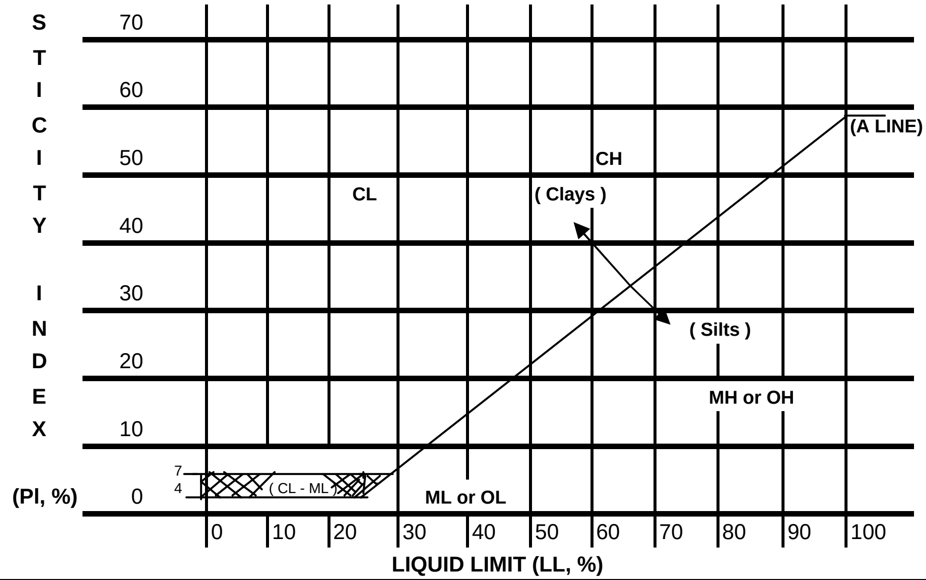
United Soil Classification System
ASTM Designation D - 2487

Information To Build On
Engineering • Consulting • Testing

Based upon percentage of material passing No. 200 sieve classify as:

Less than 5%	GW, GP, SW, SP
More than 12%	GM, GC, SM, SC
5% to 12%	Borderline, use dual symbols

Plot instersection of PI and LL as determined by Atterberg Limits Tests. Data points above A LINE indicated Clay soils, those below the A LINE indicate Silt.



Coarse Grained Soils (More than half of is larger than No. 200 sieve)	Gravels (More than 50% retained on No.4 sieve)	GW	Well graded gravels, gravel-sand mixtures, little or no fines	$C_u = \frac{D_{60}}{D_{10}} > 4$; $1 < C_c = \frac{[D_{30}]^2}{D_{10} * D_{60}} < 3$
		GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	Does not meet all requirements for GW
		GM	Silty gravels, gravel-sand-silt mixtures	below A Line, PI < 4; in shaded area 4 < PI < 7 Dual Symbols
		GC	Clayey gravels, gravel-sand-clay mixtures	above A Line, PI > 7
	Sands (More than 50% passing a No. 4 sieve)	SW	Well graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}} > 6$; $1 < C_c = \frac{[D_{30}]^2}{D_{10} * D_{60}} < 3$
		SP	Poorly graded sands, gravelly sands, little or no fines	Does not meet all requirements for SW
		SM	Silty sands, sand-silt mixtures	below A Line, PI < 4; in shaded area 4 < PI < 7 Dual Symbols
		SC	Clayey sands, sand-clay mixtures	above A Line, PI > 7
Fine Grained Soils (More than half of material is smaller than No. 200 sieve)	Silts & Clays (LL less than 50)	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
		OL	Organic silts and organic silty clays of low plasticity	
	Silts & Clays (LL greater than 50)	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, plastic silts	
		CH	Inorganic clays of high plasticity fat clays	
		OH	Organic clays of medium to high plasticity	
	Highly Organic Soil	Pt	Peat and other highly organic soils	