City of Rochester Hills
Invitation to Bid
Construction and Development Nowicki Park
ITB-RH-26-007
Addendum #1

Wednesday, February 25, 2026

This document is considered Addendum #1 to the Invitation to Bid – Construction and Development of Nowicki Park – ITB-RH-26-007.

Attached and made part of this addendum include the following:

- Pre-Proposal Meeting Notes
- Sign-In Sheet for Pre-Proposal Meeting
- Addition of Corrected Table of Contents Technical Specification and Technical Specification Sheets that were noted as To Be Added
    - Corrected Table of Contents
        - Division 26 – Electrical: 26220 Low-Voltage Transformers Pages 819A-822D
        - Division 27 – Communications: 270529 Pages 868A-870C
        - Division 27 – Communications: Conduit for Communications Systems Pages 871A-877G
- Revision to Time of Completion
    - Please Note the Time of Completion, noted on the Instructions to Bidders, Page 10, Item 18 has been revised as follows:
        - The Contractor shall complete the project, including restoration of all disturbed areas, within the time limits indicated below and after the Notice to Proceed has been given. **Completion of all project elements shall be no later than Friday, ~~August 6, 2027~~** Monday, August 17, 2027**. In addition, all road widening work within Adams Road shall be completed between June 1, 2027 and August 6, 2027.** The amount of liquidated damages for this project shall be as identified under Item 20 of the Instruction to Bidders and under the terms and conditions stated in Section VI of the General Conditions.

Lisa Cummins, NIGP-CPP, CPPB
Procurement Manager
City of Rochester Hills

City of Rochester Hills
PRE-BID VOLUNTARY MEETING NOTES
Monday, February 23, 2026 at 10:00 a.m.

INVITATION TO BID (ITB)
FOR CONSTRUCTION AND DEVELOPMENT NOWICKI PARK
ITB-RH-26-007

The non-mandatory pre-bid meeting was held on Monday, February 23, 2026 at 10:00 a.m. at the City of Rochester Hills, Auditorium, 1000 Rochester Hills Drive, Rochester Hills, Michigan for the purpose of reviewing the ITB, providing project information, and answering questions.

Lisa Cummins, Procurement Manager City of Rochester Hills; Emily Perez, Procurement Associate City of Rochester Hills; Ken Elwert, Director Parks and Natural Resources City of Rochester Hills; Dennis Andrews, Deputy Director Parks and Natural Resources City of Rochester Hills; Mike Viazanko, Director Department Building, Ordinance, Facilities City of Rochester Hills; Matt Exley, Facilities Manager City of Rochester Hills; Steve Sutton, Engineer, Nowak & Fraus; Ed Alonso, Architect, A3C; and interested contractors were in attendance.

All Contractors present were asked to complete the "sign-in" sheet. Attendees were encouraged to register as a vendor on the Michigan Intergovernmental Trade Network (MITN) in order to receive addenda and award information relative to the proposal. Attendance at the pre-bid meeting is voluntary and is not required to submit a bid. Contractors were instructed that meeting notes and the sign-in sheet will be issued as an addendum on the MITN procurement site.

Sealed bids will be received in the Purchasing Division, City of Rochester Hills, 1000 Rochester Hills Drive, (Lower Level), Rochester Hills, Michigan 48309 until Thursday, **March 12, 2026 @ EXACTLY 3:00 p.m.** at which time the bids will be publicly opened and read aloud. Faxed, emailed, or late proposals will not be accepted.

The deadline for questions is Thursday, February 26, 2026 at 5:00pm. Once deadline for questions has passed an addendum will be posted on the MITN site with any remaining questions received. Bidders were reminded that all questions must be submitted to the attention of: Lisa Cummins, NIGP-CPP, CPPB, Procurement Manager, City of Rochester Hills, 1000 Rochester Hills Drive, Rochester Hills, MI, 48309, Email: cumminsl@rochesterhills.org, Phone: (248) 841-2537. Vendors cannot contact any entity or employee with their questions.

The Bidder Minimum Qualifications must be met by the awarded Contractor.

Lisa Cummins, City of Rochester Hills Procurement Manager, then proceeded with a general overview of the ITB and explained the format and submittal requirements. Lisa indicated that all bids must be received PRIOR to the stated deadline. Any late bids would be rejected. She continued to highlight information contained in the Invitation to Bid, which included the MDOT prequalification requirements for the paving and road portion of the project, and then stressed the importance of Contractors in familiarizing

themselves with the stated bidder minimum qualifications on pages 2-5 of the ITB. She went through the two (2) project completion deadlines, and highlighted that the road work would need to take place specifically within the timeline addressed in the bid documents due to school start and end dates.

Question: Does the road work have to be completed in 2027, or can it occur in 2026?

Answer: After discussion, the City has determined that the road work must occur in 2027, as if the road was completed sooner, there could be damaged sustained during the construction of the park due to the amount of heavy equipment and traffic the park will see during its development. **Please note: A Revised Time of Completion Date is included and incorporated as part of issuance of this addendum.**

Revision to Instructions to Bidders, Page 10, Item 18: *The Contractor shall complete the project, including restoration of all disturbed areas, within the time limits indicated below and after the Notice to Proceed has been given.* ***Completion of all project elements shall be no later than ~~Friday, August 6, 2027~~ Monday, August 17, 2027. In addition, all road widening work within Adams Road shall be completed between June 1, 2027 and August 6, 2027.*** *The amount of liquidated damages for this project shall be as identified under Item 20 of the Instruction to Bidders and under the terms and conditions stated in Section VI of the General Conditions.*

Lisa went on to explain that permits have been applied for and would be furnished when available. If this occurs prior to the bid opening date it will be issued as part of the addendum, however if it occurs after, these will be provided to the Awarded Contractor. She also highlighted the bond and insurance requirements, and pointed out that most of the insurance requirements are standard but there is a Builder's Risk Insurance policy requirement the awarded contractor will have to provide due to the construction of the buildings. Lisa then asked if there were any questions related to the bid, and being no questions, she then turned the meeting over to Steve Sutton.

Steve Sutton, Engineer at Nowak and Fraus, provided the highlights of the project itself. He talked about where various elements will be located within the park and explained that the Adams Road work will be a widening of the road to accomplish a continuous center turn late along the park frontage. Ken Elwert, then asked Steve Sutton to talk about the wetlands in the park. Steve explained that there are two ponds in the project. One (1) is as a detention pond, and then the second one is an existing low area to be retrofitted as a pond with clay liner to re-naturalize the areas in the center of the property. He also spoke about the Irrigation Plan which will pull from the pond located within the park and indicated the vendors may want to spend some time in familiarizing themselves with this work. Steve, then turned the meeting over to Ed Alonso.

Ed Alonso, Architect from A3C, spoke briefly about the four (4) buildings that will be contained within the park. He indicated that the buildings will include office areas, a community room, locker rooms, public restrooms, etc. The exterior of the buildings will be stone with cement board and metal roofs. The maintenance building will have a basic two (2) car garage for equipment/vehicle storage and then a small storage room and maintenance work area. There is also a building to the south of the playground that will be a small public restroom structure.

At this point, the meeting was opened up for questions from interested contractors in attendance.

Question: Will excess soil be kept on site?

Answer: Yes.

Question: Are there wage requirements for this project?

Answer: No.

Question: It was mentioned that the Contractor will need to coordinate with the Playground equipment provider. Typically, the work that is required in order to prepare for playground equipment includes underdrain, foundations, etc. Will the Contractor or Playground Vendor be responsible for the underdrains, etc.

Answer: The Contractor is responsible for the elements proposed on sheets L501-L593, except for the actual play equipment and their related foundations, which will be by others. The grading, underdrain, concrete base for poured in place material, concrete edge borders, boulder and stonework, play hut foundation, and all at grade decking as shown on sheet L593 is included. Sheet L503 shows equipment being purchased separately.

Question: Typically, there may be some additional grading required for playgrounds, typically it is greater than 1/10 fine grading. Who is responsible for doing the grading and final "tweaking" of grade?

Answer: All required sub grading and base grading in the playground area is the responsibility of the contractor. Concrete base of poured in place is the responsibility of the contractor. Top of concrete grade to be coordinated with depth of poured in place. Finished grade of play surfacing is established by poured in place installer (not in contract). Finished grade outside of the poured in place play surfacing is the responsibility of the contractor (landscape beds, play sand, etc.).

Question: In the plans it shows there are boardwalks connecting from the pathway to playground structure. Is the playground vendor providing the boardwalks, or is the contractor responsible for providing?

Answer: The Contractor is responsible for the concrete abutment at the entry side of the boardwalk. The boardwalks shown connecting to Timber Towers is by the equipment supplier and not included in this contract.

Question: Is the Contractor responsible for providing site furnishings?

Answer: Yes, there is a line item in the bid form for Site furnishings.

Question: Are we able to get an excel document for the bid form?

Answer: We don't currently have the bid form in excel format. The pdf is editable for typing in the information if needed, versus that of hand written. The City can also provide the Bid Form in Word Format if requested in writing by email to Lisa.

Question: Is there an anticipated start date?

Answer: The City's intent is to bring this forward to the April 13 City Council meeting, and if accepted the Intent to Award would go out that same week, and once the City collects and verifies all paperwork, and Notice to Proceed would follow.

Question: Are there any tree clearing restrictions regarding bats, etc.?

Answer: The tree survey has been completed, and if trees are cleared prior to June 1, when bats need to be counted, there are no restrictions.

Question: Does the City know what the fees for the permits will be?

Answer: There is an allowance in the bid form on line item 2 for permit fees. City permit fees, for instance for each of the buildings in the park, will be waived. This line item has been reduced to $15,000. A revised Bid Form will be posted with issuance of Addendum #2.

There being no further questions, the meeting ended at approximately 10:38 a.m.

Questions received via Email:

Question: Regarding bid form line item #46 – 6-foot-wide boardwalk, I can't seem to a find call out for this in the plans like I can for the other boardwalk bid items on C2.0 and L301. Is the 6-foot board walk considered to be key note H on L501, or is that considered to be a part of bid item #81-playground entry structure? Please clarify further.

Answer: Item #46 would be for completion of the playground wood decking shown on sheet L593.

Question: There are multiple spots within the plans that calls out "Install Tree Protection Fence, paid for as Erosion Control - Tree Protection Fence", but there isn't a quantity and pay item in the proposal for this item. Can 1 be added or do we need to put the cost elsewhere in the bid?

Answer: The callout "Erosion Control - Tree Protection Fence" is incorrect. A new item "Fence, Protective" has been included for all tree protection fencing proposed.

ITB-RH-26-007
Construction and Development Nowicki Park
PRE-BID MEETING
Monday, February 23, 2026 @ 10:00 a.m.

PLEASE SIGN IN:

COMPANY NAME	CONTACT NAME	ADDRESS, CITY, STATE, ZIP	PHONE #	EMAIL ADDRESSS
Quadrate Construction	Don Allender	1580 23 mile Rd Macomb 48042	586-824-4712	Don@Quadrateco.com
L. D'Agostini & Sons	Aaron Carr	15801 23 mile rd Macomb 48042	906-371-0169	AaronC@ldagostini.com
~~Nate Wade~~ DeMaria	Nate Wad	45500 Grand River Ave, Novi	248-305-4991	nathanW@DeMariaBuild.com
D&R EARTHMOVING LLC	TIM LANGE	10733 PLAZA DR. WHITMORE LAKE	~~517~~ 515-6845	TLANGE@DREARTHMOVING.COM
KYLE BUILDERS	KYLE HUMPHREY	4445 22 MILE RD STERLING	810-343-7521	KYLEBUILDERS@SBCGLOBAL.NET
Brencal Contractors Inc ~~Nicholas Rowland~~	Nicholas Rowland	26079 Schoenherr rd Warren 48089	586-758-6000	nrowland@brencal.net
Davey Resource Group	Mike Sobieski	24301 Catherine Industrial Dr 124 Novi, MI 48375	586-747-1773	mike.sobieski@davey.com
NEW ENERGY WORKS	DRAKE AMBROSINO	3845 LEROY ANN ARBOR 48103	7342605045	DRAKE@NEWENERGYWORKS.COM

ITB-RH-26-007
Construction and Development Nowicki Park
PRE-BID MEETING
Monday, February 23, 2026 @ 10:00 a.m.

PLEASE SIGN IN:

COMPANY NAME	CONTACT NAME	ADDRESS, CITY, STATE, ZIP	PHONE #	EMAIL ADDRESSS
ANGELO IAFRATE CONST	BEN KOLARIK	26300 SHERWOOD AVE, WARREN 48091	586-756-1070	bKolarik@iafrate.com
MTD Construction	Bryce Cole	126 Summit St, Brighton MI 48116	517-745-1019	metal@MTDConstruction.Net
Deangelis Diamond	YOUSIF HUBALLAH	39555 Orchard Hill Pl. Suit 245 Novi, 48375	313-467-4746	yousif.huballah@deangelisdiamond.com
Frank Rewold + Sons	Bradley Detwiler	305 E. Third St. Suite 300 Rochester MI 48307	216-598-0936	bdetwiler@frankrewold.com
2 Contractors	Nick Weber	$50500 Design Ln Shelby twp, MI	810-824-0975	NWeber@2-Contractors.com
WARREN CONTRACTORS	NICK CERULLO	14979 TECHNOLOGY DR SHELBY TWP., MI 48315	586-323-3350	NICK@WARRENCONDEV.COM

TABLE OF CONTENTS

SECTION 262200
LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General purpose transformers.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260533 - Conduit for Electrical Systems: Flexible conduit connections.

1.03 REFERENCE STANDARDS

A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.

B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type General Purpose Distribution and Power Transformers; 1982 (R2006).

C. IEEE C57.96 - Guide for Loading Dry-Type Distribution and Power Transformers; 2013.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2009.

F. NEMA ST 20 - Dry-Type Transformers for General Applications; 2014.

G. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.

K. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate the work with placement of supports, anchors, etc. required for mounting.
   4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013323, Shop Drawings, Project Data and Samples, for submittal procedures.

B. See Section 013000 - Administrative Requirements, for submittal procedures.

C. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point

dimensions, weight, required clearances, service condition requirements, and installed features.
1. Vibration Isolators: Include attachment method and rated load and deflection.
2. K-factor Rated Transformers: Include K-factor ratings.

D. Shop Drawings: Provide dimensioned plan and elevation views of transformers and adjacent equipment with all required clearances indicated.

E. Project Record Documents: Record actual locations of transformers.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Ambient Temperature: Do not exceed the following maximum temperatures during and after installation of transformers.
1. Greater than 10 kVA: 104 degrees F maximum.
2. Less than 10 kVA: 77 degrees F maximum.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB/GE: www.geindustrial.com/#sle.

B. Eaton Corporation: www.eaton.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

D. Siemens Industry, Inc: www.usa.siemens.com.

E. Source Limitations: Furnish transformers produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 TRANSFORMERS - GENERAL REQUIREMENTS

A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.

B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
1. Altitude: Less than 3,300 feet.
2. Ambient Temperature:
a. Greater than 10 kVA: Not exceeding 104 degrees F.

b. Less than 10 kVA: Not exceeding 77 degrees F.

C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.

D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.

E. Basic Impulse Level: 10 kV.

F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

G. Isolate core and coil from enclosure using vibration-absorbing mounts.

H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.03 GENERAL PURPOSE TRANSFORMERS

A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.

B. Primary Voltage: 240 x 480 volts, 1 phase.

C. Secondary Voltage: 120/240 volts, 1 phase.

D. Insulation System and Allowable Average Winding Temperature Rise:
1. Less than 15 kVA: Class 180 degrees C insulation system with 115 degrees C average winding temperature rise.
2. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.

E. Coil Conductors: Continuous aluminum windings with terminations brazed or welded.

F. Winding Taps:
1. Less than 3 kVA: None.
2. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.
3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.
4. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.

G. Energy Efficiency: Comply with 10 CFR 431, Subpart K.

H. Sound Levels: Standard sound levels complying with NEMA ST 20

I. Mounting Provisions:
1. Less than 15 kVA: Suitable for wall mounting.
2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
3. Larger than 75 kVA: Suitable for floor mounting.

J. Transformer Enclosure: Comply with NEMA ST 20.
1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
a. Indoor clean, dry locations: Type 2.
2. Construction: Steel.
a. Less than 15 kVA: Totally enclosed, non-ventilated.
b. 15 kVA and Larger: Ventilated.
3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
4. Provide lifting eyes or brackets.

K. Accessories:
1. Mounting Brackets: Provide manufacturer's standard brackets.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.

C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install transformers in accordance with NECA 409 and IEEE C57.94.

D. Use flexible conduit, under the provisions of Section 260533, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.

F. Install transformers plumb and level.

G. Transformer Support:
   1. Provide required support and attachment in accordance with Section 260529, where not furnished by transformer manufacturer.
   2. Use integral transformer flanges, accessory brackets furnished by manufacturer, or field-fabricated supports to support wall-mounted transformers.
   3. Unless otherwise indicated, mount floor-mounted transformers on properly sized 3 inch high concrete pad constructed in accordance with Section 033000.
   4. Use trapeze hangers assembled from threaded rods and metal channel (strut) to support suspended transformers. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

H. Provide grounding and bonding in accordance with Section 260526.

I. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.

J. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

3.04 ADJUSTING

A. Measure primary and secondary voltages and make appropriate tap adjustments.

B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from transformer components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 270529
HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 2 PRODUCTS

1.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with the following. Where requirements differ, comply with most stringent.
      a. TIA-569.
      b. NFPA 70.
      c. Requirements of authorities having jurisdiction.
   2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of communications work.
   3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
   4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported _____. Include consideration for vibration, equipment operation, and shock loads where applicable.
   5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
      a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit Supports: Straps and clamps suitable for conduit to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Cable Supports: Suitable for cables to be supported, including but not limited to J-hooks, bridle rings, drive rings, and flexible harnesses/slings.
   1. Applications:
      a. Do not exceed 5 feet between cable supports.
      b. Maximum Number of Cables per Cable Support:
      c. Allowable Cable Types:
         1) J-Hooks: Category 3, Category 5e, and Category 6.
   2. Comply with TIA-569.

D. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

E. Metal Channel/Strut Framing Systems:
   1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
   2. Comply with MFMA-4.
   3. Channel Material:
      a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.

F. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
   1. Minimum Size, Unless Otherwise Indicated or Required:
      a. Equipment Supports: 1/2-inch diameter.
      b. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch diameter.
      c. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch diameter.
      d. Outlet Boxes: 1/4-inch diameter.

G. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.
6. Wood: Use wood screws.
7. Hammer-driven anchors and fasteners are not permitted.
8. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
   a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
   b. Comply with MFMA-4.
   c. Channel Material: Use galvanized steel.

PART 3 EXECUTION

2.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

2.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1, BICSI ITSIMM, and BICSI N1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:
   1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
   2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

I. Secure fasteners in accordance with manufacturer's recommended torque settings.

J. Remove temporary supports.

2.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 270533.13
CONDUIT FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).
B. Stainless steel rigid metal conduit (RMC).
C. Galvanized steel intermediate metal conduit (IMC).
D. Stainless steel intermediate metal conduit (IMC).
E. PVC-coated galvanized steel rigid metal conduit (RMC).
F. Galvanized steel electrical metallic tubing (EMT).
G. Stainless steel electrical metallic tubing (EMT).
H. Rigid polyvinyl chloride (PVC) conduit.
I. Reinforced thermosetting resin conduit (RTRC).
J. High-density polyethylene (HDPE) conduit.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.
B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.
C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.
D. ASTM F2160 - Standard Specification for Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD); 2016.
E. ASTM F2176 - Standard Specification for Mechanical Couplings Used on Polyethylene Conduit, Duct and Innerduct; 2017.
F. BICSI ITSIMM - Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition; 2022.
G. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.
H. BICSI TDMM - Telecommunications Distribution Methods Manual, 15th Edition; 2024.
I. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
J. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
K. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2003.
L. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.
M. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.
N. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.
O. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.
P. NEMA TC 7 - Solid-Wall Coilable and Straight Electrical Polyethylene Conduit; 2021.
Q. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.

R. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

S. TIA-568.0 - Generic Telecommunications Cabling for Customer Premises; 2020e.

T. TIA-569 - Telecommunications Pathways and Spaces; 2015d, with Addendum (2016).

U. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

V. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.

W. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

X. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

Y. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

Z. UL 651A - High Density Polyethylene (HDPE) Conduit; Current Edition, Including All Revisions.

AA. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

BB. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel; Current Edition, Including All Revisions.

CC. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with actual type and quantity of cables to be installed.
   2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
   4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
   5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of communications cables until installation of conduit between termination points is complete.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

1.06 QUALITY ASSURANCE

A. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions and shop drawings.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, TIA-569, BICSI ITSIMM, BICSI TDMM, manufacturers' instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
   1. Under Slab on Grade: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless

steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).

2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), rigid PVC conduit, reinforced thermosetting resin conduit (RTRC), or high-density polyethylene (HDPE) conduit.
3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), rigid PVC conduit, reinforced thermosetting resin conduit (RTRC), or high-density polyethylene (HDPE) conduit.
4. Where rigid polyvinyl chloride (PVC) conduit or high-density polyethylene (HDPE) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), or schedule 80 rigid PVC conduit where emerging from underground.
5. Where rigid polyvinyl chloride (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows, stainless steel rigid metal conduit (RMC) elbows, galvanized steel intermediate metal conduit (IMC) elbows, stainless steel intermediate metal conduit (IMC) elbows, PVC-coated galvanized steel rigid metal conduit (RMC) elbows, or concrete-encased PVC elbows for bends.
6. Where galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC) is installed in direct contact with earth where soil has resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.
7. Where galvanized steel electrical metallic tubing (EMT) is installed in direct contact with earth, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.
8. Where aluminum rigid metal conduit (RMC) or aluminum electrical metallic tubing (EMT) is installed in direct contact with earth, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.
9. Where galvanized rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT) emerges from concrete into soil, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection for minimum of 4 inches on either side of where conduit emerges.

2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70 and TIA-569.

B. Provide conduit, fittings, supports, and accessories required for complete communications pathway.

C. Provide products listed, classified, and labeled as suitable for purpose intended.

D. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Communications Outlet Box: 3/4-inch trade size.

E. Where conduit size is not indicated, size to comply with NFPA 70, TIA-569, and BICSI TDMM, but not less than applicable minimum size requirements specified. Where specified standards differ, comply with most stringent.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:
   1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
   4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
      a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.04 STAINLESS STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC stainless steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6A.

B. Fittings:
   1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
   2. Material: Use stainless steel with corrosion resistance equivalent to conduit.
   3. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
   4. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

2.05 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
   1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
   4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
      a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.06 STAINLESS STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
   1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
   2. Material: Use stainless steel with corrosion resistance equivalent to conduit.
   3. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
   4. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

2.07 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch.

C. PVC-Coated Boxes and Fittings:
   1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
   2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.
   3. Material: Use steel or malleable iron.
   4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch.
   5. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch.

2.08 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use compression/gland or set-screw type.
      a. Do not use indenter type connectors and couplings.
   4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
      a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.09 STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT stainless steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797A.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use stainless steel with corrosion resistance equivalent to conduit.
   3. Connectors and Couplings: Use compression/gland or set-screw type.
   4. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

2.10 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage.

B. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.
   3. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
      a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.11 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

A. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).

B. Supports: As recommended by manufacturer.

C. Fittings: Same type and manufacturer as conduit to be connected.
   1. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

2.12 HIGH-DENSITY POLYETHYLENE (HDPE) CONDUIT

A. Description: NFPA 70, Type HDPE high-density polyethylene solid-wall conduit complying with ASTM F2160 and NEMA TC 7; list and label as complying with UL 651A; Schedule 40 unless otherwise indicated.

B. Joining Methods: Approved by HDPE conduit manufacturer.

C. Mechanical Fittings: Comply with ASTM F2176; list and label as complying with UL 651A.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1, BICSI ITSIMM, and BICSI N1.

C. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.

D. Galvanized Steel Intermediate Metal Conduit (IMC): Install in accordance with NECA 101.

E. PVC-Coated Galvanized Steel Rigid Metal Conduit (RMC): Install using only tools approved by manufacturer.

F. Galvanized Steel Electrical Metallic Tubing (EMT): Install in accordance with NECA 101.

G. Rigid Polyvinyl Chloride (PVC) Conduit: Install in accordance with NECA 111.

H. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated without specific routing, determine exact routing required.
   3. Conceal conduits unless specifically indicated to be exposed.
   4. Conduits in the following areas may be exposed, unless otherwise indicated:
      a. Electrical rooms.
      b. Communications rooms.
      c. Mechanical equipment rooms.
   5. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
   6. Arrange conduit to maintain adequate headroom, clearances, and access.

I. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

J. Connections and Terminations:
   1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
   2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
   3. Use suitable adapters where required to transition from one type of conduit to another.
   4. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
   5. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect cables.
   6. Secure joints and connections to provide mechanical strength and electrical continuity.

K. Penetrations:
   1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
   2. Make penetrations perpendicular to surfaces unless otherwise indicated.
   3. Provide sleeves and/or slots for penetrations as indicated or as required to facilitate installation.
   4. Conceal bends for conduit risers emerging above ground.
   5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
   6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
   7. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.

L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed cables or connected equipment. This includes, but is not limited to:
   1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
   2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
   3. Where calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
   4. Where conduits are subject to earth movement by settlement or frost.

M. Provide grounding and bonding.

END OF SECTION