

# SPECIAL PROVISIONS

**SECTION X - SPECIAL PROVISIONS**

<b><u>Item</u></b>	<b><u>Title</u></b>	<b><u>Page Number</u></b>
1	H Brackets	83
2	Steel Strain Pole	84-86
3	Accessible Pedestrian Signal Pole	87-92
4	Span Wire Tether	93
5	Span Wire	94
6	Long Life Emitting Diode Traffic Signal	95-96
7	Steel Strain Pole Foundation Revisions	97
8	Miscellaneous Metal Products Revisions	98-99
9	Traffic Signal Inspection	100-101
10	Traffic Signal Work Construction Methods and General Provisions	102-109
11	Handhole, Round	110-113
12	Traffic Signal Backplates	114-116
13	Digital / ITS Type Nema TS2 Cabinet	117-141
14	Digital Traffic Signal Controller	142-144
15	Pedestal, Alum	145-146
16	Utility Coordination	147-148
17	Permit / Private Utility Fees	149
18	Adams Road Traffic Control	150
19	Pavement Removals	151
20	Machine Grading, Modified	152-154
21	Adams Road Station Grading	155
22	Earthmound Underdrain	156
23	Modified Aggregate Surface Course	157
24	Helical Piles	158-168
25	Detention Pond Standpipe and Overflow Assembly	169
26	Modified Sidewalks, Curb Ramps, and Concrete Curb and Gutter	170-171
27	Modified Storm / Sanitary and Water Main Structures	172
28	Pavement Marking / Signage – Adams Road	173
29	Pavement Marking / Signage – Park	174
30	4-Foot Ornamental Fence and Gates	175
31	6-Foot Ornamental Fence and Gates	176
32	Pressure Treated Wood Boardwalk & Railing	177-178
33	Concrete Edge Detail	179
34	Site Furnishing	180-181
35	Stonework	182-183
36	Glow Aggregate Paving Detail	184
37	Dry Creek	185
38	Entry Structures	186
39	Hammock Grove	187
40	Nursery Stock	188-190
41	Waterfall	191
42	Site Electrical Infrastructure (Lighting and Facility Power)	192-194

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**H BRACKETS**

BFS:JJG

1 of 1

APPR:MWB:AJU:12-08-23  
FHWA:APPR:12-12-23

**Delete subsection 810.04.N, on page 8-58 of the Standard Specifications for Construction, in its entirety and replace with the following:**

- N. **H Bracket.** Provide and install H brackets in accordance with MDOT's Sign Support Standard Plans SIGN 740 series, or as directed by the Engineer.

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**STEEL STRAIN POLE**

SIG:EMS

1 of 3

APPR:MJF:REL:06-20-24  
FHWA:APPR:06-21-24

**a. Description.** This work consists of furnishing, fabricating, and erecting a traffic signal steel strain pole as shown on the plans, in accordance with the standard specifications, and as specified herein. This special provision is for an anchor base type (six anchor bolt system) strain pole and includes all other associated hardware required to complete the work.

**b. Material.** Furnish material in accordance with sections 906, 908 (as modified by 20SP-908A - Miscellaneous Metal Products Revisions), and 921 of the Standard Specifications for Construction and this special provision.

Material specifications for the strain pole are included in Table 1.

**Table 1: Material Specifications**

Component	Specification
Pole Tube	<i>ASTM A572/A572M, Grade 50, ASTM A572/A572M, Grade 65 or ASTM A595/A595M, Grade A</i>
Base Plate	<i>ASTM A36/A36M</i>
Bottom Steel Template	<i>ASTM A36/A36M</i>
Hand Hole Frame	<i>ASTM A705/A705M, ASTM A572/A572M, Grade 50 or ASTM A572/A572M, Grade 65</i>
Hand Hole Cover	<i>ASTM A1011/A1011M Grade 36</i>
Stainless Steel Hardware	<i>AISI 300 SERIES (18-8)</i>
"ANCO" Lock Nuts or Equivalent	<i>ASTM A563/A563M GR DH</i>
Flat Washers	<i>ASTM F436/F436M</i>

Ensure bolts, nuts, and washers meet subsection 906.07 of the Standard Specifications for Construction.

Blast clean fabricated components with a nominal thickness greater than 1/2 inch to remove mill scale and welding slab before galvanizing. For components with a nominal thickness of 1/2 inch or less, blast cleaning can be waived if the galvanizer inspects the material and provides a written statement to the fabricator that blast cleaning is not required. Otherwise blast cleaning is required.

Acceptance of strain pole is based on general certification in accordance with the *MQAP Manual*.

**c. Strength Requirements.** Furnish a strain pole capable of withstanding combined shear force and moment as specified in Table 2 applied at the base of the pole without exceeding the elastic limit. A strain pole connected to a tie-off span is a pole in which any of the connecting span or tether wires connects to a tie-off. Ensure that the deflection of the pole does not exceed

0.40 inch per 100 pounds of transverse load applied at the same point.

**Table 2: Loads for Strength Requirements**

Pole Height	Strain Pole Not Connected to Tie-off Span		Strain Pole Connected to Tie-off Span	
	Shear	Moment	Shear	Moment
30 feet	23.8 kips	521 kip-ft	26.5 kips	542 kip-ft
36 feet	25.5 kips	679 kip-ft	29.7 kips	730 kip-ft
40 feet	26.1 kips	790 kip-ft	30.3 kips	858 kip-ft

**d. Fabrication.** Fabricate and weld in accordance with section 707 of the Standard Specifications for Construction, except as modified herein.

Ensure the strain pole is hot-dip galvanized in accordance with subsection 716.03.B.4 of the Standard Specifications for Construction. If strain poles are required to have a duplex coating, ensure the coating is in accordance with 20SP-716A - Coating of Galvanized Lighting, Signal, Sign, and Miscellaneous Support Structures.

Submit shop drawings in accordance with subsection 707.03.A of the Standard Specifications for Construction.

Perform NDT of welds in accordance with subsection 707.03.D.12 of the Standard Specifications for Construction except ensure MT inspection frequency of fillet welds is increased to 25 percent. Fillet welds used to secure the strain pole cap do not require MT.

1. Base plate warpage must not exceed 1/16 inches per foot.
2. Tolerance for overall length of strain pole is -1/8 inch to +3 inch. Tolerance for sweep and camber of strain pole 1/8 inch per 10 foot. Tolerance for twist of strain pole is  $\pm 10$  degrees.
3. Strain pole wall must be single-ply.
4. Strain pole must be round or 12-sided.
5. Strain poles cannot have more than two longitudinal welds. Transverse welds are prohibited.
6. Provide a hand hole opening and cover. Weld a reinforcing frame to the pole for the hand hole opening. Ensure the placement of the hand hole does not reduce the strength of the pole. Securely fasten the handhole cover using stainless steel hex head cap screws or by an approved locking device.
7. Longitudinal seam welds must have 60 percent minimum penetration or fusion except full penetration groove welds are required for a minimum of 6 inches from tube to baseplate.

**e. Erection.** Ensure anchor bolts are pretensioned using the Turn-of-Nut (TON) method in accordance with subsection 810.03.N.2 of the Standard Specifications for Construction (as modified by 20SP-810H - Permanent Traffic Signs and Supports Revisions).

Furnish the Engineer 5 work days notification prior to the start of installation so they may witness or monitor the Contractor's activities.

**f. Construction.** Ensure all work is in accordance with subsection 810.03 and sections 818 and 820 of the Standard Specifications for Construction and the contract.

Perform repairs to galvanized surfaces in accordance with subsection 716.03.E of the Standard Specifications for Construction.

**g. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<b>Pay Item</b>	<b>Pay Unit</b>
Strain Pole, Steel, 6 bolt, Size __ .....	Each

**Strain Pole, Steel, 6 bolt, Size \_\_** includes furnishing all materials, fabrication, shop cleaning, galvanizing, shipping, and erection.

No extension of time or additional compensation will be granted due to obtaining the proper *AISC* certifications and/or endorsements required for this project.

Construction of the foundation will be included in other items.

MICHIGAN  
DEPARTMENT OF TRANSPORTATION  
  
SPECIAL PROVISION  
FOR  
**ACCESSIBLE PEDESTRIAN SIGNAL SYSTEM**

SIG:EMS

1 of 6

APPR:DJA:NJB:06-11-24  
FHWA:APPR:06-17-24

**a. Description.** This work consists of either furnishing and installing an accessible pedestrian signal system and push button station(s) or removing a system and push button station(s) at locations as shown on the plans.

The following terminology is used in this special provision.

1. Accessible pedestrian signal system, or system hereafter, refers to central control unit (CCU) and multiple push button stations.

2. CCU, refers to the unit installed in an existing traffic signal controller cabinet, frame, and all required mounting hardware and the configurator. The CCU is the power supply and signaling interface, between the intersection traffic signal controller and the push button stations. Configurator refers to a handheld, password secure, infrared device capable of setting and resetting all push button stations on the intersection from a single push button station (global updating). Each CCU will control multiple push button stations. A complete system includes one CCU.

3. Push button station (PBS), refers to a Public Rights-of-Way Accessibility Guidelines (PROWAG) compliant push button station including signs when specified, installed at crosswalk termini, and all required mounting hardware. A system can include 2 to 12 PBS (maximum of 3 per phase).

**b. Materials.** Furnish an accessible pedestrian signal system including CCU and PBS meeting the requirements of this subsection. Furnish all hardware and other appurtenant materials in accordance with sections 918 and 921 of the Standard Specifications for Construction and this special provision.

1. Accessible Pedestrian Signal System.

A. Furnish an accessible pedestrian signal system from the following list.

(1) Polara Navigator.

(2) Approved equal (AE). Ensure the AE is evaluated, tested, and approved per the MDOT New Traffic Signal Device Product Review Guidelines. The review time is not justification to delay the project.

2. The system must:

A. Furnish various audible features including but not limited to locator tones. All

locator tones must emanate from push button stations and be synchronized;

B. Have multiple language capability, selectable by user, and able to play an emergency preemption message;

C. Be able to self-test and report any faults to the traffic controller;

D. Furnish the following audible feature, each with a minimum and maximum volume independently settable using the configurator:

(1) One locating tone;

(2) Five walk sound choices (field selectable);

(3) Three pedestrian - clearance sound choices (field selectable) ensuring one of which is an audible countdown;

(4) Direction of travel (as standard feature with extended push); and

(5) Information message (custom feature with extended push).

E. Automatically adjust audible features to ambient noise levels over a 60 decibel (dB) range; and

F. Mute sounds on all crosswalks except the activated crosswalk (selectable feature).

3. The CCU must meet the following requirements:

A. Be compatible with solid-state pre-timed or actuated traffic signal control equipment and cabinet environments;

B. Be capable of controlling up to and including 12 PBSs and controlling up to and including 4 pedestrian phases;

C. Receive timing from the walk and don't walk signals;

D. Have additional advanced configurations available by using general purpose inputs and outputs;

E. Ensure full optical isolation of all inputs and outputs and include transient voltage protection as follows:

(1) General Purpose Inputs. 10 to 36 VAC/VDC peak with a 10 milli Ampere (mA) maximum.

(2) General Purpose Outputs and Pedestrian Outputs. 36 VAC/VDC peak, 0.3 Ampere (A) solid state fused contact closure.

(3) Fault Output. Normally open and closed relay contacts, 125 VAC/VDC, 1 A maximum.

(4) Pedestrian Hand/Walking Person (Walk/Don't Walk) Inputs. 80-150 VAC/VDC, 5 mA maximum.

(5) A, B, C, D PBS Power Outputs. Nominal 22 VDC, short circuit protected, auto recovering.

(6) Environment Operation and Storage Range. -30 °F to 165 °F (-35 °C to 74 °C), 0 to 100 percent Humidity, Non-condensing.

(7) Line Power. 25 Watt (W) to 75 W typical, 120 W peak with 8 PBSs.

F. Include a 50-pin connector and cable that plugs into the CCU for termination to the traffic signal controller terminal facilities. Ensure the connector is a Positronic MD50F20Z0X or equivalent, provided with 20-24 gauge wire, which complies with the requirements of *UL 1061*.

4. The PBS must meet the following requirements:

A. Design each PBS in accordance with the following:

(1) Produce sounds emanating from the back of the unit via an 8 ohms 15 W, weather-proof speaker protected by a vandal resistant screen;

(2) Require only two wires coming from the traffic control cabinet for each phase/crosswalk;

(3) Include push buttons which are audibly locatable and equipped with tactile arrows pointing in the same direction as the associated crosswalk;

(4) PROWAG compliant, cast aluminum, nickel plated, powder coated with raised tactile arrow on button;

(5) Include solid-state switch rated to 20 million activations (minimum); and

(6) Include a two inch button with a tactile raised directional arrow on the button that can be changed to one of four directions to coincide with the direction of travel of the associated crosswalk.

B. The PBS must include the following standard features:

(1) The arrow/button must vibrate during the walk period, following a button push;

(2) Confirm a button push via a "vibratactile" bounce and a red LED, clearly visible in direct sunlight, which latches ON when the button is pushed;

(3) Indicate the direction of travel with extended button push;

(4) Transmit a standard locating tone, custom sound, or verbal countdown during pedestrian clearance;

(5) Ensure sounds automatically adjust to ambient over 60 dB range;

- (6) Allow sounds to have minimum and maximum volume set independently;
- (7) Synchronize all sounds;
- (8) Extended button push can turn on, boost volumes, and/or mute all sounds except those on activated crosswalk; and
- (9) Include message to clear the intersection when preemption is activated.

C. Ensure the PBS is capable of custom message and sound options for the following features:

- (1) Custom locating tone;
- (2) Custom clearance sound;
- (3) Custom walk sounds/message;
- (4) Informational message;
- (5) Multiple languages (up to three, selected by user); and
- (6) Street name in Braille on the sign.

D. Ensure the PBS is fabricated in accordance with the following:

- (1) Available in three standard colors: Black, Green, and Yellow. The default color is yellow unless specified otherwise;
- (2) Have an operational temperature range of -40 °F to 165 °F (-40 °C to 60 °C);
- (3) Ensure the housing material is cast aluminum;
- (4) Chemically filmed and powder coated;
- (5) Face plate constructed of powder coated aluminum with ink marking; and
- (6) Have pre-drilled mounting holes to hold a 9 inch by 12 inch, R10-3b, 3d, or 3e pedestrian sign.

E. PBS LED display operational requirements:

- (1) Light when the button is pushed and remain lit until the next walk phase.
- (2) Luminous intensity greater than 1200 maximum continuous discharge (mcd), sunlight visible, ultra bright red, with a 160 degree viewing angle.

F. PBS audio operational requirements:

- (1) Audio amplifier power output of 10 W rms into 8 ohms.

(2) Volume control automatic adjustment range of 28 dB (maximum).

(3) Microphone ambient noise frequency range of approximately 170 Hertz (Hz) to 2.3 Kilo Hertz (kHz).

(4) Button tone provides a brief “tick” to confirm each button push.

(5) Audible locating tone operates during the pedestrian-clearance and don't walk interval at an 880 Hz plus harmonic, 0.1 second duration, 1 second interval.

(6) Audible “chirp” operates only during walk intervals at 2700 Hz to 1700 Hz, 0.2 second duration, 1 second interval.

(7) Audible “cuckoo” operates only during walk intervals at 1250 Hz to 1000 Hz, 0.6 second duration, 1.8 second interval.

5. Ensure the configurator meets the following requirements:

A. Be a handheld, password protected, remote that configures the CCU or an individual PBS;

B. Communicate via infrared technology with the CCU and the PBS with an interactive operation to select various configuration options at the intersection(s), by standing adjacent to either the CCU or a PBS;

C. Feature a LCD display, with two 16-character lines, with backlight and adjustable contrast;

D. Be powered by four AA 1.5 Volt cell batteries, include a low battery warning, and have an auto or manual shut-off switch; and

E. Have an operating temperature range of 32 °F to 122 °F (0 °C to 50 °C).

6. Warranty. Furnish a manufacturer's warranty, transferable to the Department or the local agency responsible for the project, that the supplied materials will be free from all defects in materials and workmanship for a 2-year period from the date of shipment. Furnish the warranty and other applicable documents from the manufacturer, and a copy of the invoice showing date of shipment, to the Engineer at the time of delivery.

**c. Construction.** Complete this work in accordance with sections 818 and 820 of the Standard Specifications for Construction, typical signal construction details, and this special provision.

1. Furnish and Install. Furnish and install a system at an intersection as shown on the plans and in accordance with the *MMUTCD*. Ensure that the arrow on the PBS button(s) points in the direction of pedestrian travel for the associated crosswalk.

2. Remove. Remove an accessible pedestrian signal system or a PBS and store, as directed by the Engineer, or dispose of all removed materials.

A. Where removal of an accessible pedestrian signal system is specified on the plans, remove the CCU, hardware, cable, connectors, and other appurtenant material required to complete the work.

B. Where removal of a PBS is specified on the plans, remove the PBS, sign, associated assembly, hardware, cable, connectors, and other appurtenant material required to complete the work.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

<b>Pay Item</b>	<b>Pay Unit</b>
Pedestrian Signal System, Accessible.....	Each
Push Button Station.....	Each
Push Button Station and Sign.....	Each
Pedestrian Signal System, Accessible, Rem .....	Each
Push Button Station, Rem .....	Each

1. **Pedestrian Signal System, Accessible** includes installing the accessible pedestrian signal system at an intersection, including a CCU, configurator, hardware, fittings, conduit(s), wiring, grounding and ground rod(s), and all appurtenant material required to complete the work.

2. **Push Button Station** and **Push Button Station and Sign** includes installing the push button station, sign (when specified), associated assembly, brackets, hardware, fittings, conduit(s), cable to controller, wiring, grounding, ground rod(s), and all other appurtenant material required to complete the work.

3. **Pedestrian Signal System, Accessible, Rem**, includes removing an accessible pedestrian signal system at an intersection including a CCU, configurator, hardware, fittings, hardware, cable, connectors, conduit(s), grounding, and other material required to complete the work. **Pedestrian Signal System, Accessible, Rem** also includes storage or disposal of removed material.

4. **Push Button Station, Rem**, includes removing a push button station, sign, associated assembly, brackets, hardware, fittings, cable, connectors, conduit(s), ground, and other material required to complete the work. **Push Button Station, Rem** also includes storage or disposal of removed material.

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**SPAN WIRE TETHER**

SIG:EMS

1 of 1

APPR:NJB:HLO:03-17-25  
FHWA:APPR:03-17-25

**a. Description.** This work consists of furnishing and installing hardware, connector hangers, fittings, stabilizer bar, pole clamps, tri-stud and 2 nested extension plates, 22 inches minimum length associated stainless steel fasteners and a span wire tether.

Bottom tether or top tether traffic signal heads as shown on plans or as directed by the Engineer.

**b. Materials.** Furnish material meeting the requirements of sections 818, 820, and 921 of the Standard Specifications for Construction.

1. Furnish tether span wire that is 1/4 inch nominal diameter for spans without tie-offs or with tie-offs, extra high-strength grade, 7-strand, galvanized, Class A, zinc-coated steel meeting the requirements of *ASTM A475*. Maintain clearance of 17 feet over roadway.
2. Ensure pole clamps, turnbuckle, tether wire to breakaway link connection, and all other components in the load path from the wire to the pole are galvanized steel.
3. Ensure the bull ring, galvanized or stainless, can resist a single pull load of 10,800 pounds minimum. Ensure breakaway link breaks at 3,325 pounds.
4. Materials will be accepted based on certification and visual inspection.

**c. Construction.** Complete this work in accordance with sections 818, 820 and 921 of the Standard Specification for Construction, as shown on the plans, and as directed by the Engineer.

Where installation is specified, install the span wire tether on existing or new signal head(s) at location(s) shown on the plans. Furnish, install, remove, or install on the project, a span wire tether, as shown on the plans or as directed by the Engineer.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<b>Pay Item</b>	<b>Pay Unit</b>
Span Wire Tether .....	Each

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**SPAN WIRE**

SIG:EMS

1 of 1

APPR:MLO:SCK:07-31-23  
FHWA:APPR:08-08-23

**a. Description.** This work consists of furnishing and installing hardware, connector hangers, fittings, bull rings or three-way pull-off connections, span wire clamps, pole band clamps, associated stainless steel fasteners and a span wire.

**b. Materials.** Furnish material meeting the requirements of sections 818, 820, and 921 of the Standard Specifications for Construction.

1. Furnish span wire that is 5/16 inch nominal diameter for spans without tie-offs and 1/2 inch nominal diameter for spans with tie-offs, extra high-strength grade, 7-strand, galvanized, Class A, zinc-coated steel meeting the requirements of *ASTM A475*. Maintain clearance of 17 feet over roadway.

2. Ensure pole clamps and all other components in the load path from the wire to the pole are galvanized steel, capable of resisting a load of 6,570 pounds minimum for 5/16 inch nominal diameter span wire and 13,705 pounds minimum for 1/2 inch nominal diameter span wire without permanent distortion.

3. Ensure three-way pull-off connection or bull ring, galvanized or stainless steel, can resist a single pull load of 13,705 pounds minimum.

4. Materials will be accepted based on certification and visual inspection.

**c. Construction.** Complete this work in accordance with sections 818, 820 and 921 of the Standard Specifications for Construction, as shown on the plans, and as directed by the Engineer.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<b>Pay Item</b>	<b>Pay Unit</b>
Span Wire .....	Each

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**LONG LIFE LIGHT EMITTING DIODE TRAFFIC SIGNAL**

SIG:EMS

1 of 2

APPR:NJB:HLO:11-17-23  
FHWA:APPR:11-21-23

**a. Description.** This work consists of installing long life LED traffic signals. Adhere to the standard specifications for all other requirements for traffic signals not specifically listed in the requirements of this special provision.

**b. Materials.** Ensure materials are in accordance with sections 918 and 921 of the Standard Specifications for Construction, the *MMUTCD* and the requirements of this special provision.

1. LED Module. Furnish LED modules consisting of high flux LEDs mounted on a metal core circuit board and LED electrical contacts soldered to the circuit board. Furnish all power supplies with conformal coating for additional protection and solid connections (no connectors) between driver and LED light engine. Furnish non-electrolytic capacitors to enhance long life.

Furnish green LEDs that use indium gallium nitride technology. Furnish green LED traffic signal modules that do not illuminate if the applied voltage is less than 35 VAC.

Furnish yellow LEDs that use indium gallium nitride technology, absorbing substrate or transparent substrate. Furnish yellow LED traffic signal modules that do not illuminate if the applied voltage is less than 35 VAC.

Furnish LED modules for traffic signals with the following maximum power consumption:

A. Eight inch and 12-inch red ball traffic signal modules with a maximum power consumption no greater than 8 watts and 9 watts respectively, at 120 VAC, at 77 °F;

B. Eight inch and 12-inch yellow ball traffic signal modules with a maximum power consumption no greater than 8 watts and 13 watts, respectively, at 120 VAC, at 77 °F;

C. Eight inch and 12-inch green ball traffic signal modules with a maximum power consumption no greater than 7 watts and 9 watts, respectively, at 120 VAC, at 77 °F;

D. Twelve inch red arrows with a maximum power consumption no greater than 7 watts at 120 VAC, at 77 °F;

E. Twelve inch yellow arrows with a maximum power consumption no greater than 14 watts at 120 VAC, at 77 °F; and

F. Twelve inch green arrows with a maximum power consumption no greater than 9 watts at 120 VAC, at 77 °F.

2. Lens. Furnish an LED signal module lens made from UV-stabilized polycarbonate. Use lenses that are color tinted red, yellow, and green. Furnish a hard-coated lens or a lens that otherwise complies with the material exposure and weathering effects requirements of *SAE J576*.

For arrows incorporate a black arrow mask behind the outer lens to define the arrow icon. Furnish an outer lens with raised optical detail on the inner surface to distribute the light rays to meet the intensity and distribution standards required by this subsection.

3. Operational Requirements. Furnish LED traffic signal modules that meet the minimum intensity requirements while operating from temperatures of -40 °F to 165 °F for 15 years.

4. Warranty. Furnish materials with a manufacturer’s warranty, transferable to the MDOT, that the supplied materials are free from all defects in materials and workmanship. Furnish the warranty and other applicable documents from the manufacturer, and a copy of the invoice showing the date of shipment, to the Engineer prior to acceptance.

**c. Construction.** Furnish and install the long life LED traffic signals as shown on the plans or as directed by the Engineer. All work must comply with sections 819 and 820 of the Standard Specifications for Construction and this special provision. Storage and/or disposal of removed material is included and must comply with section 204 of the Standard Specifications for Construction or as directed by the Engineer.

Install, direct, and mask the signal indication(s) in accordance with the manufacturer’s recommendation and the visibility requirements as directed by the Engineer.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

<b>Pay Item</b>	<b>Pay Unit</b>
TS, __ Way __ Mtd (LED), Long Life .....	Each
TS, __ Way __ Mtd, __ (LED), Long Life .....	Each

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
STEEL STRAIN POLE FOUNDATION REVISIONS

SIG:EMS

1 of 1

APPR:MLO:REL:11-12-24  
FHWA:APPR:11-21-24

Delete the following pay items in subsection 820.04, on pages 8-200 and 8-201 of the Standard Specifications for Construction.

Pay Item	Pay Unit
Strain Pole Fdn, 6 Bolt.....	Foot
Casing.....	Foot

Add the following pay items in subsection 820.04, on pages 8-200 and 8-201 of the Standard Specifications for Construction.

Pay Item	Pay Unit
Strain Pole Fdn, 6 Bolt, __ inch .....	Foot
Casing, __ inch.....	Foot

Delete the first sentence of the sixth paragraph of subsection 820.04.C, on page 8-204 of the Standard Specifications for Construction, in its entirety and replace it with the following:

**Strain Pole Fdn, 6 Bolt, \_\_ inch** includes disposal of removed material in the pay item.

MICHIGAN  
DEPARTMENT OF TRANSPORTATION  
  
SPECIAL PROVISION  
FOR  
**MISCELLANEOUS METAL PRODUCTS REVISIONS**

STR:REL

1 of 2

APPR:MJF:MLO:08-12-25  
FHWA:APPR:08-12-25

**Delete subsection 908.14, on page 9-63 of the Standard Specifications for Construction, in its entirety and replace with the following:**

- A. **General.** Provide the Engineer with a Mill Test Report (MTR) from the manufacturer's records that indicate the chemical composition and physical properties of the anchor bolt material meets ASTM F1554 for the grade specified in the contract in addition to the following:

1. Heat number;
2. Yield strength;
3. Tensile strength;
4. Elongation;
5. Reduction of area;
6. Charpy V-notch (when applicable); and
7. Furnace lot numbers for heat treatment (when applicable).

Order additional bolts to replace those used for Department testing. Each anchor bolt must be provided with two washers and two nuts unless otherwise required in the contract.

Provide bolts, nuts, and washers in the size and shape shown on the plans and hot-dip galvanized in accordance with ASTM F2329/F2329M. Galvanize the exposed threaded end of anchor bolts a minimum of 20 inches.

Nuts must meet the requirements of ASTM A563/A563M, Grade DH, or ASTM A194/A914M, Grade 2H. Lubricate nuts in accordance with ASTM A563/A563M, supplementary requirement S1 and S2. Re-tap nuts after galvanizing in accordance with ASTM A563/A563M. Provide flat, circular washers meeting the requirements of ASTM F436/F436M.

- B. **Anchor Bolts for Traffic Sign Support Structures (Cantilever, Truss, and Dynamic Message Sign), CCTV Pole, Tower Lighting Unit, Light Standards, and Traffic Signal Mast Pole and Mast Arm.** Steel anchor bolts must meet the requirements of subsection 908.14.A and meet ASTM F1554 Grade 55 with supplemental requirements

S1, S3 and S4.

Bolt threads must conform to Class 2A, Unified Coarse Thread Series of ASME B1.1 before coating. After coating, the pitch and major diameter must not exceed the dimensions specified in ASTM F1554 for allowable zinc build up and corresponding between thread dimensions.

Nut threads must conform to Class 2B, Unified Coarse Thread Series of ASME B1.1 before zinc coating. Zinc coated nuts must be overtapped with the diametral allowance for the thread series listed in ASTM A563/A563M.

- C. **Anchor Bolts for Traffic Signal Strain Poles.** Steel anchor bolts must meet the requirements of subsection 908.14.A and meet ASTM F1554 Grade 105 with supplemental requirements S3 and S4.

Bolt threads must conform to Class 2A, Unified Coarse Thread Series of ASME B1.1 before coating. After coating, the pitch and major diameter must not exceed the dimensions specified in ASTM F1554 for allowable zinc build up and corresponding between thread dimensions.

Nut threads must conform to Class 2B, Unified Coarse Thread Series of ASME B1.1 before zinc coating. Zinc coated nuts must be overtapped with the diametral allowance for the thread series listed in ASTM A563/A563M.

- D. **Anchor Bolts for Other Purposes.** Steel anchor bolts must meet the requirements of subsection 908.14.A and meet ASTM F1554 Grade 36 (Grade 55 supplemental S1 may be substituted at the supplier's discretion).

ROAD COMMISSION FOR OAKLAND COUNTY

SPECIAL PROVISION  
FOR  
**TRAFFIC SIGNAL INSPECTION**

RCOC/TOC

PAGE 1 OF 2

RCOC20SP818A

ORG:05-07-21

REV: 03-01-25

**a. Description**

This work consists of inspection of electrical construction and/or relocation of traffic signal facilities.

**b. Materials**

None.

**c. Construction**

The Road Commission for Oakland County (RCOC) will inspect the installation of all traffic signal equipment. The Contractor will notify RCOC when work is going to be performed. The Contractor must provide three (3) working days' notice (excluding Saturday, Sunday, and Holidays) to RCOC, Signal Systems Division, telephone (248) 858-7250, for the inspection to be performed.

1. Materials Inspection Request

The Contractor is required to schedule inspection by completing an online inspection request form, which is located at

<https://www.rcocweb.org/FormCenter/Traffic-Safety-17/SignStriping-Inspection-Request-Form-76>

Material Inspection:

<https://www.rcocweb.org/FormCenter/Construction-16/Materials-Inspection-Request-73>

Refer to RCOC Special Provision for Division I - General Provisions for additional information.

Work performed without inspection by RCOC, will be rejected and not approved for payment. Rejected work shall be removed and replaced at the sole expense of the Contractor and will not be grounds for an extension of time.

The Contractor will furnish RCOC with the traffic signal controllers and cabinets and all traffic signal timing devices so they can perform final adjustments, set signal timings and bench test the equipment.

Within 10 days of Award, the prime contractor and signal subcontractor shall attend a meeting with the Road Commission for Oakland County (RCOC) Traffic Operations Center. At this meeting, the contractor shall supply the equipment procurement schedule for the traffic signal controller cabinet and internal parts to be delivered to RCOC. Coordinate the meeting with RCOC/TOC Mr. Steve Wheeler (248) 858-7250.

After RCOC has received all equipment, the Contractor must contact the Signal Operations Engineer in the Signal Systems Division at (248) 858-7250, to schedule adjustments, timings, and testing a minimum of three (3) weeks in advance of the required date. Delays resulting from adjustments, timings, and testing shall not be grounds for an extension of time or additional costs.

When the necessary adjustments, timings, and testing have been completed, the contractor must pick up the cabinets and controllers. The Contractor must provide a minimum of seven (7) calendar days' notice prior to picking up cabinets and controllers from RCOC District 8, 2420 Pontiac Lake Rd, Waterford, MI. Coordinate logistics of pick-up with RCOC: Mr. Steve Wheeler (248) 858-7250.

Mast arm inspection is required. The Contractor must contact the Signal Operations Engineer in the Signal Systems Division at (248) 858-7250, to schedule inspection with the RCOC Consultant a minimum of four (4) weeks in advance of the required inspection date. The Contractor must provide the mast arm supplier and manufacturing location.

When a traffic signal installation is completed in accordance with the plans and specifications, the Road Commission's traffic signal inspector will energize the traffic signal equipment.

**d. Measurement and Payment**

The above items of work will not be paid for separately and are considered included in the contract unit price for other items of work.

ROAD COMMISSION FOR OAKLAND COUNTY

SPECIAL PROVISION  
FOR  
**TRAFFIC SIGNAL WORK**  
**CONSTRUCTION METHODS AND GENERAL PROVISIONS**

RCOC/TOC

PAGE 1 OF 8

RCOC20SP818B

ORG:05-07-21

REV: 04-21-25

**a. Description**

This special provision is for electrical construction and/or relocation of traffic signal facilities to be used in addition to the applicable sections of the standard specifications.

The Road Commission for Oakland County (RCOC) document entitled "Standard Construction Details for Traffic Signal Contracts" dated March 2014 is incorporated by reference. Copies of this document are available from the RCOC Signal Systems Division at (248) 858-7250 or on-line at [www.rcocweb.org](http://www.rcocweb.org).

**b. Materials**

1. Furnish new material and equipment, unless specified otherwise, and comply with the contract documents.
2. Materials furnished by RCOC to the Contractor will be picked up by the Contractor at such site as designated by RCOC, with any associated costs included in pay items as indicated on the plans and will not be paid for separately.
3. Service Disconnect  
Disconnect switches (stainless steel) shall be NEMA heavy duty (HD), 4X, unless otherwise noted. The service disconnect is supplied by the contractor when a pay item is included in the project.

**c. Construction**

1. General  
All work on any RCOC facility is subject to their inspection.

The Contractor shall mark the month and year of installation on the back-side (which is inside the signal head) of each LED lens.

If requested by the Engineer, the Contractor shall provide a copy of the cabinet and controller shipper signed by an RCOC representative to the Project Engineer within 3 calendar days of being delivered to the RCOC.

All weather heads and LB's installed on this project shall be new and metal.

The Contractor shall notify the RCOC Signal Department, ten (10) working days' (excluding Saturday, Sunday, and Holidays) in advance of relocation of controllers, shutdown of traffic signals, traffic shifts, and work required in the cabinet/controller by the RCOC Signal Maintenance Department.

Always maintain existing communication lines for controllers.

Within five calendar days after completion of the conduit work or of any portion where a working cable is installed, the Contractor shall furnish to the RCOC (if requested by the Engineer) an as-built record of the length of the duct lines as constructed, clearly showing any departures from the original plans. The lengths shall be measured from the inside walls of manholes and the center of post foundations, cable poles, and handholes. Final payment shall be withheld until work is completed and accepted.

2. Signal cutovers

All traffic signal cut-overs, modifications of any signal configuration, traffic switches, and stage changes must occur on Monday through Thursday between 9:00 a.m. and 3:00 p.m. unless otherwise directed by the Engineer. Cut-overs are not permitted on Holidays.

3. Insulators and electrical protection devices

Where required by the local Utility Company or applicable electrical Code, install or have installed all necessary insulators or electrical protection devices and/or coordinate with the local Utility Company to install required protective devices on the Utility Company's facilities. The cost of any protective devices or insulators shall be included in the cost of performing this signal work and not paid for separately. The contractor is responsible for scheduling this work.

When insulators or electrical protection devices are not sufficient, the contractor shall provide a Qualified Person and Qualified Linemen to construct the proposed work. The cost shall be included in the other contract items and not paid for separately.

Delay of any Utility Company installation on any portion of this project may be considered the basis for a claim for an extension of time for completion as determined reasonable by the Engineer but will not be considered the basis for a claim for extra compensation or an adjustment in contract unit prices.

#### 4. Submittals

A. On each submittal page, list the pay item name, material, unique proposal line number, and MDOT item code that applies.

B. If there are multiple products, materials, sizes, etc. on one page, the pay item/material must be clearly identified.

C. Submittals / shop drawings are not considered a substitute for the materials certification procedures required in the contract documents.

D. The Signal Contractor is required at each submission to provide a transmittal cover letter which includes the following:

- (1) Each specific variation that the Shop Drawings may have from the requirements of the contract plans, specifications, and contract documents.
- (2) In addition, the drawings will contain a specific notation that explicitly and prominently calls out all deviations as indicated in the cover letter.
- (3) RCOC may or may not accept deviations or variations to the contract documents.
- (4) Each variation shall provide supporting documentation why the variation is equal to or greater than the requirements of the contract documents.  
For some variations, as-directed by the engineer, the Contractor must ensure that a Professional Engineer, licensed in the State of Michigan, seals all working drawings, documentation, and design calculations submitted. RCOC, at its sole discretion, may or may not accept variations.
- (5) When deviations do not exist, it shall be stated in the cover letter.
- (6) The supplier of the shop drawings shall also provide a transmittal cover letter of the same required content as described above.

The review of a submittal will not be considered to be approval of a variation in which the project requirements are affected unless specifically so noted in the review comments as returned with the submittal.

The review of a signal submittal may be returned with a Road Commission for Oakland County cover letter and each page may be numbered with the shop drawing number and page number. A stamp will not be included.

E. The Contractor shall also prepare and submit shop drawings in accordance with the Special Provision entitled "Submittals" included elsewhere in the Contract documents.

## 5. Traffic Loops / Wireless Detection / Wireless Vehicle Sensor Nodes

A. RCOC will lay out all traffic loops and/or wireless detection nodes prior to installation.

B. No detector loop shall be installed unless the roadway surface temperature is 40 degrees Fahrenheit or above.

C. Traffic loops must be placed in the leveling course of asphalt, milled surface under proposed asphalt, or as-directed by the engineer. Place the sealant below the surface of the asphalt to prevent bleeding into the next layer of asphalt. Allow the sealant to fully cure according to manufacturer's recommendations before placing a layer of asphalt over the loops. Sawing slurry shall be completely cleaned and removed prior to opening to traffic and placing next lift of asphalt.

### D. Install traffic loops

- After the proposed curb, concrete flatwork, sawing, and all other proposed construction is completed in order to prevent damage to the proposed traffic loops.
- After the completion of all traffic signal underground work, no sooner than 3 weeks prior to the start of signal overhead work, and within 3 weeks after the traffic signal cutover.

The RCOC Maintenance Department may be performing maintenance and asphalt milling/overlays in the construction zone which may damage proposed traffic loops. Coordination shall be required with RCOC Maintenance and the RCOC Signal Field Operations Engineer.

## 6. Utility coordination

Schedule, coordinate, install, and pay for work provided by the local utility company(s), as indicated on the plans or as directed by the Engineer. The Engineer will not authorize payment for delay caused by the Contractor's failure to properly schedule and coordinate any utility work.

## 7. 107.12 – Contractor's Responsibility for Utility Property and Services

Backfill for utility location per section 107.12 (Contractor's Responsibility for Utility Property and Services) of the Standard Specifications for Construction:

Use Granular Material Class III in accordance with section 902 of the Standard Specifications for Construction for backfill. If compaction of each layer to at least 95% of the maximum unit weight cannot be achieved, use Aggregate, 6A or 34R as directed by the Engineer.

When pavement coring is required by the Engineer, core hole backfill shall require multiple materials as-directed by the Engineer including self-compacting aggregate (6A or 34R), two-part epoxy non-shrink grout, asphalt to match existing pavement, concrete to match existing pavement, and existing pavement core material (if structurally sound).

Use material removed during exploratory investigation for backfill only if approved by the Engineer.

8. Agency Coordination

Secure all necessary permits covering the operations, including permits from the Public Authorities having jurisdiction over the streets, or other Public Properties in which the work is located, and the improvements therein. Obtain the amount of any charges for payment, including fees or inspection charges required by such authorities, and include the cost of these fees in the bid prices.

The local traffic authority may impose restrictions regarding particular times of certain days of the week wherein the Contractor cannot perform work and may, in fact, be required to clear the area of work obstacles or construction equipment. The Contractor must take note of this and there will be no extra payment to perform the work with possible restrictions imposed. The Engineer will not authorize extra payment if the Contractor chooses to perform work during overtime status.

9. Anchor bolt testing

This work consists of the contractor's responsibility to test the strain pole and mast arm anchor bolts. The contractor shall also test the mast arm A449 clamp bolts, rods, studs, nuts, washers, and lock washers.

Provide anchor bolts, nuts, and washers in accordance with subsections 105.10, 820, and 908.14 (or MDOT 20SP-908A current edition if included in proposal) of the Standard Specifications for Construction and all contract documents.

Anchor bolts shall be marked (color coded ends and non-removable casting (heat) stamp) to provide traceability during testing and installation. Include pictures (or other proposed method) with the testing results of the materials at the contractor's yard and lab for traceability in the field. The testing results (bolts, nuts, and washers) shall include all product markings, color coding, lot number, heat number, and manufacturer documented directly on the test results. The contractor may propose alternates for traceability prior to sampling and testing.

The Contractor shall provide testing (bolts, nuts, and washers), per subsection 908.14 (or MDOT 20SP-908A current edition if included in proposal) of the Standard Specifications for Construction and all contract documents, for the anchor bolts from an RCOC approved independent lab. MDOT does not test for Local Agency projects.

The RCOC approved independent labs can be found:

RCOC Notice to Bidders, Anchor Bolt Testing - Approved RCOC Independent Labs

<https://www.rcocweb.org/561/Frequently-Used-Special-Provisions>

Provide Test Data Certification to the engineer according to the *MDOT Materials Source Guide*.

Anchor bolt testing is not paid for separately and is included in other items of work.

#### 10. Density

At the sole discretion of the Engineer, density/compaction as specified in traffic signal related subsections 820.03. A. 3. and 820.03 B. of the Standard Specifications for Construction, as determined by the Engineer, will be accepted by one of the following two methods, in lieu of percent density/compaction specified elsewhere in the contract.

##### A. Visual Inspection

Documented by the Engineer, based upon number of roller/plate compactor passes and roller/plate compactor pattern acceptable to the Engineer. Another compaction equipment may be approved by the engineer.

##### B. Proof Roll

Complete a proof roll using equipment approved by the Engineer. The Engineer must witness and document the proof roll and will determine the proper course of action to maintain compaction until pavement is placed and correct any observed rutting or displacement.

#### 11. Protection of work

The contractor must protect all signal related items until final satisfactory final inspection. This includes protecting signal foundations, strain poles, mast arms, pedestals, pushbuttons, concrete foundations, etc. Contractor must repair damage to highway and signal facilities caused by work not protected properly from naturally occurring events and roads open to traffic at no additional cost to the Department. Payment for a pay item does not represent acceptance of an item or satisfactory final inspection.

#### 12. Delivery Claims for Extensions of Time

Delivery delay claims by the Contractor for Extensions of Time will not be considered unless two or more letters from different local traffic signal suppliers (Metro Detroit area) are supplied to the engineer within 14 calendar days of contract award.

Any delay (material shortages, pandemics, shipment delays, supply chain delays, delayed deliveries as a result of an industry-wide shortage, wars, etc.) will not be considered unless the contractor/supplier letter is accompanied by an FHWA letter and Michigan Department of Transportation (MDOT) letter declaring a nationwide shortage of a specific material.

Delivery claims may be considered for a claim for an extension of time for completion as determined reasonable by the Engineer, but shall not be considered the basis for a claim for extra compensation or an adjustment in contract unit prices.

#### 13. Materials Certification Procedures – Signal Materials

Unless specified elsewhere in the contract documents, provide at a minimum:

- General Certification documentation according to the *MDOT Materials Source Guide*
- In addition to the *MDOT Materials Source Guide* requirements, provide the RCOC name of material designation on each certification. If requested by the contractor, the RCOC Engineer will provide the material designations on the project.

#### 14. Material Source List

- Provide RCOC name of material designation. If requested by the contractor, the RCOC Engineer will provide the material designations on the project.

#### 15. Prior to ordering proposed materials, the contractor shall field measure and field verify all existing conditions.

For retrofit and salvage type work, existing material sizes, material types/brands/manufacturers must be measured and determined by the contractor prior to ordering materials.

#### 16. TS, \_\_, Rem

The unit price for relevant removal pay items include the cost of removing and disposing of traffic signals, pedestrian signals, cables, and other materials.

#### 17. Special Tools

No special tools shall be required for any proposed material, repair application, assembly, or installation/maintenance of any material/equipment.

#### 18. Compatibility

The equipment and materials supplied shall be compatible and interchangeable with the equipment commonly in use in the Road Commission for Oakland County's system.

**d. Measurement and Payment.**

The above items of work will not be paid for separately and are considered included in the contract unit price for other items of work.

ROAD COMMISSION FOR OAKLAND COUNTY

SPECIAL PROVISION  
FOR  
**HANDHOLE, ROUND**

RCOC/TOC

PAGE 1 OF 4

RCOC20SP818F

ORG:05-07-21

REV: 05-05-25

**a. Description**

This work consists of constructing a round handhole, and providing hardware, connectors, fittings, cast iron frame, cast iron ring and cover, mastic sealer, excavation, backfill, and removal of waste excavated material, and all materials necessary to complete the work.

This work must be done in accordance with sections 818, 820, and 918 of the Standard Specifications for Construction, except as herein provided.

**b. Materials**

Provide material in accordance with section 918 of the Standard Specifications for Construction.

1. Provide handhole with live loads in accordance with the requirements of AASHTO HS 20 for wheel loading.
2. Provide Grade 4500 concrete in accordance with section 1004 of the Standard Specifications for Construction.
3. Provide smooth or deformed welded wire fabric in accordance with *ASTM A185/A185M or ASTM A497/A497M*.
4. Provide reinforcing steel in accordance with the requirements of *ASTM A615/A615M*, Grade 60 rebar, if required. Bend bars and place in accordance with the latest *ACI* standards.
5. Provide integral wall and base.
6. Provide round frame and round cover:
  - A. Provide a heavy-duty frame and cover manufactured by East Jordan, Neenah Foundry, or a Department approved equal, with "TRAFFIC SIGNAL" cast into the cover.

7. Provide 2-foot diameter precast handhole with the following characteristics:

A. Construct per MDOT detail SIG-240-A dimensions except as herein provided:

- (1) One, 6-inch opening in the base for a sump drain hole.
- (2) Walls with four tapered knock-outs for conduits entering the handhole, 12 inches in diameter.

8. Provide 3-foot diameter precast handhole with the following characteristics:

A. Construct per MDOT detail SIG-240-A dimensions except as herein provided:

- (1) One, 6-inch opening in the base for a sump drain hole.
- (2) Walls with four tapered knock-outs for conduits entering the handhole, 12 inches in diameter.

9. Grounding Rod

A. Provide a copper clad steel grounding rod with a diameter of at least  $\frac{3}{4}$  inch and a length of at least 10 feet, with no more than 10 ohms resistance to ground.

Use a ground rod that meets the requirements of subsection 918.02.C of the Standard Specifications for Construction.

10. Granular Material Class II – per section 902 of the Standard Specifications for Construction

11. Butyl rubber sealant that conforms to ASTM C990 - Place the butyl sealant between the bottom of the heavy-duty frame and concrete.

### **c. Construction**

Complete this work in accordance with sections 818, 820, and 918 of the Standard Specifications for Construction, as shown on the plans, and as directed by the Engineer.

1. Submittals / Working Drawings

If requested by the Engineer, submit a detailed dimensional drawing of all equipment, material specification list which shows the materials to be used, equipment to be furnished, and assembly/installation method.

2. General

Construct the handhole to accept a heavy-duty frame and cover centered on top of the handhole. Ensure the inner surface of handhole is smooth.

The handhole must be delivered and unloaded at the job site in good condition. Any cracked or otherwise damaged units shall not be accepted, nor shall any reimbursement be made for delivery or pick-up of damaged units.

The handhole must be installed so the top of the frame and cover is level or flush with finish grade level, as directed by the Engineer.

All conduits entering the handhole must be installed in the provided terminators or in individually bored holes. Conduits installed in bored holes must be properly spaced, cut flush with the interior face on the wall and must be grouted from the outside of the handhole. Attach end bells on the ends of conduits entering handholes to prevent damage to the cable.

3. Grounding Rod

The grounding rod must be installed centered in the sump opening. The ground rod must be installed with 12 inches of exposed rod above the bottom of the handhole.

4. Backfill

Install the handhole on compacted 6 inches of Class II granular material. Granular Class II material shall be used in backfilling all handholes that fall within the 1:1 influence lines from the edge of pavement or back of curb. All material must be compacted. The Engineer will determine whether excavated material meets the backfill requirement. Use Class II granular material if the Engineer determines that excavated material does not meet the backfill requirement.

**d. Measurement and Payment**

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item(s):

<b>Pay Item</b>	<b>Pay Unit</b>
Hh, Round, 2 foot dia, RCOC .....	Each
Hh, Round, 3 foot dia, RCOC .....	Each

**Hh, Round, \_\_ foot dia, RCOC (Ea)** includes all costs for, but not limited to, constructing a round handhole and providing hardware, connectors, fittings, cover and all material necessary to complete the work. The contract unit price shall be payment in full for furnishing and installing all materials including frame and cover, ground rod(s), steel reinforcement and sewer grade ring, sealing the joints with mortar, and all required material to build the structure complete. Where existing cables are maintained in new manholes or handholes additional cable shall be spliced into the cable for proper racking on the manhole or handhole walls. Excavation, granular material backfill, compaction, breaking away concrete encasement and conduit where new manholes or handholes are broken into an existing conduit run and disposal of waste excavated material is also included in the item and will not be paid for separately. The unit prices for handhole pay items include the cost of removing concrete encasement and conduit where new manholes or handholes access an existing conduit run as indicated on the plans and installing cable racks and hooks.

ROAD COMMISSION FOR OAKLAND COUNTY

SPECIAL PROVISION  
FOR  
**TRAFFIC SIGNAL BACKPLATES**

RCOC/TOC

PAGE 1 OF 3

RCOC20SP820B

ORG:05-07-21

REV: 03-01-25

**a. Description**

This work consists of completing one or more of the following work types at location(s) shown on the plans according to the plans and sections 204, 818, 820, and 921 of the Standard Specifications for Construction except as herein provided.

1. Furnishing and installing a traffic signal backplate.
2. Removing and disposing of an existing traffic signal backplate.

As applicable, this work includes removal or installation of hardware, connectors, fittings, mounting hardware, and all material necessary to complete the work.

**b. Materials**

Material must meet section 921 of the Standard Specifications for Construction.

1. Provide backplates with a 3M 4081 ASTM Type XI reflective fluorescent yellow tape border. Ensure that a one-inch border is used with yellow signal heads and visors.
2. Do not cut the backplate for installation.
3. The backplates must be one-piece construction unless otherwise directed by the engineer.
4. Provide a one-piece backplate for three or four section traffic signal heads as indicated on the plans or as directed by the Engineer. Ensure that five section (doghouse) signal head combinations are provided with no more than three vacuum formed pieces.
5. Provide backplates that are designed to precisely fit the manufacturer's signal heads and supplied with necessary hardware to attach the backplate to the signal.
6. Provide backplates that are vacuum formed from 0.125-inch-thick black acrylonitrile butadiene styrene (ABS) plastic with a hair cell finish on the front side (facing approaching traffic) to reduce glare.

Use 0.156-inch-thick ABS plastic for 5 section and HAWK.

7. Provide backplates that are constructed with a minimum 5/8-inch flange on all sides to provide structural rigidity. Ensure the backplates are provided with a three-inch corner radius.
8. Ensure that all backplates extend five inches around the perimeter of the traffic signal combinations after installation.
9. Proposed backplates must accommodate case signs on traffic signal heads.

#### 10. Warranty and Guarantee

Provide materials with a manufacturer's warranty/guarantee, transferable to the Road Commission for Oakland County, that the supplied materials will be free from all defects in materials and workmanship for one (1) year from the date of final project acceptance. If requested by the Engineer, supply manufacturer's warranty and guarantee documents from the manufacturer and a copy of the invoice showing date of shipment.

The contractor shall repair and replace any backplates that the reflective fluorescent yellow tape border has been removed from the backplate prior to final project acceptance.

11. Backplates shall be attached with stainless steel bolts, washers, and lock nuts; or self-tapping screws and washers, or as directed by the Engineer. The washer should be 1 inch by 0.5 inch or as directed by the Engineer.

#### 12. Acceptance

Provide General Certification per the *MDOT's Materials Quality Assurance Procedures Manual* to the Engineer that the materials meet the requirements specified herein.

### **c. Construction.**

Complete this work in accordance with sections 818 and 820 of the Standard Specifications for Construction, as shown on the plans, and as directed by the Engineer. Remove, store, and dispose of material in accordance with section 204 of the Standard Specifications for Construction.

#### 1. Special Tools

No special tools shall be required. If special tools are required for any other application in the repair, assembly, or installation of this equipment, forty (40) complete sets of such tools shall be furnished.

#### 2. Submittals / Working Drawings

If requested by the Engineer, submit a detailed dimensional drawing of all equipment, material specification list which shows the materials to be used, equipment to be furnished, and assembly/installation method.

3. Samples

If required, a complete sample backplate must be delivered within seven (7) working days after the request is submitted.

Special consideration shall be given to workmanship, materials and superior features demonstrated by the sample.

**d. Measurement and Payment.**

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item(s).

<b>Pay Item</b>	<b>Pay Unit</b>
Backplate, TS, RCOC.....	Each

**Backplate, TS, RCOC (Ea)** includes installing the backplate on existing or new signal head(s) at location(s) shown on the plans where installation is specified. Furnish and install a traffic signal backplate, as indicated on the plans or as directed by the Engineer. The pay item includes all components and associated hardware to complete the work.

Backplate, TS, Rem will not be paid for separately and is included in other items of work. The removal includes removing the existing backplate, hardware, and other appurtenances, required for a complete removal. Dispose of removed materials.

ROAD COMMISSION FOR OAKLAND COUNTY

SPECIAL PROVISION  
FOR  
**DIGITAL / ITS TYPE NEMA TS2 CABINET**

RCOC/TOC

PAGE 1 OF 25

RCOC20SP820C

ORG:05-07-21

REV: 08-01-25

**a. Description**

This special provision outlines the Road Commission for Oakland County's specifications for the traffic signal cabinet. The traffic signal cabinet must meet or exceed all requirements of the NEMA Standard TS2-2003 specification. Sections A. through K., as detailed below, are exceptions to the NEMA Standard TS2-2003 specification and are specific to the Road Commission for Oakland County.

**b. Materials**

1. Transfer Switch Assembly.

Each control cabinet must be provided with a transfer switch assembly completely wired.

A. Transfer Switch Compartment.

The compartment door must be flush mounted to the outside of the cabinet, located near the top of the right-hand side wall of the cabinet. The compartment door is to be hinged at the top with provisions that allow the generator cord to be plugged in with the door closed. The door will incorporate a piano type hinge utilizing stainless steel hinge pins. The hinge is to be attached in such a manner that no rivets or bolts are exposed. The door must be equipped with a lock, which can be operated by the main cabinet door key. The door opening must be a minimum 9" high by 6" wide to facilitate plugging in the generator cable. The door must include a slot with a sliding cover plate to allow the generator cable to remain plugged in while the door is closed and locked.

B. Transfer Switch Wiring.

A 30 Amp (minimum) rocker-type switch must be provided and installed in the generator transfer switch compartment. When in the "Utility" position power from the load side of the Main circuit breaker is to be routed to the line side of all secondary circuit breakers. When the transfer switch is in the Generator position, power from the transfer switch compartment generator inlet is to be routed to the line side of all secondary circuit breakers except any designated for illuminated signs. An indicator lamp within the compartment must be included and wired such that it is illuminated only if the transfer switch is in the Generator position and Utility power is supplied to the cabinet. A 30A twist-lock flanged inlet with a NEMA rating for L5-30P must be installed in the generator transfer switch compartment.

## 2. Cabinet Lifting Ears.

Each control cabinet must include a pair of permanent lifting ears. The lifting ears are to have the same finish as that provided on the control cabinet. They are to be provided installed on the top right-hand side and top left-hand side of the cabinet in such a manner as to support the cabinet in an upright position when lifted. Each lifting ear must be attached by a single 9/16" (or larger) stainless steel carriage type bolt with nut and washer located on the inside of the cabinet. This is to facilitate rotation of the lifting ear into the storage position without complete removal of the fastening hardware.

## 3. Cabinet Fan Quantity.

The size M30 cabinet is to be equipped with one fan; the size M36 cabinet and size 6 cabinet are to be equipped with two fans. All fans to be provided per NEMA Standard TS2-2003 Section 7.9 specifications. All cabinets must be equipped with an electric heater system. The heater must be a 150W, touch-safe heater, with no motors, convection style heater. The heater must be controlled by a hygrostat that can sense the ambient temperature and humidity in the cabinet.

## 4. Cabinet Ventilation Filter Type.

The filter must meet UL Class 2 filter requirements and include a disposable cardboard type filter. The cabinet must include a louvered metal cover over the air filter. The louvers must be pointed down to direct any incoming water away from the cabinet equipment. Water shall not enter the cabinet.

## 5. **Power Distribution.**

Panel must be provided as follows:

### A. Circuit Breakers.

Provisions must be made for mounting and wiring up to nine circuit breakers in the terminal facility. A quantity of nine circuit breakers must be provided with ampacity as noted in table 1. Circuit breakers are to be installed on the power panel near the top, arranged from left (Circuit Breaker 1) to right.

**Table 1: Power Panel Circuit Breakers**

<b>Circuit Breaker ID</b>	<b>Size (Amps)</b>	<b>Label</b>	<b>Function</b>
1	30	MAIN	Service Connection
2	20	LOAD SWITCH	Signal Bus
3	15	FLASHER	Flash Power
4	15	ELECTRONIC	CU and MMU
5	15	MISC	Fans, heater, cabinet lights
6	15	ENCLOSURE	Digi/External Enclosure/Other
7	15	PWR STRIP	Power Strip/Other
8	15	AUX	Illuminated Signs/Other
9	15	AUX	Illuminated Signs/Other

The main circuit breaker must be wired to protect the entire facility and must be identified as the "MAIN" breaker. The load side of the Main circuit breaker must feed the "Utility" termination of the transfer switch (if used) and the line side of the Aux circuit breakers. The Load Switch breaker is connected to the load side of the solid-state bus relay and must provide power to the load switches. The Flasher breaker must have the flasher connected to its load side. The miscellaneous breaker must have the cabinet fan, light, and door mounted duplex GFCI receptacle connected to its load side. The AUX breakers must be available to powering auxiliary devices such as illuminated signs. The circuit breakers must be capable of manual operation with markings to indicate rating and whether it is in the open or closed position. Square D series QO circuit breakers (or approved equal) are to be used and mounted on a QON2ACL (or approved equal) breaker block.

Provide an encapsulated 3-electrode gas tube surge arrestor, engineered to protect equipment from lightning and induced surges. The 3-electrode gas tube surge arrestor must be installed in a line arrestor line fashion. The arrestor must have a current rating of 40,000 amp (8/20 impulse).

The M30-ITS, M36-ITS, and the 6- ITS cabinets will include an additional 30-amp circuit breaker mounted on the main cabinet power panel, utilizing a single phase of the AC power to power the ITS compartment devices. Two 15 Amp and one 10 Amp circuit breakers will be provided in the ITS compartment, wired to the load side of the 30 Amp breaker. This 30 Amp breaker will have a separate surge protection device wired to its load side. The breakers in the ITS portion of the cabinet must be mounted in a way so that there are no exposed electrical connections.

#### B. Service Connections.

The incoming AC power service must terminate in compression fittings capable of accepting a #4 AWG or #6 AWG conductor for AC+ and AC- and accepting a #8 AWG conductor for safety (Earth/Chassis) ground. The AC+ line must terminate directly to the main circuit breaker. The AC- and safety ground lines must terminate directly to their respective bus bars.

### 6. **Detector Assembly.**

All cabinets must include a 20-channel detector assembly that meets NEMA Standard TS2-2003 Section 5.3.4 specifications as a minimum. The detector assembly must accommodate 16 channels of vehicle detection and an additional 4 channels of pedestrian detection push button isolation, or 4 channels of emergency vehicle priority control cards.

#### A. Detector Rack.

The BIU must be located in the first (furthest to the left) slot in the detector rack. The 16 channels of vehicle detection must be located immediately to the right of the BIU. The four channels of pedestrian detection (or emergency vehicle preempt card(s)) must be located in the last (furthest to the right) slot positions.

#### B. Detector Panel.

The detector panel must be provided installed on the lower left wall of the cabinet with components mounted on 1/8-inch (0.125-inch) sheet aluminum. Components on the detector panel include a modular detector input printed circuit card, push button terminal block, ground bus, common bus, and I/O expander harness. All components are to be accessible for ease of maintenance.

(1) The detector panel printed circuit card must have termination points for 16 loop inputs, a DB37F connector that mates with the detector cable, cabinet power supply inputs, and jacks that accept loop detector surge arrestors.

(2) The push button terminal block(s) must be provided located near the bottom of the detector panel. 30-amp terminal blocks are to be provided for push button terminations, with a minimum of 4 positions available for push button common and 2 positions for each of the 4 channels of inputs. A minimum 30 amp 4 position terminal positions must be provided to connect the push button isolator outputs to the BIU pedestrian detector inputs. On the M30 facility, isolator outputs 1 thru 4 are to be wired to BIU pedestrian detector inputs 1 thru 4 respectively. On the Size 6 facility, isolator outputs 1 thru 4 are to be wired to BIU pedestrian detector inputs 2, 4, 6, and 8 respectively. Provisions must be made to easily convert the 4 channels of push button isolation to 4 channels of emergency vehicle priority control.

(3) A ground bus bar is to be provided below the push button terminal block that will accept 4 – 16 American Wire Gage (AWG) copper conductors. This bus bar must be connected to the ground bus on the power panel with an 8 AWG conductor. A minimum of 12 open termination positions to be available for field wiring ground connections.

(4) A common bus bar is to be provided below the push button terminal block that will accept 4 –16 American Wire Gage (AWG) copper conductors. This bus bar must be insulated from the cabinet and be connected to the common bus on the power panel with an 8 AWG conductor. A minimum of 12 open termination positions must be available for field wiring common connections.

(a) Wiring to be provided from the push button terminal block to an I/O expander harness for a minimum of push button inputs 5, 6, 7, 8 to terminal facility BIU #2.

#### **7. Flash-Normal Switch.**

A flash-normal switch must be provided in a panel on the inside of the front cabinet door. The switch and wiring must provide flashing operation as defined for police panel flash-normal switch. This switch must be labeled "flash-normal".

#### **8. Cabinet Lighting Fixture.**

Install two LED lighting panels to illuminate the cabinet.

A door switch to activate the light(s) when the door is opened and off when door is closed must be provided. Install one lighting panel above the top shelf and install the second to the bottom of the lower shelf's storage drawer. Each panel must provide at least 450 lumens of light and consume no more than 15W of power.

The lights shall be installed on rotating clips that can be aimed by hand when working on the cabinet.

Install a third LED lighting panel in the ITS compartment, if an ITS compartment is required.

Wire the switches and lights to the Miscellaneous circuit breaker.

#### **9. Load Resistors.**

Size M30, M30-ITS, M36, M36-ITS, 6, and 6-ITS cabinets must include a .125-inch-thick panel installed on the side wall of the cabinet with surface/panel mount power resistors installed. Provide 50 watt, 3,000 ohm, resistors wired to load switch 1, 3, 5, 7, 13, 14, 15, and 16 green and yellow outputs. A clear heat resistant panel is to be provided over the resistors.

Apply to 8, 12, or 16 load bay cabinets as applicable.

### **10. Auxiliary Input/Output Assembly.**

When called for on the plans an Input/Output assembly is to be provided, consisting of a Bus Interface Unit (BIU), rack, and interface panel with harness.

#### **A. BIU.**

A BIU must be provided that meets Section 8 of NEMA Standard TS2-2003 specifications.

#### **B. Rack.**

A 2 position BIU rack with address easily programmable is to be provided. The rack must be shelf mounted and not exceed 5" H, 6" W, and 8" deep.

#### **C. Interface Panel.**

A modular printed circuit type interface panel with wiring harness is to be provided to access all inputs/outputs available on terminal facility BIU 3 and 4 as specified in NEMA Standard TS2-2003 Section 5.3.1. The panel is to be provided with # 8 size terminal blocks for termination of input/output.

### **11. SDLC Patch Panel.**

To facilitate SDLC communications among devices in the control cabinet, a 6-position printed circuit patch panel and cabling is to be provided installed in each cabinet. The patch panel is to be mounted to the left-hand side wall of the cabinet. A quantity of 5 SDLC communications cables are to be provided complete with 15 pin connectors and latching clips to connect from each device to the patch panel. Communications cable must meet NEMA Standard TS2-2003 Section 5.3.3 specification.

### **12. TRAFFIC CONTROL CABINET**

#### **A. Scope.**

This section defines the minimum acceptable requirements for a series of cabinets that differ in size, to house the CU and related devices. Provide the base mounted size 6 cabinet unless the plans indicate otherwise. Cabinets to be supplied meeting NEMA Standard TS2-2003 Section 7 specifications.

#### **B. Outline Dimensions.**

Minimum outline dimensions are shown in Table 1. These dimensions are outside dimensions exclusive of hinges, handles, overhang(s), vent housing, and adapters. Cabinet heights are measured to the lowest point of the top surface of the cabinet. The combined overhangs of the four sides of the cabinet must not exceed 4 inches.

**TABLE 1: Minimum Outline Dimensions (larger dimensions are acceptable upon written approval)**

Size	Height (inches)	Width (inches)	Depth (inches)
M30	51	30	16
M30-ITS	61	30	16
M36	51	36	19
M36-ITS	61	36	19
6	56	44	25.5
6-ITS	66	44	25.5

### C. Cabinet types and mountings.

#### (1) Base Mounted (Size 6 and 6-ITS).

The size 6 cabinet must be constructed so that it can be mounted on a 30 inch by 48 inch foundation. Anchor bolt mounting provisions for four 3/4 inch bolts on 40 3/4 inch centers (side-to-side) on 18 1/2 inch centers (front-to-back).

#### (2) Pole Mounted/Base Mounted (M30, M36, M30-ITS, and M36-ITS).

Cabinets intended for side of pole mounting must be provided with any necessary adapter, exclusive steel banding, to permit mounting to a 4 1/2 inch or larger diameter pole. The adapter must accommodate lag bolts up to 3/8 inch and steel banding up to 1 inch wide. Mounting points must be provided at or near the top and bottom of the cabinet. The adapter must have provisions for two holes spaced horizontally, which will have a center-to-center distance of 3 1/2 inches. Cabinets must be furnished without conduit holes. In addition, the cabinet must be provided with a removable bottom to enable it to be pole or base mounted.

### D. Materials.

The traffic control cabinet must be constructed of aluminum alloy. The aluminum material must be a minimum of 1/8 inch alloy sheet, ASTM B 209, 5052-H32 or equivalent.

The cabinets shall be weatherproof and impervious to rain, sleet, snow, dripping water, corrosion, hose down, splashed water, oil, and coolant seepage.

### E. Finish and Surface Preparation.

(1) Both the cabinet and base extension are to be unfinished both inside and outside, unless the plans indicate a finishing treatment.

#### F. Top Surface Construction.

The cabinet must be manufactured to prevent the accumulation of water on its top surface.

#### G. Conduit Entrances.

All conduit entrances must be sealed with a non-toxic, non-corrosive, non-staining non-hardening pliable duct seal compound. The duct seal compound must be moisture resistant and prevent the infiltration of moisture, dust and debris. The duct seal compound must be sufficiently applied to fully seal the conduit entrance.

Cap any unused conduit entrances.

#### H. Doors.

##### (1) Main Cabinet Door.

The cabinet must have a main door which permits access to all equipment within the cabinet. Doors must be hinged on the right side of the cabinet as viewed from the outside facing the cabinet door opening. They must have a handle made of one piece construction and swing away from the locking mechanism.

##### (2) Hinges.

All cabinet doors must incorporate a piano type hinge utilizing stainless steel hinge pins.

##### (3) Door Stop.

The cabinet door must be provided with a door stop which holds the door open as a minimum at 90 degrees and 180 degrees ( $\pm 20$  degrees).

##### (4) Latches and Locking Mechanism.

(a) All cabinets must incorporate a main door lock, Corbin No. 15481RS or Pelco (Type II) SM-1025 or equivalent, constructed of nonferrous or stainless materials, which must operate with a Traffic Industry conventional #2 key, Corbin No. 1R6380 or Pelco (Type II) SM-0198-2 or equivalent. A minimum of two keys must be included for the main door of each cabinet.

(b) The cabinet door(s) must be provided with a three-point latch. The top and bottom must have rollers to secure the door in a closed position.

(c) When in the locked position, the lock must prevent the movement of the three-point latching mechanism.

(d) The cabinets must be provided with a means of externally padlocking the latching mechanism. A minimum of 3/8 inch diameter lock shackle must be accommodated.

(5) Door Opening.

The main door opening of all cabinets must be at least 80 percent of the area of the side which the door closes, exclusive of the area of plenums.

(6) Switch Compartment.

(a) A hinged switch compartment door must be mounted to the outside of the main cabinet door. The door must permit access to a switch panel but must not allow access to exposed electrical terminals or other equipment within the cabinet.

(b) In order to allow for the switch controls and storing of the manual control cord (if used), the switch compartment with the door closed must have minimum internal dimensions of 3 1/2 inches high, 7 1/2 inches wide, and 2 inches deep. Additionally, the volume must not be less than 70 cubic inches.

(c) Switch compartment doors must be equipped with a lock, which can be operated by a police key, Corbin Type Blank 04266 or Pelco type SM-0200 long keys, or equivalent. A minimum of two keys must be included for the switch compartment of each cabinet.

(7) The doors shall be weatherproof and prevent water from entering the cabinet.

I. Shelves.

The cabinet must be provided with two shelves for supporting the control equipment. The shelves must be at least 10 inches in depth. All cabinets must have a provision for positioning shelves to within 12 inches of the bottom of the cabinet and to within 6 inches of the top of the cabinet in increments not more than 1/2 inch.

J. Ventilation and Heater System.

All cabinets must incorporate a ventilation system to provide for the circulation of external air through the enclosure to remove excess heat, fumes, or vapors.

(1) Fan System

(a) Fan Type. The electric fan used in the cabinet must have a capacity of at least 100 cubic feet of air per minute. The fan must be rated a minimum

of 100 cubic feet per minute as designated by NEMA Standard TS2-2003, Section 7.9.1.

(b) Fan Controls. All cabinets must have a thermostat device to control the operation of the fan(s). The device switch-on point must be manually adjustable at least in the range from 80 degrees Fahrenheit to 120 degrees Fahrenheit. The device must have a differential between its switch-on point and its switch-off point. This differential must not be greater than 25 degrees Fahrenheit. The device must be located in the inside of the top of the cabinet not lower than 6 inches from the top of the cabinet.

(c) The filter size will be according to the provisions for the type of cabinet as stated in NEMA Standard TS2-2003, Section 7.9.2.3 and must be a replaceable pleated air filter with a Minimum Efficiency Reporting Value (MERV) rating of 5 or higher as defined by the ASHRAE 52.2-1999 specification.

## (2) Heater System

(a) Provide a DIN Rail mounted touch-safe 150 W Convection style Heater for all cabinets.

(b) The heater must be operated via an electrical hygrotherm device. The hygrotherm device must have an adjustable temperature range from 32 to 140 degrees Fahrenheit, adjustable humidity range from 50 to 90% RH. The output relay must have a rate of 6 amps resistivity with a SPDT relay type.

(c) Mount the heater within 18 inches of the cabinet bottom away from any warm temperature sensitive equipment.

## K. Intelligent Transportation System (ITS) Compartment

(1) When called for on the plans include a hinged compartment door mounted to the outside front of the cabinet, above the main door. The door will provide access shelf and DIN rail mounted ITS devices and electrical power components to power these devices.

(2) The ITS compartment door will have a minimum opening size:

	Height	Width
M30-ITS	8"	27"
M36-ITS	8"	33"
6-ITS	8"	41"

The depth of the compartment will be the full depth of the cabinet.

(3) The ITS compartment door is to be equipped with a Type 2 lock, cut for the Traffic Industry standard #1 key. A minimum of two keys must be included for the ITS compartment.

(4) Accommodations will be made to allow free air movement from the ITS compartment to the lower signal controller compartment.

(5) The ITS compartment will include U-channels mounted to the side of the compartment for mounting panels and DIN rails. Provide 2 channels on each side wall and on the back wall.

(6) Flexible conduit must be field installed from the bottom of the main signal cabinet section to the upper ITS compartment. The flexible conduit must be installed in such a way that wires and cables can be run in to the ITS compartment from the outside of the cabinet without accessing the main signal compartment.

#### L. Terminals and Facility.

##### (1) Scope.

This section defines the minimum acceptable requirements for terminal and facilities to interconnect the related devices within a traffic control cabinet. The terminal facility must conform to NEMA Standard TS2-2003 Section 5, Type 1 specifications.

##### (2) Mechanical Construction.

The terminal facility must conform to the following mechanical requirements.

###### (a) Terminal Identification.

All terminals must be permanently identified in accordance with the cabinet wiring diagram. Where through-panel terminal blocks are used, both sides of the panel must have the terminals properly identified with the terminal position number.

Identification must be permanently attached and close as possible to the terminal strip and must not be affixed to any part which is easily removable from the terminal block panel.

Each input or output terminated on a terminal block must be identified on the front of the panel by position number and function terminology (e.g., Ph 1 Red, Ph 2 Hold, etc.). The same identification must be used consistently on the cabinet wiring diagram.

(b) Component Identification.

All components which make up the basic terminal facility must be permanently identified in accordance with the cabinet wiring diagram. The following components are considered part of the basic terminal facility:

- (i) Load Switch Sockets.
- (ii) Flash Transfer Relay Sockets.
- (iii) Flasher Socket.
- (iv) Main and Auxiliary Circuit Breakers.
- (v) Radio Interference Suppressor and Surge Protector.
- (vi) Solid State Signal Power Relay.
- (vii) Power Terminal Bus Bars.

Where through-panel components are used, both sides of the panel must have the components properly identified by relative symbols (e.g., FRI, LS1, etc.).

Identification must be permanently attached and as close to the component as possible and must not be affixed to any part which is easily removable from the panel.

Each component must be identified on the front of the panel by symbol and function terminology (e.g., LF1 Filter, BR1 Signal Bus, etc.).

(c) Load Switch and Flasher Support.

Load switch and flasher bases must be so designed and constructed as to receive all such devices which may be manufactured to the maximum size requirements permitted under the NEMA TS2-2003 Standards Publication. All support(s) must be provided so that, as a minimum, it is supporting the flasher and load switch of the maximum size at some point(s) between 3 inches and 7 inches from the panel. At least 90 percent of the area beneath the load switch or flasher must be open to allow for the free flow of air across the load switches or flasher. There must be no obstruction within 1 inch above or below the units within the open area.

(d) Load Switch, Flasher, Flasher Transfer Relay, BIU Positions.

Wired load switch, flasher, flash transfer relay, and BIU sockets must be provided on the main load bay in the quantities listed below:

**TABLE 2: Load Switch, Flasher, Flash Transfer Relay and BIU Socket Quantities**

<b>Configuration</b>	<b>Load Switch</b>	<b>Flasher</b>	<b>Flash Transfer</b>	<b>TF BIU</b>
M30 and M30-ITS	12	1	6	2
M36 and M36-ITS	16	1	8	2
6 and 6-ITS	16	1	8	2

The flasher socket must be wired for a Type 3 solid state flasher conforming to Section 6.3 of NEMA Standard TS2-2003 specifications. Flashing of even numbered load switch output indications must be placed on one circuit and flashing for odd numbered load switch output indications must be placed on the other circuit. It must be possible to flash either the amber or red indication on any load switch outputs. It must be possible to easily change the flash indication from the front side of the panel using simple tools without the need to unsolder or re-solder connections.

Rack style mounting must be provided on the main panel to accommodate the two required terminal facility BIU's, consisting of a dual-row 64-pin female DIN 41612 Type B connector for each BIU rack position and card guides for top and bottom edges of the BIU. Terminal Facilities BIU mounting must be an integral part of the main panel.

(e) Terminal Blocks.

Terminal blocks must have mechanical characteristics to properly support the wiring connected without warping the terminal block. All materials including screws and threaded portions used in terminals and terminal blocks must be stainless steel or nickel plated brass.

(i) Field Terminal Blocks.

Field terminal blocks for all inputs and outputs for a fully expanded CU must be included. These blocks must be either single terminal type with through-panel connection on the rear side of the mounting panel or double binder head screw terminals. Either type of terminal block used must be of the correct ampacity for the application. Minimum acceptable ratings are 30 amperes, 300 V, with 10 - 32 binder head screws.

(ii) Control Terminal Blocks.

Control terminal blocks for inputs and outputs of the CU, MMU, flash transfer relays, load switches, etc., must be included. These blocks must be either single terminal type with through-panel connections or double binder head screw terminals. Either type of terminal block used must be

of the correct ampacity for the application. Minimum acceptable ratings are 15 amperes, 250 V, with 6-32 x 1/4 inch pan or binder screws.

Control terminal blocks for controller unit inputs and outputs must be provided on the main terminal facility panel and must be single terminal type with through-panel connections with a minimum acceptable rating of 15 amperes, 250 volts, with 6-32x1/4 pan or binder screws

Terminal blocks for monitor control circuits and main terminal facility panel electrical distribution must be provided on the main terminal facility panel and be a single terminal type with through-panel connections with minimum acceptable rating of 15 amperes, 250 volts, with 6-32x1/4 pan or binder screws. These terminals must be organized in a logical manor on the right-hand side of the load switches.

(iii) Detector Terminal Blocks.

Detector terminal blocks for loop and push button inputs must be included. These blocks must be either single terminal type with through-panel connections or double binder head screw terminals. Either terminal block must be of the correct ampacity for the application. Minimum acceptable ratings are 20 amps, 250 V with 8 - 32 pan or binder screws.

(f) Wiring Harnesses.

The CU, Cabinet Power Supply, and MMU harnesses must be neatly arranged and provided with the flexibility for the connectors to reach at least 40 inches from the top of the terminal block panel which must be mounted directly below the CU shelf. The harness connectors must not have any sharp edges and the stress relief attachment screws must not extend greater than 1/4 inch beyond the stress relief.

Terminal positions must be provided, completely wired and neatly arranged, providing access to inputs and outputs in the MMU. All MMU inputs must be terminated. Type select and port one disable inputs must be terminated.

Terminal positions must be provided, completely wired and neatly arranged, providing access to all inputs and outputs for the cabinet power supply.

Terminal positions must be provided, completely wired and neatly arranged, providing access to all inputs and outputs defined in NEMA Standard TS2-2003 Section 5.3.1 for Type 3 and Type 4 facilities. Additionally Input/Output terminal positions must be provided for quantity 8 pedestrian detect inputs.

Terminal positions must be provided, completely wired and neatly arranged, providing access to the CU TS2 inputs and outputs including AC line, AC neutral, Ground, Logic Common, and Fault Monitor. This harness is to be wired to a 55 position MSA type socket for connection directly to the controller unit without the need for an adapter.

(g) Power Distribution panel must be provided per NEMA Standard TS2-2003 Section 5.4.1 The panel must contain one 10-ampere circuit breaker to provide overload protection to the CU, MMU, BIU, +12/24 VDC cabinet power supply, and detection devices. It must also contain one main circuit breaker of 35 or 40 ampere, to provide over-load protection to the signal and flash buss load. All breakers must have line and load terminals clearly labeled.

The signal bus must be connected to the incoming AC line through a mercury contact switch or a solid-state control device functionally equivalent to the NEMA Standard TS2-2003 Section 5.4.2.3 specified contact switch. The terminals for AC line and AC neutral to the cabinet must be capable of accepting a No. 6 wire. With the CA 10 ampere and Main 35-40 ampere circuit breakers off (tripped), all units inside the cabinet and the intersection display must be off. With the 10-amp breaker on and main 35-40 ampere circuit breaker off, the signal output must be off and the major units within the cabinet must function. With the 10-amp breaker off and main 35-40 ampere circuit breaker on, the intersection must be in flash mode and all units within the cabinet will be off.

(i) Cabinet Surge Protection and Filtering.

A RFI Line Filter must be installed on the power panel per NEMA Standard TS2-2003 Section 5.4.2. The ampacity of the filter must be equal to or greater than the ampacity of the main circuit breaker. The filter must attenuate signals both line to load and vice versa. The attenuation in both directions to be a minimum of 50 decibels over the frequency range of 200 kHz to 75 MHz.

A Line Arrestor device must be installed and wired on the power panel per NEMA Standard TS2-2003 Section 5.4.2. The line arrestor is jack mounted using a 12 pin Beau type connector for ease of replacement and includes two LEDs for failure indicators. This device must be rated for 20,000 amps peak current, less than 3 nanosecond response time, and provide a minimum of 15 amps continuous current filtered power.

Provide a switched, surge protected, metal enclosed outlet strip. For the M30-ITS, M36-ITS, and 6-ITS include an additional outlet for the ITS compartment. This outlet strip is to provide a minimum 3,300 joule

suppression rating and is wired to the load side of one of the 15 amp compartment breakers. Ensure the outlet strip is mounted on the rails on the back of the cabinet in the compartment.

Provide a 3-electrode gas tube surge arrestor to the line of the compartment breakers which will be used for miscellaneous or auxiliary uses. The gas tube arrestor must be rated at 40,000 amps (8/20 impulse) with a 300-500 VDC break down voltage.

(ii) Solid State Signal Power Relay.

The terminal facility must include a SPST-NO signal power relay wired to provide power from the main circuit breaker and RFI filter to the AC signal power bus bar and load switches. The solid-state relay must be energized to provide power to the signal bus and have ampacity of 75 amps. It must provide zero voltage switching from 47 - 63Hz. The Signal Power Relay must be mounted on a panel on the lower right side of the controller cabinet and easily accessible for replacement.

(iii) AC-Common Bus Bar.

The AC-common (Neutral) must be terminated on a solid metallic multi-terminal bus bar that will accept 4 - 16 American Wire Gage (AWG) copper conductors. This bus bar must be insulated from the cabinet. Separate wires must be run from this bus bar to each unit or group of similar units in the terminal facility which requires AC-common connection. A quantity of one conductor only must be allowed in each termination position. A minimum of 12 open termination positions must be available for field wiring common return connections. A single lug attached to the Common Bus that accepts 2 AWG conductors must be provided.

(iv) Safety Ground Bus Bar.

The safety (Earth/Chassis) ground must be terminated on a solid metallic multi-terminal bus bar that will accept 4 - 16 AWG copper conductors. This bus bar must be connected to the cabinet. A quantity of one conductor only must be allowed in each termination position. A minimum of 12 open termination positions must be available for field wiring ground connections. Separate wires must be run from this bus bar to each unit or group of similar units in the terminal facility which requires safety ground connection. A single lug attached to the Ground Bus that accepts 2 AWG conductors must be provided.

(v) In addition to the three breakers and surge protected outlet strip, ensure the upper ITS compartment includes: GFI outlet wired to the load side of one of the 15 amp ITS compartment breakers, a minimum

6 position ground bus, LED lighting mounted above the air plenum above the door power via a door switch and the 10 amp ITS compartment breaker, and a minimum 12" long piece of DIN rail mounted across the channels on the back of the cabinet.

(h) Conductors.

All conductors used in the terminal facility wiring must be #22 AWG, or larger, with a minimum of 19 strands. Conductors terminated on the AC-Common Bus Bar and Safety Ground Bus bar must be tinned and a minimum size of #16 AWG. Conductors must conform to Military Specification MIL-W-16878, Type B or D. The insulation must have a minimum thickness of 10 mils and must be nylon jacketed polyvinyl chloride or must be irradiated cross-link polyvinyl chloride. Conductors #8 AWG must be UL Type THHN. All conductors used in the terminal facility wiring must conform to the following color-code requirements:

(i) The AC-common conductor of a circuit must be identified by a continuous white color.

(ii) The safety (Earth/Chassis) ground conductor of a circuit must be identified by a continuous green color or a continuous white color with one or more green stripes.

(iii) The AC line power conductor of a circuit must be identified by a continuous black color.

(iv) The low-level DC (+24 or less) conductor of a circuit must be identified by a continuous blue color.

(v) Other conductors, not conforming to one of the above, must be identified by any continuous color not defined above.

(i) Wiring (Power Distribution within the Facility).

All terminal facility wiring must be neat, firm, and routed, where practical, to minimize crosstalk and electrical interference.

All terminal facility conductors must be of sufficient size to carry the maximum current of the circuit or circuits they are provided for. They must be sized based on the ampacity ratings as follows:

**Table 5: Terminal Facility Conductor Size**

<b>AWG Wire Size</b>	<b>Ampacity Rating</b>
#22	5 Amps
#16	10 Amps
#14	15 Amps
#12	20 Amps
#10	30 Amps
#8	50 Amps

The ampacity ratings are calculated based on the current required to raise the temperature of a single insulated conductor in free air (86 degrees Fahrenheit ambient) to the limit of the insulation and applying a bundle de-rating factor of 0.5 for wires #22 AWG through #10 AWG and a de-rating factor of 0.7 for wires #8 AWG and #6 AWG.

The conductor feeding power from the main circuit breaker to the auxiliary breakers, solid state signal power relay, primary and secondary SPD terminal blocks, and AC+ signal power bus bar must have an ampacity of 40 amps.

The conductor feeding power to the flasher socket must have, as a minimum, an ampacity of 30 amperes.

The conductor feeding power from the AC+ signal power bus bar to each load switch socket must have an ampacity of 10 amperes and must be capable of being easily programmed to supply the load switch from another point or interrupt AC+ signal power to an individual load switch for special applications.

The conductors feeding power from the load switch to the field signal terminals must have an ampacity of 10 amperes.

The conductors feeding power from the flasher socket to the flash transfer relay sockets, which feed flashing power to same, must have an ampacity of 15 amperes. The remaining wires to and from the flash transfer relay socket, which are in the circuit between the load switch socket and the field signal terminals, are covered in the previous paragraph.

(j) Control Circuits.

(i) Flash Transfer Control.

The control circuit to the flash transfer relay sockets must be such as to provide flashing operation when the MMU or optional auxiliary

equipment calls for flash (e.g., police panel flash switch and/or maintenance panel). The flash transfer control must also conform to the following:

The flash transfer relay socket must be wired so the coil of the relay(s) must be de-energized for flashing operation. The flash transfer relay sockets must be located in close proximity to the load switches, flasher, and field signal terminals.

(ii) MMU Control.

The MMU must be wired to provide flashing operation when the fault relay de-energizes or if the MMU is disconnected. It must also provide AC line power to the CU by via the Start Delay contacts.

(iii) Logic Common, +24 volts, and AC common must be wired from the source in a "loop" to each load switch so that an open fault at any one point will not prevent the load switches from working properly.

AC common and 120 volts AC to the coils of the Flash Transfer relays must be wired in a "loop" from the source so that an open fault at any one point will not prevent the relays from working properly.

(3) Field Wire Terminal Locations.

The terminal facility must provide Field Wire Terminals located to conform to the following requirements:

- (a) AC Service Hookup. Incoming AC power service must terminate on the right side of the cabinet on the power distribution panel.
- (b) Signal Hookup. Signal wires must terminate on terminal blocks on the back of the cabinet at least 3 inches but not over 6 inches from the bottom of the cabinet.

Signal terminals must be directly accessible from the front of the cabinet. One terminal must be provided for each load switch output.

- (c) All cabinets must incorporate a 16-channel detector rack and panel, configuration #2, as per NEMA Standard TS2-2003 Section 5.3.4

(4) Auxiliary Equipment.

- (a) The terminal facility must include provisions for the following equipment in a panel accessible from a police door on the front of the cabinet.

(i) Signals On-Off Switch.

A signals on-off switch must be included, installed, and wired. The switch and wiring must energize or de-energize the solid-state signal power relay. AC signal power must not be routed through this switch. The switch must be labeled "Signal-Off". When in the "Off" position, all signal field terminal must be de-energized and the Red Enable input to the MMU must be inactive.

(ii) Flash Normal Switch.

A flash-normal switch must be included. When in the Flash position, the flash transfer relays and solid-state signal power relay must be de-energized, resulting in flash being displayed to traffic. Neither AC signal power nor flashing power must be routed through this switch. The switch must be labeled "flash-normal". When the switch is returned to the "Normal" position, the signals must return to the initialization phase and begin cycling.

Operation of the signal-off switch must override this switch. That is, when in the "Off" position, the signal-off switch prevents flashing operation as called for by all flash control circuits.

(b) Maintenance Panel Options.

(i) Stop Time Switch.

A stop time switch must be provided in a panel on the inside of the front cabinet door. The switch and wiring must provide three modes of operation which are:

1) Normal.

"Stop time" to the CU must be provided as required by the MMU.

2) Run.

"Stop time" is prevented from being applied to the CU from other devices.

3) Stop.

"Stop time" is applied to the CU.

This switch must be labeled "Stop-Run-Normal".

(ii) Duplex Receptacle.

A duplex receptacle of a three-wire ground fault interrupter (GFI) type must be provided in a panel on the inside of the front cabinet door per NEMA Standard TS2-2003 Section 5.4.2.6.

## (c) Cabinet Lighting.

(i) An LED lighting panel with door actuated switch per NEMA Standard TS2-2003 Section 5.4.2. is to be provided. The LED lighting panel must have an operating temperature range of -40 to 150 degree Fahrenheit. The panel must operate at not more than 9 watts and produce not less than 115 lumens per watt and be rated for a minimum of 90,000 hours of continuous operation.

## (5) Prints, Functional Data, and Parts List.

The manufacturer must supply each of the following items with each cabinet:

(a) Two complete set of schematic and wiring diagrams of the cabinet and terminal facilities.

(b) Cabinet mounting diagram.

(c) Complete parts list of cabinet and accessories.

Each of these items must apply directly to the cabinet with which it is applied. One set is to be put in the installed cabinet, and one set is to be furnished to the maintaining agency.

## 2. Traffic Control Cabinet Accessories

For projects bidding through RCOC for the sole purpose of RCOC Signal Maintenance Department (District 8) stock: Pack all cabinet accessories in separate boxes and label with accessory description.

## A. Scope.

This section defines the minimum acceptable requirements for plug-in accessories for the traffic controller assembly within a traffic control cabinet. Accessories are to be provided in quantities listed in table 6 below.

**Table 6: Accessory Quantities (ea)**

<b>Cabinet</b>	<b>CPS</b>	<b>MMU</b>	<b>Flasher</b>	<b>Flash Relay</b>	<b>Load Switch</b>	<b>BIU</b>
M30 and M30-ITS	1	1	1	4	12	3
M36 and M36-ITS	1	1	1	6	16	3
6 and 6-ITS	1	1	1	6	16	3

B. A shelf mount Cabinet Power Supply (CPS) is to be provided with each controller assembly and is to adhere to the guidelines of NEMA Standard TS2-2003 Section 5.3.5. The power supply must be encased on all sides so that no circuitry is exposed to the user.

C. A Malfunction Management Unit (MMU) is to be provided with each controller assembly. The MMU must be in accordance with the standards of NEMA Standard TS2-2003 Section 4. The MMU is to be wired to monitor each load switch output.

D. A two-circuit flasher is to be provided with each controller assembly. The flasher will conform to Section 6.3 of the NEMA Standard TS2-2003 Standards Publication. The flasher must be rated at 15 amperes, double pole with a nominal flash rate of 60 flashes per minute.

E. Flash transfer relays must be provided with each cabinet conforming to the requirements of Section 6.4 of the NEMA Standard TS2-2003 specifications. Quantity provided to conform to Table 6.

F. Load switches must be provided with each cabinet conforming to the requirements of NEMA Standard TS2-2003 Section 6.2 specifications. Quantity provided to conform to Table 6.

G. Bus Interface Units (BIU) must be provided with each cabinet conforming to the requirements of NEMA Standard TS2-2003 Section 8 specifications. Quantity provided to conform to Table 6.

### 3. Exceptions

This specification does not include any proprietary items or devices which would preclude any equipment manufacturer from reproducing equipment to meet these specifications. All technical tolerances, ratings, and technically specified criteria contained within these specifications are currently being met by commercially available equipment. The fact that a manufacturer chooses not to produce equipment to meet these specifications, providing the above criteria are met, will not be considered sufficient cause to adjudge these specifications as restrictive.

### 4. Guarantee and Warranty

As a minimum, each control cabinet must be guaranteed against defects in materials and workmanship for a period of 18 months from date of shipment. Details of the manufacturer's guarantees and warranties must be supplied with the bid. The warranty offered by the manufacturer must be assigned to the Road Commission for Oakland County. If requested by the Engineer, supply manufacturer's warranty or

guarantee documents from the manufacturer and a copy of the invoice showing date of shipment.

#### 5. Packing and Marking

Except as otherwise specified in the request for quotation, each control cabinet must be packed separately in such a manner that there will be no injury or defacement to the control cabinet during transportation to the point of destination. Each carton must be legibly marked with the controller description, purchase order number, and vendor's name.

For projects bidding through RCOC for the sole purpose of RCOC Signal Maintenance Department (District 8) stock: Pack all cabinet accessories in separate boxes and label with accessory description.

#### 6. Sampling, Testing and Basis of Acceptance

One or more control cabinets may be selected at random from the shipment and tested in accordance with Road Commission for Oakland County (RCOC) methods for compliance with the requirements of these specifications. If so notified by RCOC, the vendor must complete one controller for preliminary testing and inspection to determine compliance with these specifications. If this one control cabinet conforms to these specifications, the vendor will be notified in writing and must furnish the remainder of the order, which will be subject to testing in accordance with RCOC methods. If the preliminary sample does not conform to these specifications, either the order will be canceled or the vendor will be notified, in writing, of all deficiencies so that the necessary changes or corrections to all cabinets on the purchase order may be made. The entire order will then be subject to testing in accordance with RCOC methods.

The Basis of Acceptance is at the sole discretion of the Road Commission for Oakland County. If the cabinet is not found to be acceptable, the rejected cabinet a new cabinet must be provided at no additional cost. The Contractor/Supplier must provide a detailed accounting (cut sheet) of all equipment supplied with the cabinet.

Acceptance - Provide General Certification per the MDOT's *Materials Quality Assurance Procedures Manual* to the Engineer that the materials meet the requirements specified herein.

At the sole discretion of the Engineer, caulk may be visually inspected.

- Seal the cabinet base to the concrete with a silicone caulk bead.
- Seal any space between conduit entering the controller and the foundation with silicone caulk.

#### 7. Patented Processes and Materials

The vendor must defend any and all patent infringement suits resulting from the use of any design, device, material or process, or portion or phase thereof, employed in the manufacture or use of said controllers in accordance with the Road Commission for Oakland County's plans and specifications, and must save harmless and indemnify RCOC on account of any and all such suits or claims for royalties, damages, or costs.

#### 8. Delivery

The pay item must include the cost of delivery to the Road Commission for Oakland County, 2420 Pontiac Lake Road, Waterford, MI 48328.

#### 9. Delivery Claims for Extensions of Time

Delivery delay claims by the Contractor for Extensions of Time will not be considered unless two or more letters from different local traffic signal suppliers (Metro Detroit area) are supplied to the engineer within 14 calendar days of contract award.

Any delay (material shortages, pandemics, shipment delays, supply chain delays, delayed deliveries as a result of an industry-wide shortage, etc.) will not be considered unless the contractor/supplier letter is accompanied by an FHWA letter declaring a nationwide shortage of cabinets or a specific material.

Delivery claims may be considered for a claim for an extension of time for completion as determined reasonable by the Engineer, but will not be considered the basis for a claim for extra compensation or an adjustment in contract unit prices.

### **c. Construction**

All work must be in accordance with the contract documents.

The cabinet shall be placed on a level concrete foundation for ground mount cabinets.

Caulk base of cabinet per RCOC Signal Details.

**d. Measurement and Payment**

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item(s).

<b>Pay Item</b>	<b>Pay Unit</b>
Cabinet, ITS Type, RCOC.....	Each
Cabinet, ITS Type, Salv, RCOC.....	Each
Cabinet, ITS Type, Delivered, RCOC.....	Each

**Cabinet, ITS Type, RCOC (Ea)** will be measured as a unit. The unit shall be as indicated on plans. The contract unit price each shall be payment in full for installing the traffic signal cabinet, and accessories required to provide the traffic signal control operation as shown on the plans and in accordance with the MMUTCD and this special provision.

**Cabinet, ITS Type, Salv, RCOC (Ea)** will be measured as a unit. The unit shall be as indicated on the plans. The contract unit price each shall be payment in full for pick up and installing the controller and cabinet complete on the steel or wood pole or on a concrete foundation (if required) and furnishing and installing all necessary equipment, hardware, conduit risers, sealing of conduit entrances, cable, wiring, necessary rewiring of signal head(s) and grounding all as specified herein and as shown on the plans.

**Cabinet, ITS Type, Delivered, RCOC (Ea)** will be measured as a unit. The unit shall be as indicated on plans. The contract unit price each shall be payment in full for furnishing and delivering to RCOC for set-up of the cabinet as specified herein and as shown on plans. The unit price shall include transporting the cabinet from RCOC to the job site for installation.

ROAD COMMISSION FOR OAKLAND COUNTY

SPECIAL PROVISION  
FOR  
**DIGITAL TRAFFIC SIGNAL CONTROLLER**

RCOC/TOC

PAGE 1 OF 3

RCOC20SP820G

ORG:04-11-22

REV: 03-01-25

**a. Description**

This work shall be done in accordance with section 818, 819, 820, 918, and 921 of the Standard Specifications for Construction, except as herein provided.

This work consists of furnishing, delivering, and installing a traffic signal controller, *NEMA* Advanced Transportation Controller (ATC) type.

**b. Materials**

All work must be in accordance with the contract documents.

Provide materials meeting the requirements in sections 918 and 921 of the Standard Specifications for Construction and this special provision.

1. Controller Unit (CU)

A. Provide a CU from the following list. Confirm the appropriate firmware version with the Engineer prior to ordering. No additional payment will be made based on the firmware version provided:

(1) Econolite Group, Inc.

- (a.) Controller Software: EOS NEMA TS2 Fully-Actuated Advanced Traffic Controller Software version 03.2.15.
- (b.) Cobalt by Econolite
- (c.) Basic display with text and textual menus only – no touch screen
- (d.) TS2 Type 2 connector

(2) Yunex Traffic/Siemens

- (a.) Controller Software: SEPAC Fully-Actuated Advanced Traffic Controller Software version 3.58d.
- (b.) Siemens m60 Linux Series Controllers

(3) Approved equal. The approval of submitted alternate models may take several months. Requests to use an alternate model will not be justification for project delays.

- B. Provide materials and associated software and drivers conforming to the following:
    - (1) ATC 5201 v06.25 Advanced Transportation Controller (ATC) Standard Version 06 for use in NEMA TS-1 or TS-2 Cabinets.
    - (2) NTCIP 1202 v02, Object Definitions for Actuated Signal Controllers (ASC) Interface Published November 2005.
    - (3) NEMA Standards Publication TS 2-2021 Traffic Controller Assemblies with NTCIP Requirements Version 03.08.
  - C. Controller shall function with RCOC Digital / ITS Type NEMA TS2 Cabinet Special Provision.
2. Delivery
- A. The pay item shall include the cost of delivery to the Road Commission for Oakland County (RCOC), 2420 Pontiac Lake Road, Waterford, MI 48328.
  - B. Packing and Marking. Ensure each CU is packed separately in such a manner that there will be no injury or defacement to the CU during transportation to the point of destination, unless otherwise specified in the contract. Ensure each carton is legibly marked with the CU description, purchase order number, and vendor's name.
3. Warranty and Guarantee
- Provide materials with a manufacturer's warranty/guarantee, transferable to the Road Commission for Oakland County, that the supplied materials will be free from all defects in materials and workmanship for 1 year for CU software and 2 years for CU hardware from the date of final project acceptance. If requested by the Engineer, supply manufacturer's warranty and guarantee documents from the manufacturer and a copy of the invoice showing date of shipment.
4. Acceptance
- Provide General Certification per the MDOT's *Materials Quality Assurance Procedures Manual* to the Engineer that the materials meet the requirements specified herein.

### **c. Construction**

Complete this work in accordance with sections 819, 818, and 820 of the Standard Specifications for Construction, as shown on the plans and as directed by the Engineer.

1. Submittals / Working Drawings

Submit a detailed dimensional drawing of all equipment, material specification list which shows the materials to be used, equipment to be furnished, material documentation that meets this specification, and assembly/installation method.

- A. Submit controller unit
- B. Submit software version

**d. Measurement and Payment**

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item(s):

<b>Pay Item</b>	<b>Pay Unit</b>
Controller, Digital Type, Delivered, RCOC.....	Each
Controller, Digital Type, Delivered, SCATS, RCOC .....	Each

**Controller, Digital Type, Delivered, RCOC and Controller, Digital Type, Delivered, SCATS, RCOC (Each)** will be measured as a unit. The unit shall be as indicated on plans and the contract unit price each shall be payment in full for all labor, equipment, and materials required to:

1. Furnishing and delivering the controller to the RCOC for controller timing and setup.
2. Transporting the controller from the RCOC to the job site for installation.
3. Install the traffic signal controller unit (CU), and accessories required to provide the traffic signal control operation as shown on the plans and in accordance with the MMUTCD and this special provision.

ROAD COMMISSION FOR OAKLAND COUNTY

SPECIAL PROVISION  
FOR  
**PEDESTAL, ALUM**

RCOC/TOC

PAGE 1 OF 2

RCOC20SP820J

ORG:05-07-21

REV: 03-01-25

**a. Description**

This work consists of aluminum pedestals with octagonal base according to the plans and sections 820 and 921 of the Standard Specification for Construction except as herein provided.

This specification is for a pedestal suitable for mounting traffic signals equipped with slip fitters for 4" nominal size pipe. The overall height of the pedestal shall be as shown on the contract documents, typical signal construction details, and to provide the signal mounting height. The pedestal shall conform to the minimum specifications given below, but consideration will be given to features of design, construction, and workmanship.

**b. Materials**

All work must be in accordance with the contract documents.

1. Octagonal Aluminum Pedestal Base

Provide octagonal shape pedestal base.

The octagonal aluminum base shall be fabricated free of voids, pits, dents, molding sand and excessive foundry grinding marks. All corners shall be smooth and intact. Exterior surface finish shall be smooth and cosmetically acceptable by being free of molding fins, cracks and other exterior blemishes.

The octagonal aluminum base shall accommodate bolt circles from 12 inches to 14½ inches. The base shall be designed to accommodate (4) anchor bolts from 5/8 inch to 3/4 inch in diameter. There shall be slots in the bottom of the base 1½ inches wide and 2½ inches long to allow adjustment for anchor bolt placement.

Must meet MDOT Detail SIG-070-A Note #4 for pedestal base requirements:

A. Pedestal base must meet the requirements of National Cooperative Highway Research Program Report 350 (NCHRP 350) or Manual for Assessing Safety Hardware (MASH) and have Federal Highway Administration (FHWA) acceptance. Pedestal base must also be certified to have a 4-inch maximum stub height after the support has broken away from its base, as specified in the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals and the AASHTO Roadside Design Guide.

2. Aluminum Pedestal Poles

Provide aluminum pedestal poles material in accordance with section 921 of the Standard Specification for Construction except as provided in RCOC detail OC-5A.

The aluminum pedestal pole shall consist of aluminum alloy 6063-T6.

The threaded end of the pole shall have a protective cap installed to prevent thread damage. A cardboard sleeve shall cover the entire length of the shaft to protect the surface finish during shipment and storage.

3. Acceptance

Provide General Certification per the MDOT's *Materials Quality Assurance Procedures Manual* to the Engineer that the materials meet the requirements specified herein.

**c. Construction**

All work must be in accordance with the contract documents.

1. Submittals / Working Drawings

Submit a detailed dimensional drawing of all equipment, material specification list which shows the materials to be used, equipment to be furnished, material documentation that meets this specification, and assembly/installation method.

**d. Measurement and Payment**

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item(s).

<b>Pay Item</b>	<b>Pay Unit</b>
Pedestal, Alum, RCOC.....	Each
Pedestal, Alum, Salv, RCOC.....	Each

**Pedestal, Alum, RCOC (Ea)** will be measured as a unit. The contract unit price each shall be payment in full for furnishing and installing pedestal, fittings, ground rod(s), ground wire and such other material as may be required to provide a complete and operating job as specified herein as shown on the plans.

**Pedestal, Alum, Salv, RCOC (Ea)** will be measured as a unit. The contract unit price each shall be payment in full for furnishing and installing (salvaged) pedestal, hardware, connectors, wiring, service cables, conduits, grounding, fittings, ground rod(s), ground wire and such other new material as may be required to provide a complete and operating job as specified herein and as shown on the plans.

## CITY OF ROCHESTER HILLS

### UTILITY COORDINATION

N&F: SWS

1 of 2

02/02/26

The contractor shall cooperate and coordinate construction activities with the owners of utilities as stated in subsection 104.08 of the Standard Specifications for Construction. In addition, for the protection of underground utilities, the contractor shall follow the requirements in subsection 107.12 of the Standard Specifications for Construction. Contractor delay claims, resulting from a utility, will be determined based upon subsection 108.08 and 109.05 of the Standard Specifications for Construction.

#### **Description**

The following public utilities have facilities located within the right of way:

#### **Electric:**

DTE Energy  
37849 Interchange  
Farmington Hills , MI 48335  
Contact: Carl Ford (248) 427-3947  
[FordC@dteenergy.com](mailto:FordC@dteenergy.com)

#### **Telephone:**

AT&T  
54 N. Mill Street  
Pontiac, MI 48342  
Contact: Matthew Sliwa (248) 877-0762  
[ms6913@att.com](mailto:ms6913@att.com)

#### **Cable Television:**

WOW Network  
950 E. Whitcomb  
Madison Heights, MI 48071  
Contact: Frank Binaghi (248) 677-9008  
[FBinaghi@wideopenwest.com](mailto:FBinaghi@wideopenwest.com)

#### **Cable Television :**

Comcast  
25626 Telegraph Road  
Southfield, MI 48033  
Contact: Mike Marlow (248) 809-2707  
[Michael\\_Marlow@comcast.com](mailto:Michael_Marlow@comcast.com)

#### **Cable Television:**

WOW Network  
950 E. Whitcomb  
Madison Heights, MI 48071  
Contact: Frank Binaghi (248) 677-9008

#### **Cable Television:**

AT&T  
54 N. Mill Street  
Pontiac, MI 48342  
Contact: Jeff Heath (248)975-4588  
[jh1786@att.com](mailto:jh1786@att.com)

#### **Natural Gas:**

Consumers Energy Groveland Service Center  
14500 Dixie Highway  
Holly, MI 48442  
Contact: Cheri Payne (248) 769-5704  
[Cheri.payne@cmsenergy.com](mailto:Cheri.payne@cmsenergy.com)

#### **Cable Television / Fiber Conduit:**

123 NET  
24700 Northwestern Hwy  
Southfield, MI 48075  
Contact: Amanda Griffith (248) 228-8286  
[agriffith@123.net](mailto:agriffith@123.net)

On all projects: "Three Working Days before you Dig – Call MISS DIG (800)482-7171" or call 811.

Existing service facilities, which are located within grading limits, will be moved or adjusted by the owners to locations or elevations designated by the Engineer. Owners of public utilities will not be required by the City to move additional poles or structures in order to facilitate the operation of construction equipment unless it is determined by the Engineer that such poles or structures constitute a hazard to the public or are dangerous to the Contractor's operations.

The Contractor shall notify and coordinate with the appropriate utility company representative(s) for raising or lowering of existing utility company manhole castings, prior to construction. Said manhole adjustments are as noted on the plans.

CITY OF ROCHESTER HILLS

SPECIAL PROVISION  
FOR  
**PERMIT / PRIVATE UTILITY FEES**

NFE:SWS

1 of 1

01/25/26

**a. Description.** This special provision describes the way the reimbursement, for permit fees or private service provider fee, as stated in section 107 of the Standard Specifications for Construction, and otherwise noted below, will be paid.

**b. Materials.** None specified.

**c. Construction.** None specified.

**d. Measurement and Payment.** Any permit fees required by outside agencies, or direct costs from service providers for associated work required for the project, as described in section 107 of the Standard Specifications for Construction, will be paid for using the following pay item:

<b>Pay Item</b>	<b>Pay Unit</b>
Permit / Private Utility Fees .....	Dollar

**Permit / Private Utility Fees** includes the reimbursement for the eligible permit or service provider fees with supporting receipts or other proof of payment documentation from the Contractor. No markup of fees will be considered for reimbursement.

CITY OF ROCHESTER HILLS  
SPECIAL PROVISION  
ADAMS ROAD TRAFFIC CONTROL

NFE:SWS

1 of 2

01/25/26

**Description:** This work consists of furnishing, installing, maintaining, relocating, and removing all traffic control required for construction operations on Adams Road, including all barricades, channelizing devices, temporary traffic control devices, and construction signage. All traffic control shall be in accordance with the Michigan Manual on Uniform Traffic Control Devices (MMUTCD) and the requirements of the Road Commission for Oakland County (RCOC). The work on Adams Road will be completed in phases and will require movement, adjustment, and updating of traffic control devices and construction signage.

**Materials / Construction:** All barricades, drums, cones, signs, and channelizing devices shall meet MMUTCD and RCOC standards. Construction signing and traffic control layouts shall be in accordance with the approved plans, typical details, and permit requirements. The Contractor shall install, move, modify, and update traffic control devices and signage as required to accommodate phased construction operations. The Contractor shall maintain all traffic control devices in proper position, clean, and in serviceable condition at all times. The Contractor shall be responsible for providing and maintaining safe access for emergency vehicles, local traffic, and adjacent properties at all times. Any damaged, missing, or non-compliant traffic control devices shall be immediately replaced at no additional cost. Any modifications, relocations, or additional traffic control measures required by the Road Commission for Oakland County shall be implemented by the Contractor at no additional cost to the Owner.

**Measurement and Payment:** Payment shall include all labor, materials, equipment, maintenance, relocations, updates, and incidentals required to provide complete traffic control for Adams Road for the duration of the project, including phased construction and any changes required by RCOC.

**Pay Item Pay Unit**

Traffic Control - Adams ..... Lump Sum

CITY OF ROCHESTER HILLS  
SPECIAL PROVISION  
PAVEMENT REMOVALS

NFE:SWS

1 of 1

01/25/26

**Description:** This work consists of removing existing pavement of any type and any thickness in accordance with the Michigan Department of Transportation (MDOT) Standard Specifications for Construction, except as modified herein. Pavement removal includes, but is not limited to, asphalt pavement, concrete pavement, composite pavement, brick pavers, and other pavement types encountered within the project limits.

**Materials / Construction:**

The Contractor shall remove pavement regardless of thickness without additional compensation.

Removal operations shall be performed in a manner that minimizes damage to adjacent pavement, curbs, sidewalks, utilities, and drainage structures.

The Contractor shall properly dispose of or recycle removed pavement materials in accordance with MDOT and applicable local requirements.

Areas disturbed by pavement removal shall be left in a condition suitable for subsequent construction operations.

Saw cutting will not be paid for separately but shall be included in pavement removal item.

**Measurement and Payment:** Payment shall include all labor, materials, equipment, disposal, recycling, protection of adjacent features, and incidentals required to remove pavement of any type and any thickness.

**Pay Item Pay Unit**

Pavt Rem, Modified ..... Square Yard

CITY OF ROCHESTER HILLS

SPECIAL PROVISION  
FOR

**MACHINE GRADING, MODIFIED**

N&F: SWS

1 of 3

1/25/26

**a. Description**

This work shall be done in accordance with the requirements of the Standard Specifications for Construction, section 205, except as described herein and other earthwork technical specifications within the contract:

This work consists of performing machine grading to construct finished subgrades and finished grades in accordance with the plans and these specifications. The work includes rough grading, fine grading, shaping of slopes, embankments, swales, detention features, and preparation of subgrades for pavements, building pads, playground, trails, landscaped areas, and other park improvements.

**b. Materials**

Furnish embankment material in accordance with section 205 of the Standard Specifications for Construction, Earthwork specification or as approved by the Engineer.

Any of the existing material that is excavated and deemed suitable, as determined by the Engineer, may be used for embankment material. The Contractor shall be responsible for the proper disposal of any existing material that is excavated and deemed unsuitable by the Engineer.

**c. Equipment**

If the earthwork contractor intends to utilize GPS machine control, submit machine control system information, including control points, calibration procedures, and verification methods, prior to use. Maintain conventional survey stakes at critical locations as directed by the Engineer for independent verification. Machine control use does not relieve the Contractor of responsibility for meeting grade tolerances.

**d. Construction**

Complete this work in accordance with the standard specifications. The work includes, but is not limited to, the following:

Strip and stockpile all existing topsoil.

Perform rough grading to bring surfaces to within  $\pm 0.3$  feet of required subgrade elevations.

Shape areas to approximate final lines and grades, maintaining drainage toward designated outlets.

Remove unsuitable materials encountered and replace with approved materials as directed by the Engineer.

Scarify subgrade surfaces to a minimum depth of 6 inches prior to compaction.

Adjust moisture content to achieve specified compaction.

Compact subgrades to the following minimum requirements unless otherwise shown on the plans. Rework areas failing to meet compaction requirements.

Fine grade surfaces to the lines and grades shown on the plans.

Provide smooth, uniform transitions free of abrupt changes, depressions, or irregularities between all new pavement edges or transitions to fences or other site features.

Construct slopes, embankments, and detention basin features to the lines and grades shown on the plans. Placement of pond clay liner is also included,

Place embankment material in lifts not exceeding 8 inches loose thickness unless otherwise approved by the Engineer. Compact each lift to the specified density prior to placement of subsequent lifts.

Dress slopes to a smooth, uniform condition suitable for erosion control, seeding, or turf establishment.

Grade all areas to provide positive drainage and prevent ponding as needed and per drawings.

Protect graded areas from damage due to construction traffic, weather, or erosion. Regrade and recompact areas disturbed by subsequent construction activities at no additional cost to the Owner.

All grading within the playground area to allow for concrete and poured in place materials should be included. Grading as needed to establish building pads is included.

Earthwork required to complete the earth mound as detailed on the construction plans shall be included in Machine Grading, Modified.

**e. Measurement and Payment**

The completed work, as described, will be measured and paid for the contract unit price using the following pay items:

<u>Pay Item</u>	<u>Pay Unit</u>
Machine Grading, Modified.....	Lump Sum

The hauling and installation of any off-site material that may be required for embankment will not be

paid for separately but shall be included in the pay item for Machine Grading, Modified.

The Contractor shall be responsible for determining his own volume of earthwork required to construct the project features to the proposed grade elevations specified in the construction drawings. No additional compensation will be made for the final net amount of earth excavation or imported fill required to construct the project.

All pavement, curb and gutter, and sidewalk removals will be paid for separately under applicable pay items. The Contractor will provide labor, materials, and equipment necessary to meet all applicable Michigan Frost Law requirements, which will not be paid for separately, but will be included in other pay items in the contract. Grading required for Adams Road widening will be paid for separately.

CITY OF ROCHESTER HILLS  
SPECIAL PROVISION  
ADAMS ROAD STATION GRADING

NFE:SWS

1 of 1

01/25/26

**Description:** This work shall consist of performing station grading in accordance with the Michigan Department of Transportation (MDOT) Standard Specifications for Construction, as modified herein, for all grading work within Adams Road right-of-way (ROW). Work includes, but is not limited to, earth excavation, embankment, shaping, trimming, restoration, and final grading necessary to complete the work as shown on the plans.

**Materials / Construction:**

All station grading shall conform to the applicable sections of the MDOT Standard Specifications for Construction, except as modified by this special provision. Grading operations shall be coordinated with phased construction and traffic control requirements for Adams Road. The Contractor shall protect existing pavement, curb and gutter, sidewalks, utilities, drainage structures, and other appurtenances within the ROW. Any damage shall be repaired or replaced at no additional cost. Final grading shall match existing and proposed grades and provide positive drainage. Disturbed areas within the ROW shall be restored in accordance with Road Commission for Oakland County (RCOC) requirements and is to include placement of 3” screened topsoil and placement of Class A Hydroseed. Watering is not paid for separately but shall be completed as needed to meet restoration acceptance criteria as noted in Turf and Grasses.

All roadside ditch grading or fill placement shall be included in Station Grading item. Replacement of any disturbed gravel shoulders shall also be included in the item, in accordance with plan details and sections.

Any grading required in drives or road intersections to prepare for aggregate placement / paving shall be included.

**Measurement and Payment:** Payment shall include all labor, materials, equipment, and incidentals required to provide complete grading and restoration work associated with Adams Road widening.

**Pay Item Pay Unit**

Station Grading, Modified ..... Station

CITY OF ROCHESTER HILLS  
SPECIAL PROVISION  
**EARTHMOUND UNDERDRAIN**

NFE:SWS

1 of 1

01/25/26

**Description:** This work consists of furnishing and installing underdrain piping in accordance with the Michigan Department of Transportation (MDOT) Standard Specifications for Construction, as modified herein, for special placement within an earth mound feature to provide pathway and side slope drainage. Work includes all underdrain pipe, geotextile sock liners, backfill, fittings and outlets / associated appurtenances as shown in the construction plan cross sections.

**Materials / Construction:**

Underdrain pipe shall meet MDOT requirements for underdrain systems and shall be of the size, type, and material shown on the plans.

All underdrain pipe shall be provided with a factory-installed geotextile sock liner meeting MDOT specifications.

Backfill and filter material shall meet MDOT requirements and shall be placed and compacted in accordance with the plans and MDOT specifications.

Installation shall follow the earth mound, pathway, per cross sections shown in the plans to ensure proper drainage and performance.

The Contractor shall ensure positive drainage and proper outlet connections as shown on the plans.

Care shall be taken to prevent contamination of the drainage aggregate and geotextile during construction.

**Measurement and Payment:** Payment shall include all labor, materials, equipment, pipe, geotextile sock liner, granular backfill, placement, compaction, and incidentals required to complete the work in accordance with this provision and the plan cross sections.

**Pay Item Pay Unit**

Underdrain, Subbase, 4 inch, Modified.....Foot

**CITY OF ROCHESTER HILLS**  
**SPECIAL PROVISION FOR**  
**MODIFIED AGGREGATE SURFACE COURSE**

NFE : SWS

1 of 1

01/25/26

**Description:** This special provision describes requirements for furnishing and placing Modified Aggregate Surface Course in accordance with the 2020 Standard Specifications for Construction and as modified by plan cross section and herein. This work includes providing a compacted aggregate surface course for use on paths or designated locations as shown on the plans or directed by the Engineer.

**Materials.** Furnish Modified Aggregate Surface Course meeting the requirements of Section 902 and Section 302 of the 2020 Standard Specifications for Construction, except as modified herein. Aggregate shall be a dense-graded, crushed aggregate material capable of providing a stable, well-compacted surface. The material shall be free of organic matter, debris, and other deleterious substances. In addition to the 21AA aggregate, limestone fines meeting the gradation noted on the plans shall be placed for the final 2”.

**Construction:** Place Modified Aggregate Surface Course in accordance with Section 302 of the 2020 Standard Specifications for Construction, except as modified herein.

Prepare the subgrade in accordance with Section 205. Place aggregate in uniform lifts not exceeding 4 inches in loose thickness. Compact each lift to the satisfaction of the Engineer using approved mechanical compaction equipment.

Shape and fine grade the surface course to the lines, grades, and cross sections shown on the plans. The finished surface shall be smooth, firm, and free of ruts, segregation, or loose material. Add water as necessary to achieve proper compaction and surface stability.

Where specified, place 2” of limestone fines to achieve a tight, stable walking or driving surface.

**Measurement and Payment:** Aggregate Surface Course will be measured and paid for in accordance with Section 302 of the 2020 Standard Specifications for Construction and as follows:

<b>Pay Item</b>	<b>Pay Unit</b>
Aggregate Surface Course, 6 inch, Modified .....	Square Yard

Payment for Modified Aggregate Surface Course includes furnishing, hauling, placing, watering, grading, shaping, compacting, and all labor, equipment, and materials necessary to complete the work as specified.

CITY OF ROCHESTER HILLS

SPECIAL PROVISION  
FOR  
**HELICAL PILES**

NFE: SWS

1 of 11

8-02-24

**a. Description.** This work consists of designing, furnishing, installing, and load testing helical piles and bracket assemblies in accordance with the project plans, industry standard design methodology, the standard specifications, and this special provision. Install each helical pile at the location and to the elevation, minimum length, and load capacities shown on the plans.

The following definitions apply when used herein and on the plans:

**Allowable Pile Capacity.** Ultimate pile capacity divided by a factor of safety as designated on the plans. If the factor of safety is not designated on the plans then the factor of safety will be 2.0.

**Alignment Load (AL).** A small load applied to a helical pile during testing to keep the testing equipment correctly positioned.

**Brackets.** Cap plate or other termination device that is bolted, slipped over, or welded to the end of a helical pile after completion of installation, to facilitate attachments to structures or embedment in cast-in-place structures.

**Designer.** A Professional Engineer, licensed in the State of Michigan, who is retained by the Contractor and is responsible for the design and working drawings required herein.

**Elastic Movement.** The recoverable movement measured during a helical pile test.

**Extension Section.** Helical pile section(s), which follow the lead section into the ground and extend the helical lead to the appropriate depth. Extension section(s) consist of a central shaft and may have helical bearing plates affixed to the shaft.

**Helical Pile.** Manufactured steel foundation element with one or more helical bearing plates that is rotated into the ground to support structures. The element consists of a lead or starter section, extension section(s), brackets, and a pile cap.

**Installation Torque.** The resistance generated by a helical pile when installed into soil. The installation resistance is a function of the soil type and the size and shape of the various components of the helical pile.

**Lead Section.** The first section of a helical pile to enter the ground, lead sections consist of a central shaft with a tapered end and one or more helical bearing plates affixed to the shaft.

**Manufacturer.** The individual or legal entity that performs part of the work required through a contract agreement with the Contractor. This includes an individual or legal entity that owns the patent, product trademark, product copyright, or product name for the approved helical pile system.

**Minimum Pile Penetration Elevation.** The elevation shown on the plans to or below which the bottom of piles must be installed.

**Shop Drawings.** A submittal consisting of drawings and calculations related to the design, installation, and load testing of the helical pile system by the Contractor.

**Torque Strength Rating.** The maximum torque energy you can apply to the helical pile foundation during installation in soil, i.e., allowable or safe torque.

**Unsupported Length.** Unsupported shaft lengths shall include the length of the shaft in air, water, or in fluid soils.

**Verification Load Test.** A helical pile load test performed to verify the helical pile ultimate capacity based on the construction methods proposed. Verification load tests are performed on non-production piles, prior to installation of production piles.

**b. Materials.** Unless noted otherwise, it is the responsibility of the Contractor to select the appropriate type and design strength of helical plates, shaft connections, shafts, brackets, and the overall helical pile system to support the load capacities and criteria specified on the project plans. Materials used for helical piles must meet the requirements of ICC-ES AC358. In addition, all helical piles must be manufactured to the following criteria.

1. Central Steel Shaft. The central shaft must consist of high strength structural steel tube, pipe, or solid steel bars meeting the requirements of *ASTM A 36*, *A 252 Grade 3*, *A 500 Grade C*, or *A 576 Grade 1045* or *Grade 1530*.

2. Helix Bearing Plate. Bearing plate material must conform to *ASTM A 572 Grade 50* or *A 1018 Grade 55*.

3. Bolts, Nuts, and Washers. Must meet the material and hot-dip galvanizing requirements of subsection 906.07 of the Michigan Department of Transportation 2020 Standard Specifications for Construction.

4. Brackets. Bracket must conform to *ASTM A 36*, *ASTM A 572 Grade 50*, or *ASTM A 958 Grade SC 1045*. Piles must have U-shape bracket sleeves to mount lateral support beams for joist and deck structure.

5. Couplings. Couplings, if applicable, must conform to *ASTM A 958*.

6. Corrosion Protection. At minimum, all helical piles and hardware must have corrosion protection consisting of hot-dip galvanization in conformance with *ASTM A 153* and *ASTM A 123*, as applicable.

**c. Construction.** Furnish, design, install, and load test the helical piles in accordance with the project plans, this special provision, and the approved shop drawings.

1. Qualifications.

A. Manufacturer. The manufacturer must be a company specializing in the manufacturing and distribution of these products. Manufacturer's qualifications are to be

submitted to the Engineer in accordance with subsection c.2.A of this special provision. The submittal must include:

(1) A product catalog and evidence showing the manufacturer has at least 10 years of experience in the design and manufacture of helical piles.

(2) Current ICC-ES product evaluation report or complete description of product testing and engineering calculations used to assess product capacity.

B. Contractor. The Contractor performing the work described in the contract must be a company specializing in the installation of helical piles. The submittal must include:

(1) Evidence the Contractor has completed training in the proper methods for installation of helical piles and brackets.

(2) Documentation that the Contractor's fulltime onsite supervisor and drillers performing the work have completed at least 10 projects and have 3 years of experience installing similar types of helical piles in similar subsurface conditions to this project. Documentation must, at minimum, include project name, description, dates, number and type of helical piles, project location, and client contact information.

(3) List of installation equipment and detailed description of proposed method of installation.

C. Designer. The design of the helical piles must be done by a licensed design professional specialized in the engineering and design of helical piles. The designer must have the following qualifications:

(1) A Professional Engineer licensed in the State of Michigan.

(2) Documentation indicating the designer has designed at least five projects utilizing helical piles. Documentation must, at minimum, include project name, description, dates, number and type of helical piles, project location, and client contact information.

## 2. Submittals.

A. Qualifications. Submit manufacturer, Contractor, and designer qualifications in accordance to subsections c.1.A, c.1.B, and c.1.C.

Submit to the Engineer three copies of the project reference list and a personnel list at least 30 calendar days before the planned start of helical pile construction. Provide a summary of each individual's experience in the personnel list and be complete enough for the Engineer to determine whether each individual satisfies the required qualifications. The Engineer will approve or reject the Contractor's and manufacturer's qualifications within 15 calendar days after receipt of a complete submission. Additional time required due to incomplete or unacceptable submittals will not be justification for time extension or impact or delay claims. All such costs associated with incomplete or unacceptable submittals are to be borne by the Contractor.

Work is not to be started, nor materials ordered, until the Engineer's written approval of the

Contractor's, manufacturer's and designer's experience and personnel qualifications is given. The Engineer may suspend the work if the Contractor uses non-approved personnel, manufacturer or designer. If work is suspended, the Contractor is fully liable for all resulting costs, and no adjustment in contract time will accrue due to the suspension.

B. Shop Drawings. Prepare and submit to the Engineer shop drawings for the helical piles intended for use on the project at least 30 calendar days prior to start of installation. The shop drawings must include the following:

- (1) Overall plan drawing showing helical pile location, number, and product identification number(s).
- (2) Type and size of steel shaft and helix configuration (number and diameter of helix plates).
- (3) Maximum allowable mechanical compression and tensile strength of the helical piles. Include the Torque Strength Rating.
- (4) Helical piles respective design capacities from the drawings.
- (5) Planned installation depth and cut-off elevation and the number and type of lead and extension sections.
- (6) Designer's recommended allowable pile capacity to installation torque ratio and minimum final installation torque(s) for the helical test pile(s).
- (7) Product identification numbers and designations for all the brackets and number and size of connection bolts or couplers. Details illustrating helical pile attachment to structure relative to grade beam, column pad, pile cap, etc.
- (8) Corrosion protection coating on helical piles and bracket assemblies.

C. Design Calculations. The designer is to prepare and submit detailed design calculations to the Engineer for the helical piles intended for use on the project. Design must be in accordance with the *AASHTO Standard Specifications for Highway Bridges* and other published design methodologies as approved by the Engineer. All submittals must be sealed and stamped by the designer and submitted at least 30 calendar days prior to the start of installation. The analysis must take into account the notes and design details from the plans and must include, but is not limited to, the following items:

- (1) Reduction in the dimensions of the structural elements based on anticipated corrosion loss over the design life for the subsurface and environmental conditions encountered at the project site.
- (2) Ultimate and allowable pile capacities. Consider affects from down drag, buckling, and expansive soils. The ultimate pile capacity shall be as shown on the plans.
- (3) Minimum installation depth to reach bearing stratum and to achieve pullout capacity, if applicable. At a minimum, the top helical pile shall be installed below the frost depth of 42 inches below ground level.

D. Calibration Reports. Submit to the Engineer calibration information certified by an independent testing agency for the torque measurement device. Calibration information must have been tested within 30 days of the start of helical pile installation. Calibration information must include, but is not limited to, the name of the testing agency, identification number or serial number of device calibrated, calibration data, and the date of calibration.

E. Installation Record. Submit to the Engineer a Daily Installation Log during helical pile installation. This log must contain the following information for each helical pile:

- (1) Name of project and Contractor.
- (2) Name of Contractor's supervisor during installation.
- (3) Date and time of installation.
- (4) Name and model of installation equipment and type of torque indicator used.
- (5) Location of helical pile by grid location or assigned identification number.
- (6) Type and configuration of Lead Section with length of shaft and number and size of helical bearing plates.
- (7) Type and configuration of extension sections, with length and number and size of helical bearing plates, if any.
- (8) Installation duration and observations.
- (9) Total length installed.
- (10) Final elevation of top of shaft and cut-off length, if any.
- (11) Final plumbness or inclination of shaft.
- (12) Installation torque at minimum 3-foot depth intervals.
- (13) Final installation torque.
- (14) Comments pertaining to interruptions, obstructions, or other relevant information.

(15) Verified allowable pile axial load capacity.

3. Subsurface Data. Review the available soil boring logs from the subsurface investigation(s). Upon request, a copy of the geotechnical data report outlining the subsurface exploration conducted during the design phase will be provided. If during construction, the Contractor determines the actual subsurface conditions differ substantially from those reported on the boring logs; notify the Engineer in writing within 48 hours of such determination.

The data indicated on the available boring logs are not intended as representation or warranties of continuity of such conditions. It is expressly understood that the Department will not be responsible for interpretations or conclusions drawn therefrom by the Contractor. Additional soil test borings and other exploratory procedures may be performed by the Contractor at no additional cost to the Department.

4. Installation Equipment. The equipment must be capable of applying adequate down pressure (crowd) and torque simultaneously to ensure normal advancement of the helical piles to the ultimate pile capacities and the minimum pile penetration elevation(s) as shown on the plans. The equipment must be capable of continuous position adjustment to maintain proper alignment and position.

A. Torque Motor. Helical piles are to be installed with high torque, low RPM torque motors, which allow the helical plates to advance with minimal soil disturbance. The torque motor must be hydraulically powered with clockwise and counter-clockwise rotation capability. The torque motor must be adjustable with respect to revolutions per minute during installation. Percussion drilling equipment is prohibited. The torque motor must have a minimum torque capacity 15 percent greater than the torsional strength rating of the central steel shaft to be installed for the project. The connection between the torque motor and the installation rig must have no more than two pivot hinges oriented 90 degrees from each other.

B. Drive Tool. The connection between the torque motor and helical pile must be in-line, straight, and rigid, and must consist of a hexagonal, square, or round kelly bar adapter and helical shaft socket. To ensure proper fit, the drive tool must be manufactured by the helical pile manufacturer and used in accordance with the manufacturer's installation instructions.

C. Connection Pins. Attach the central shaft of the helical pile to the drive tool by smooth tapered pins matching the number and diameter of the specified shaft connection bolts. Maintain the connection pins in good condition allowing safe operations at all times. Inspect the pins regularly for wear and deformation. Replace pins with identical pins when worn or damaged.

D. Torque Indicator. Ensure the torque indicator is capable of providing continuous installation torque measurement during installation. Ensure the torque indicator is capable of torque measurements of 500 ft-lbs or less. Calibrate torque indicators that are mounted in-line with the installation tooling either on-site or at an appropriately equipped test facility. Re-calibrate indicators that measure torque as a function of hydraulic pressure following any maintenance performed on the torque motor. Re-calibrate torque indicators if, in the opinion of the Engineer, reasonable doubt exists as to the accuracy of the torque measurements. If recalibration is directed by the Engineer in writing and the calibration is off by less than 500

ft-lbs, the recalibration will be paid for as extra work. Otherwise recalibrations will be paid for by the Contractor at no cost to the Department.

5. Installation Procedures. The helical pile installation technique is to be determined by the Contractor such that it is consistent with the geotechnical, logistical, environmental, and load carrying conditions of the project.

A. Position the lead section at the location depicted on the working drawings. Battered helical piles can be positioned perpendicular to the ground to assist in initial advancement into the soil before the required batter angle is established. The equipment must be capable of continuous position adjustment to maintain proper helical pile alignment. Apply constant axial force (crowd) while rotating helical piles into the ground. Apply sufficient crowd to ensure the helical pile advances into the ground a distance equal to at least 80 percent of the blade pitch per revolution during normal advancement.

B. Advance the helical pile sections into the soil in a smooth, continuous manner at a rate of rotation between 5 RPM's and 40 RPM's. Adjust the rate of rotation and magnitude of down pressure for different soil conditions and depths.

C. Provide extension sections to obtain the required minimum overall length and installation torque as shown on the shop drawings. Use coupling bolt(s) and nuts torqued in accordance to the manufacturer's guidelines to connect sections together.

D. Do not exceed the manufacturer's Torque Strength Rating of the helical pile during installation.

E. The Contractor must adjust the elevation of the top end of the shaft to the elevation shown on the shop drawings or as required. This adjustment may consist of cutting off the top of the shaft and drilling new holes to facilitate installation of brackets to the orientation shown on the shop drawings. Alternatively, installation may continue until the final elevation and orientation of the pre-drilled bolt holes are in alignment. Do not reverse the direction of torque and back-out the helical pile to obtain the final elevation.

F. Install brackets in accordance with helical pile manufacturer's details or as shown on the shop drawings.

G. Ensure all helical pile components, including the shaft and bracket, are isolated from making a direct electrical contact with any concrete reinforcing bars or other non-galvanized metal objects since these contacts may alter corrosion rates.

H. Obstructions. Terminate the installation and remove the pile if the helical pile encounters refusal or is deflected by a subsurface obstruction. Remove the obstruction if feasible, and reinstall the helical pile. Backfill and compact the resulting excavation before reinstalling the pile. Install the helical pile at an adjacent location, subject to review and approval by the Engineer, if the obstruction can't be removed. Removal of such obstructions will be incidental to helical pile installation.

6. Helical Pile Testing. Perform verification testing of helical piles according to *ASTM D 1143*, except as modified herein. Perform the testing under the direction of a Professional Engineer licensed in the State of Michigan. Determine the site specific K factor based on load test results to correlate torque to allowable pile capacity. Summarize the test data in a report to

be sealed by the Professional Engineer. Submit the report to the Engineer within 24 hours of each load test. Notify the Engineer in writing 3 working days prior to any load test. Do not perform load tests without the Engineer being on site to witness the load test.

Do not exceed 80 percent of the following helical pile structural elements during load testing: steel yield in tension, steel yield in compression, and steel buckling in compression. Costs associated with increasing the strength of the verification test pile structural elements above the strength required for production piles will be borne by the Contractor.

A. Testing Equipment and Data Recording. Testing equipment includes, but is not limited to: dial gauges, dial gauge supports, jack and pressure gauges, electronic load cell, reaction piles, and a reaction frame. The load cell is required only for the creep test portion of the verification test. Submit a written description of the load test setup and jack, pressure gauge and load cell calibration reports according to subsection c.2 herein. Design the testing reaction frame to be sufficiently rigid and of adequate dimensions to prevent excessive deformation of the testing equipment. Align the jack, bearing plates stressing anchorage such that unloading and repositioning of the equipment will not be required during the test. Apply the test load with a hydraulic jack and measure the load with a pressure gauge graduated in no more than 50 psi increments or less. Use a jack and gauge with a pressure range not more than twice the anticipated maximum test pressure. Select a jack with ram travel sufficient to allow the test to be performed without repositioning during the test. Monitor the creep test load hold during verification tests with both the pressure gauge and the electronic load cell. Use the load cell to accurately maintain a constant load hold during the creep test load hold increment of the verification test. Measure the pile top movement with a dial gauge capable of measuring to 0.001 inch and a travel sufficient to allow the test to be performed without having to reset the gauge. Align the gauge to be parallel to the axis of the helical pile. Support the gauge independent from the jack, pile or reaction frame. Use a minimum of four dial gauges evenly distributed around the test pile. Record the load test data.

B. Verification Load Testing. Perform a pre-production verification load test to verify the design of the helical pile and the construction methods used to install the helical pile meet specifications. Do not use production piles as reaction piles during load tests. Unless otherwise specified on the plans, install one sacrificial verification test pile per structure. Install verification test piles at locations approved by the Engineer. The verification helical pile must be identical to those used in production and installed using the same methods to be used for installing production piles.

Do not locate reaction piles closer than 5 feet to the verification pile. Reaction piles must meet the approval of the Engineer. Perform verification load tests by incrementally loading the helical pile in compression according to Table 1. Depending on performance, the Engineer will determine whether a 10 minute or a 60 minute creep load hold is appropriate. If the pile top movement measured between 1 and 10 minutes exceeds 0.04 inches, maintain an additional 50 minutes of load hold during the creep test. Record pile top movements during each hold period at time intervals of 1, 2, 3, 4, 5, 6, 10, 20, 30, 50, and 60 minutes. Reset dial gauges to zero after the initial alignment load (AL) is applied. The acceptance criteria for helical pile verification load tests are:

- (1) Failure of the test pile does not occur before the maximum test load is applied. Failure is defined as the lesser of:

(i) The slope of the load versus deflection curve (at the end of the load increment) exceeds 0.025 inch/kip, or

(ii) Where attempts to further increase the test load simply results in continued pile movement.

(2) Test pile supports the allowable pile capacity with not more than 1.00 inch of total vertical movement at the top of the pile from its position prior to testing.

(3) At the end of the creep test load period, a creep rate not greater than 0.04 inch/log cycle time (1 to 10 minutes) and not greater than 0.08 inch/log cycle time (6 to 60 minutes or the last log cycle if held longer) and linear or decreasing creep rate.

The Engineer will provide written approval or rejection of the helical pile design and construction techniques within 7 working days of the completion of the verification load test.

If site conditions vary across the project limits additional load tests may be necessary as determined by the Engineer.

Verification piles constructed using methods different from the methods submitted for production piles will be rejected and additional verification test pile(s) will be required at no additional cost to the Department. If the verification pile fails to meet the acceptance criteria, the Engineer may modify the design of the production piles, or require the Contractor to make modifications to the construction methods, or both. Modifications may include, but not be limited to, modifying the installation methods, or changing the helical pile materials. Any modification to the construction procedure that necessitates changes to the structure requires the Engineer's review and approval.

Do not install production piles until the verification load test results have been reviewed and accepted by the Engineer. At the completion of verification testing, remove testing equipment and remove test piles and reaction piles or cut off piles to an elevation directed by the Engineer.

**Table 1: Verification Load Test Schedule**

Step	Load (a)(b)	Hold Time, minutes	Step	Load (a)(b)	Hold Time, minutes
1	AL	-	19	AL	1
2	0.10 R <sub>n</sub>	3	20	0.10 R <sub>n</sub>	1
3	0.20 R <sub>n</sub>	3	21	0.20 R <sub>n</sub>	1
4	0.30 R <sub>n</sub>	3	22	0.30 R <sub>n</sub>	1
5	AL	1	23	0.40 R <sub>n</sub>	1
6	0.10 R <sub>n</sub>	1	24	0.50 R <sub>n</sub>	1
7	0.20 R <sub>n</sub>	1	25	0.60 R <sub>n</sub>	1
8	0.30 R <sub>n</sub>	1	26	0.70 R <sub>n</sub>	1
9	0.40 R <sub>n</sub>	3	27	0.80 R <sub>n</sub>	3
10	0.50 R <sub>n</sub>	10 or 60 (creep test)	28	0.90 R <sub>n</sub>	3
11	AL	1	29	1.00 R <sub>n</sub>	10
12	0.10 R <sub>n</sub>	1	30	0.75 R <sub>n</sub>	5
13	0.20 R <sub>n</sub>	1	31	0.50 R <sub>n</sub>	5
14	0.30 R <sub>n</sub>	1	32	0.25 R <sub>n</sub>	5

15	0.40 R <sub>n</sub>	1	33	AL	5
16	0.50 R <sub>n</sub>	1			
17	0.60 R <sub>n</sub>	3			
18	0.70 R <sub>n</sub>	3			
a. R <sub>n</sub> denote nominal resistance (ultimate pile capacity). b. AL denotes alignment load. AL is equal to 0.025 R <sub>n</sub> .					

## 7. Production Helical Piles.

### A. Advance production helical piles until all of the following criteria are satisfied:

(1) Allowable pile capacity is verified by achieving the required Installation Torque. The required Installation Torque must be determined from the site specific K factor based on the verification load test results. The required Installation Torque is defined as the average of the last three readings recorded at 1 foot intervals, unless a more stringent specification is noted on the designer's shop drawings. The maximum rotational speed must not exceed 12 RPM when torque is monitored.

(2) Minimum depth as depicted on the plans is obtained.

B. If the manufacturer's Torque Strength Rating of the helical pile is obtained during installation and the minimum pile depth has not been reached, the Contractor and designer must submit revised shop drawings and design calculations for review and approval by the Engineer.

If the Contractor chooses to reinstall a pile in the same location, the topmost helix of the new lead section of the helical pile must be terminated at least 3 feet beyond the terminating depth of the original helical pile.

C. If the final Installation Torque is not achieved at the estimated length shown on the shop drawings, the Contractor has the following options:

(1) Install the helical pile deeper using additional extension sections until the required Installation Torque is obtained.

(2) Remove the helical pile and install a new one with additional and/or larger diameter helical bearing plates. This option may require an additional pile load test to determine the new K factor, as determined by the Engineer. No additional compensation for any additional pile load tests will be provided for in this option.

(3) Submit other options to the Engineer in writing for review and approval.

(4) Additional materials and work necessary to reach the required helical pile capacity, including engineering analysis and redesign, is to be furnished without cost to the Department and without an extension of the completion dates for the project.

D. The helical pile must be sized to reach the allowable pile capacity and the minimum helical pile penetration elevation. No additional compensation for changes in the helical pile will be allowed unless differing site conditions are determined by the Engineer.

## 8. Construction Tolerances.

A. Horizontal Alignment. Ensure the helical pile actual centerlines are within 2 inches of plan centerlines at the plan elevation for the top of the shaft. Tolerances for bracket assembly placement are ±1 inch in both directions perpendicular to the shaft and ±1/4 inch in a direction parallel with the shaft, unless otherwise specified.

B. Plumb. Tolerance for departure from the design orientation angles is ±5 degrees.

C. Top of Pile Elevation. Ensure helical pile is cut off at the design cut-off elevation.

D. Submit a plan for remedial action to the Engineer for approval, for helical piles not constructed within the required tolerances which are considered unacceptable. The Contractor is responsible for correcting all unacceptable piles to the satisfaction of the Engineer. Materials and work necessary to complete corrections for out-of-tolerance helical piles, including engineering analysis and redesign, must be furnished without cost to the Department and without an extension of the completion dates for the project. Do not begin repair operations until receiving the Engineer's approval of the remedial action plan.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

<b>Pay Item</b>	<b>Pay Unit</b>
Helical Pile .....	Foot

**Helical Pile** includes all labor, equipment, fabrication, designing, shop drawings, and materials to install the helical pile as shown on the plans and in this special provision, including any removal of obstructions encountered during installation. Helical Pile will be measured vertically along the pile centerline. Boring logs will be reviewed for final measurements.

**CITY OF ROCHESTER HILLS**

**SPECIAL PROVISION**

**DETENTION POND STANDPIPE AND OVERFLOW ASSEMBLY**

NFE:SWS

1 of 1

01/25/26

**Description:** This special provision describes requirements for furnishing and installing a detention pond standpipe and overflow assembly in accordance with the 2020 Standard Specifications for Construction, construction plans and details and as modified herein. This work includes providing a complete, functional outlet control structure for stormwater detention facilities, including standpipe, overflow weir or pipe, connections, and appurtenances, as shown on the plans or as directed by the Engineer.

**Materials:** Furnish materials in accordance with the 2020 Standard Specifications for Construction, the City of Rochester Hills Drainage Standards and Details, construction plan details and as approved by the Engineer. Materials may include, but are not limited to:

All pipe, fittings, and structures shall be of the sizes, types, and wall thickness shown on the plans. All materials shall be new and free from defects. Galvanized or stainless steel hardware shall be used where exposed to corrosive or submerged conditions.

**Construction:** Construct the detention pond standpipe and overflow assembly in accordance with Sections 401, 402, 403, and 706 of the 2020 Standard Specifications for Construction, the City of Rochester Hills Drainage Standards and Details, and except as modified herein.

Excavate, prepare, and stabilize foundations for structures and piping in accordance with Section 206. Set precast structures or form and place structures true to line and grade. Install standpipes, overflow pipes, and outlet connections in a watertight manner.

Provide watertight joints and connections between pipes and structures. Install other appurtenances as detailed on the plans. Seal all penetrations to prevent leakage and soil migration.

Backfill and compact around structures and pipes in accordance with Section 401 and Section 402. Restore disturbed areas as required.

The completed assembly shall be plumb, secure, and fully functional to control detention pond discharge as designed. The Engineer shall inspect and approve the installation prior to final acceptance.

**Measurement and Payment:** Detention Pond Standpipe and Overflow Assembly will be measured and paid for in accordance with the 2020 Standard Specifications for Construction and as follows:

<b>Pay Item</b>	<b>Pay Unit</b>
Detention Stand Pipe / Overflow .....	Lump Sum

CITY OF ROCHESTER HILLS

SPECIAL PROVISION

MODIFIED SIDEWALKS, CURB RAMPS, AND CONCRETE CURB AND GUTTER

NFE:SWS

1 of 2

01/25/26

**Description:** This special provision describes requirements for furnishing and constructing sidewalks, curb ramps, and concrete curb and gutter in accordance with the 2020 Standard Specifications for Construction, City of Rochester Hills standards and details, construction plans and details, and as modified herein. This work includes all concrete, aggregate base, forming, reinforcement, excavation, site preparation, placement, finishing, curing, and incidental work necessary to construct complete sidewalk, curb ramp, and curb and gutter improvements as shown on the plans or as directed by the Engineer.

Sidewalk work shall also include any areas with monolithic curb and shall include the required underlying aggregate base. Curb ramps shall include East Jordan ductile iron detectable warning plates for ADA compliance and underlying aggregate base. Concrete curb and gutter shall be constructed per details on the construction plans and shall include the underlying base leveling pad per details.

**Materials:** Furnish materials in accordance with the 2020 Standard Specifications for Construction, City of Rochester Hills standards and details, construction plan details, and as approved by the Engineer. Materials shall include, but are not limited to:

- Concrete meeting Section 701
- Aggregate base and leveling pad materials meeting Section 902
- Reinforcing steel, if required, meeting Section 905
- Ductile iron detectable warning plates meeting ADA and City of Rochester Hills requirements
- Form materials meeting Section 703
- Joint materials, curing compounds, and embedded items as shown on the plans

All materials shall be new, free of defects, and of the class, size, and type shown on the plans or directed by the Engineer.

**Construction:** Construct sidewalks, curb ramps, and concrete curb and gutter in accordance with Sections 205, 206, 301, 302, 701, 703, 905, and 803 of the 2020 Standard Specifications for Construction, the City of Rochester Hills standards and details, and except as modified herein.

Perform all required excavation, subgrade preparation, and site preparation necessary to construct the work. Proofroll and prepare subgrade to provide a firm, stable foundation. Furnish and place aggregate base and leveling pad materials to the thicknesses and limits shown on the plans or as directed by the Engineer. Compact base materials to provide uniform support for concrete placement.

Furnish, place, and secure all reinforcing steel where required. Furnish, erect, and remove all forms necessary for construction. Place, consolidate, finish, and cure concrete to produce sound, durable, and properly aligned sidewalk, curb ramp, and curb and gutter elements.

Install curb ramps in compliance with ADA requirements, including proper slopes, grades, and alignment. Install ductile iron detectable warning plates where noted in accordance with the plans, City of Rochester Hills standards, and manufacturer’s recommendations.

Construct monolithic curb and sidewalk sections where shown on the plans as part of the sidewalk work, including all required base, reinforcement, forming, and concrete placement.

Construct the 2’ concrete parking area border, per plan locations and per the detail, included in “Curb and Gutter, Conc, Det F2, Modified”

Construct the required and proposed concrete spillways / rip rap outlets within Adams Road, included in “Curb and Gutter, Conc, Det B2, Modified:

Backfill and compact adjacent areas and restore disturbed areas as required.

**Measurement and Payment:** Modified Sidewalks, Curb Ramps, and Concrete Curb and Gutter will be measured and paid for in accordance with the 2020 Standard Specifications for Construction and as follows:

Pay Item Pay Unit

Sidewalk, Conc, 6 inch, Modified .....	Square Foot
Curb Ramp, Conc, 6 inch, Modified .....	Each
Curb and Gutter, Conc, Det F2, Modified.....	Foot
Curb and Gutter, Conc, Det B2, Modified.....	Foot

Payment for the above items includes furnishing all concrete, aggregate base and leveling pad materials, reinforcing steel, detectable warning plates, forms, excavation, subgrade preparation, placement, finishing, curing, backfilling, compaction, disposal of excess material, and all labor, equipment, and incidentals necessary to complete the work as specified.

CITY OF ROCHESTER HILLS

SPECIAL PROVISION

MODIFIED STORM / SANITARY AND WATER MAIN STRUCTURES

NFE:SWS

1 of 2

01/25/26

**Description:** this work consists of furnishing, constructing, and installing storm and sanitary manholes and water main gate wells, including all proposed structure covers, and constructing low-head storm structures where indicated in the plans. All work shall conform to Michigan Department of Transportation (MDOT) standard specifications, details, and requirements, except as detailed in construction plans or herein.

**Materials:** Manholes: Materials for storm and sanitary manholes shall meet MDOT Type A or B concrete, or precast concrete specifications as applicable. All proposed structure covers, frames, and appurtenances shall meet MDOT standards for strength, durability, and traffic loading and be per City of Rochester Hills standards Covers shall be compatible with the intended structure type (storm, sanitary, water main or low-head storm). For all low-head storm structures, materials shall be selected to allow safe access, proper drainage, and durability consistent with MDOT low-head structure recommendations.

**Construction:** Manholes shall be constructed at the locations and elevations shown in the plans, ensuring proper alignment, grade, and structural integrity. All manholes shall include the proposed covers and frames, installed per City / MDOT standards. Low-head storm structures shall be constructed in accordance with the plans and details provided, with special attention to hydraulic performance, safety, and accessibility.

**Measurement and Payment:** Modified structures will be measured and paid for in accordance with the 2020 Standard Specifications for Construction and as follows:

**Pay Item Pay Unit**

Dr Structure, 48 inch dia, Modified .....	Each
Gate Well, 60 inch dia, Modified .....	Each
Gate Well, 72 inch dia, Modified .....	Each
Sanitary Structure, 48 inch dia, Modified .....	Each

CITY OF ROCHESTER HILLS

SPECIAL PROVISION

PAVEMENT MARKING / SIGNAGE – ADAMS ROAD

NFE:SWS

1 of 1

01/25/26

**Description:** This work consists of furnishing and installing both temporary and permanent pavement markings associated with the phased construction of Adams Road, as well as all new permanent signs proposed within the project limits. Temporary pavement markings shall be provided to maintain traffic control, lane delineation, and safety during construction. Permanent pavement markings and signage shall be installed in accordance with the approved plans. All pavement markings shall conform to Michigan Department of Transportation (MDOT) standards, and all signs shall comply with the Michigan Manual on Uniform Traffic Control Devices (MMUTCD).

**Materials:**

Pavement Markings: Materials shall meet MDOT specifications for durability, retro reflectivity, and color.

Signs: All signs shall be fabricated from materials meeting MMUTCD and MDOT standards, including retroreflective sheeting as required. All signposts shall be per City of Rochester Hills standards and plan details are also included.

**Construction:** Temporary pavement markings shall be installed to maintain safe traffic operations during phased construction of Adams Road and shall be removed or replaced as permanent markings are installed. Permanent pavement markings shall be installed according to the approved plans and MDOT guidelines once construction phases allow. All new permanent signs shall be installed at the locations and heights shown in the approved plans, in compliance with MMUTCD requirements. The Contractor shall verify existing conditions prior to installation to ensure proper placement of all temporary and permanent markings and signs. Any damaged or missing temporary or permanent pavement markings or signs shall be promptly replaced at no additional cost.

**Measurement and Payment:** Measurement for this work will be lump sum. Payment shall include all labor, materials, equipment, and incidentals necessary to furnish and install all pavement markings and signage as described in this provision. Pavement markings or removals will not be paid for separately

**Pay Item Pay Unit**

Pavement Marking / Signage - Adams..... Lump Sum

CITY OF ROCHESTER HILLS

SPECIAL PROVISION

PAVEMENT MARKING / SIGNAGE - PARK

NFE:SWS

1 of 1

01/25/26

**Description:** This work consists of furnishing and installing all pavement markings and all signage within the proposed interior areas of the project, excluding any signage located on Adams Road. All pavement markings shall conform to Michigan Department of Transportation (MDOT) standards, and all signs shall comply with the Michigan Manual on Uniform Traffic Control Devices (MMUTCD).

**Materials:**

Pavement Markings: Materials shall meet MDOT specifications for durability, retro reflectivity, and color.

Signs: All signs shall be fabricated from materials meeting MMUTCD and MDOT standards, including retroreflective sheeting as required. All signposts shall be per City of Rochester Hills standards and plan details are also included.

**Construction:** All pavement markings shall be accurately laid out according to the approved plans and in accordance with MDOT guidelines. Striping shall be white and all ADA markings shall be blue, waterborne paint. Signs shall be installed at locations and heights as specified in the project plans and MMUTCD requirements. The Contractor shall verify existing conditions prior to installation to ensure proper placement. Any damaged pavement markings or signs during construction shall be promptly replaced at no additional cost.

**Measurement and Payment:** Measurement for this work will be lump sum. Payment shall include all labor, materials, equipment, and incidentals necessary to furnish and install all pavement markings and signage as described in this provision.

Pay Item Pay Unit

Pavement Marking / Signage - Park..... Square Foot

CITY OF ROCHESTER HILLS

SPECIAL PROVISION  
FOR  
**4-FOOT ORNAMENTAL FENCE AND GATES**

NFE

1 of 1

02/02/26

**a. Description.** The work consists of installing new ornamental aluminum fencing and gates, where noted on the plans, and in accordance with plan details. Ensure the work is done in accordance with sections 204 and 808 of the Standard Specifications for Construction.

**b. Materials.** Furnish materials in accordance with section 808 of the Standard Specifications for Construction.

**c. Construction.** Ensure the work of installation is done in accordance with the requirements of sections 204 and 808 of the Standard Specifications for Construction and per detail on the plans. Locations for fences and gates are shown on the plans and as directed by Engineer.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<b>Pay Item</b>	<b>Pay Unit</b>
Fence, Ornamental Aluminum, 4-foot high, Modified .....	Foot
Fence Double Gate, 10-foot, for 4-foot high Ornamental Fence, Modified .....	Each

**Fence, Ornamental Aluminum, 4-foot, Modified** includes the installation of chain link fence materials, posts, bars, foundations and all hardware / components as shown on plan details.

**Fence, Chain Link, \_\_ inch, Modified** will be measured in feet along the centerline of the fence.

**Fence Double Gate, 10-foot wide, for 4' ht Ornamental Fence Modified** includes the installation of gate panels, posts, and associated hardware as shown on the plan details.

CITY OF ROCHESTER HILLS

SPECIAL PROVISION  
FOR  
6-FOOT ORNAMENTAL FENCE AND GATES

NFE

1 of 1

02/02/26

**a. Description.** The work consists of installing new ornamental aluminum fencing and gates, where noted on the plans, and in accordance with plan details. Ensure the work is done in accordance with sections 204 and 808 of the Standard Specifications for Construction.

**b. Materials.** Furnish materials in accordance with section 808 of the Standard Specifications for Construction.

**c. Construction.** Ensure the work of installation is done in accordance with the requirements of sections 204 and 808 of the Standard Specifications for Construction and per details on the plans. Locations for fence and gates are shown on the plans and as directed by Engineer. Fencing around dog park shall have post top mounted lights which will be provided as 10' high fence posts approx. 56 feet on center, per the electrical drawings,

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<b>Pay Item</b>	<b>Pay Unit</b>
Fence, Ornamental Aluminum, 6-foot high, Modified .....	Foot
Fence Gate, 5-foot, for 6-foot high Ornamental Fence, Modified .....	Each
Fence Double Gate, 10-foot, for 6-foot high Ornamental Fence, Modified .....	Each

**Fence, Ornamental Aluminum, 6-foot, Modified** includes the installation of 8' wide fence panels, both 6' and 10' high posts, foundations and all hardware / components as shown on plan details. **Fence, Chain Link, \_\_ inch, Modified** will be measured in feet along the centerline of the fence.

**Fence Gate, 5-foot wide, for 6-foot Ornamental Fence Modified** includes the installation of gate panels, posts, and associated hardware as shown on the plan details.

**Fence Double Gate, 10-foot wide, for 6' ht Ornamental Fence Modified** includes the installation of gate panels, posts, and associated hardware as shown on the plan details.

CITY OF ROCHESTER HILLS

SPECIAL PROVISION  
FOR  
**PRESSURE TREATED WOOD BOARDWALK & RAILING**

NFE / SWS

1 of 2

02-02-26

- a. **Description.** This work consists of providing all labor, materials, and equipment necessary to construct the boardwalk as shown on the plans; including all wood, cable railing, hardware, fasteners, hinges, hardware, and related construction materials as called for on the plans. Ensure all work is done in accordance with this special provision and accompanying drawings, Local and State Codes, the Americans with Disabilities Act, and the standard specifications.
- b. **Structural Load Requirements:** 20 psf Pedestrian
- c. **Materials.** Provide materials in accordance with the following:

Miscellaneous Metals .....	908
Hardware.....	908
Structural Timber and Lumber.....	912

1. Lumber. All lumber must be dressed S4S (surfaced four sides) in accordance with *ASTM D 245*. All lumber sizes are nominal. All glulam sizes are net.

- A. Wood Deck: per detail, Southern Pine No. 2, treated.
- B. Wood Joists: per detail, Southern Pine No. 1, treated.
- D. Wood Blocking: per detail, Southern Pine No. 2, treated.
- E. Wood Railing: per detail
- F. Cable Railing: per detail

All exposed edges must be free from splinters and have sharp edges sanded smooth.

2. Hardware. Provide all hardware and accessories required to properly and completely execute the carpentry for this project, including, but not limited to: screws, bolts, nuts, washers, straps, and similar items, whether specifically mentioned herein or not.

A. Fasteners. Regular hexagon-head hot dipped galvanized *ASTM A307* steel bolts, nuts and washers; *ASTM A 123* for bolts and *ASTM A 153* for washers.

B. Screws. Hot dipped galvanized, *ASTM A 653*, batch or post-dipped process, with a minimum coating thickness of 1.85 ounces of Zinc per square foot of surface area (G185), of type and size indicated on the contract plans.

C. Joist Hangers. Hot dipped galvanized, *ASTM A123*. Simpson JB212A 2x12 top flange, G90 joist hanger. Hanger for fastening joists to beams below. Hanger fastens to side of joist, and top of beam.

D. Submittals. Product data conforming to the materials listed above.

**c. Construction.** Furnish and install all materials in accordance with the plans, this special provision and sections 709 and 912 of the Standard Specifications for Construction. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit.

Framing Standard: Comply with *American Wood Council/American Forest & Paper Association (AF&PA's) "Details for Conventional Wood Frame Construction"*.

Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects. Lumber with wane will not be allowed to be used for exposed edges of railing or deck materials. Comply with AWPA M4 for applying a field treatment of copper naphthenate to cut surfaces of preservative-treated lumber. Attach joists by using metal joist tie-downs as indicated on the plans. Install deck boards with annular rings downward. Do not install boards with knot holes or defects that will affect the walking surface.

Install the boardwalk within the construction area with the least amount of disturbance to the wetlands possible.

Field Storage and Handling. If products are stored temporarily at the job site after arrival, wood members must be placed on blocking, well off the ground and be separated by wood blocking so air can circulate around each member. Place water resistance paper over the top but do not use opaque polyethylene.

**d. Measurement and Payment.** The completed work, as described, will be measured along the centerline and paid for at the contract price using the following pay item:

<b>Pay Item</b>	<b>Pay Unit</b>
Pressure Treated Wood Boardwalk & Railing, 6 foot Wide .....	Foot
Pressure Treated Wood Boardwalk & Railing, 10 foot Wide .....	Foot
Pressure Treated Wood Boardwalk & Railing, 16 foot Wide .....	Foot

**Pressure Treated Wood Boardwalk & Railing, 10 foot Wide** includes all miscellaneous metals and hardware to complete the work described herein. Helical piers will be paid for under separate item.

CITY OF ROCHESTER HILLS

SPECIAL PROVISION  
FOR  
**CONCRETE EDGE DETAIL**

1 of 1

02-02-26

**a. Description.** This work consists of installing concrete edge detail in accordance with section 802 of the Standard Specifications for Construction, except as modified by the details on the plans, this special provision and other concrete technical specifications within the contract.

**b. Materials.** Provide materials in accordance with subsection 802.02 of the Standard Specifications for Construction.

**c. Construction.** Construct the concrete curb in accordance with subsection 802.03 of the Standard Specifications for Construction, except as modified by the details on the plans and this special provision.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<b>Pay Item</b>	<b>Pay Unit</b>
Thickened Edge .....	Foot
Turned Down Edge, 12" depth.....	Foot
Turned Down Edge, 15" depth.....	Foot
Turned Down Edge, Per Each 4" Additional Depth .....	Foot
Concrete Play Border (flush), 16" Ht.....	Foot
Concrete Play Border (6" raised), 22" Ht.....	Foot
Concrete Play Border, Per Each 2" Additional Depth.....	Foot
Play Border at Sand Pit .....	Foot

CITY OF ROCHESTER HILLS

SPECIAL PROVISION  
FOR  
**SITE FURNISHINGS**

NFE

1 of 2

02/02/26

**a. Description.** This work consists of furnishing and installing site furnishings including benches, bike racks, trash receptacles, shade structures, and tables, at locations as shown on the plans.

**b. Materials.** Provide the following trailway amenities:

Bike racks with surface mounting. Racks to be Hoop Rack manufactured by Dero Bike Racks, surface mount with black powder coat finish. Hoop rack, manufactured by Dero Bike, a PlayCore Co., or approved equal.

Bench to be 6' surface mount recycled plastic resinwood bench with armrest, manufactured by Belson Outdoors, Model PB6-JAM with PB1178 arm rest, cedar color slats, black arm rest and frame.

Glider Bench to be Winston poly recycled plastic glider bench, as manufactured by A&L Furniture Co, Model AL872, cedar color, or approved equal

Picnic Table to be 6' long galvanized frame table with recycled plastic resinwood slats, as manufactured by Frog Furnishings, Model PB 6CEDGFPIIC, slat color cedar and frame color black.

ADA Picnic Table to be 6' long galvanized frame table with recycled plastic resinwood slats, as manufactured by Frog Furnishings, Model PB 6CEDGFPIICADA, slat color cedar and frame color black.

Trash Receptacle to be 32-gallon round trash receptacle with recycled plastic slats, manufactured by Belson Outdoors, Model No. PB32R.

Hex table to be six-seater, recycled plastic resinwood table with cedar slat color and black frame, as manufactured by Frog Furnishings, Model PB6HEXCED, and four-seater model, with cedar slats and black frame.

Dog park shade structure to be 12'X12' hip roof square shelter, with multi-rib metal roof, as manufactured by Poligon, Model SSH-12, structure color bumper black and roof color buckskin, or approved equal.

Pet waste station, to be Bark Park station w/ bags and can, as distributed by Parks+Docks Supply Co., Model PBARK-490, color green, or approved equal.

Dual Dog Wash Station, to be 32" high, Dual Dog Wash Station, as manufactured by Dog-On-It-Parks, Model No. 7220, color EG-08, Onyx Black.

Drinking Fountain, to be Bottle Filler with Barrier Free Fountain and Pet Bowl, as manufacturer by Dog-On-It-Parks, Model No. 7219, color EG-08, Black Onyx.

Flagpole to be 40' high aluminum, internal halyard, ground set and 8'x12' flag, Sentry Flagpole, as manufactured by American Flagpole and Flag Co., or approved equal.

The materials and workmanship must be in accordance with sections 901, 902, 903, and division 10 of the Standard Specifications for Construction.

**c. Construction.** Coordinate this work with the Engineer before construction to establish locations and review proposed installation methods. Install items listed above, in locations shown on the plans or field located with the Engineer, according to the manufacturer's specifications and recommendations.

**d. Measurement and Payment.** The completed work, as described, including all installation, preparation, and necessary hardware, will be measured and paid for at the contract unit price using the following pay items:

<b>Pay Item</b>	<b>Pay Unit</b>
Bike Rack .....	Each
Bench, 6' .....	Each
Glider Bench.....	Each
Picnic Table.....	Each
ADA Picnic Table .....	Each
Trash Receptacle .....	Each
Hex Table, six-seater.....	Each
Hex Table, four-seater.....	Each
Dog Park Shade Structure.....	Each
Pet Waste Station.....	Each
Dual Dog Wash Station .....	Each
Drinking Fountain .....	Each
Flagpole .....	Each

## **SPECIAL PROVISION FOR STONE WORK**

NFE/GO

1 of 1

02/02/26

### **DESCRIPTION**

- a. This work consists of providing all labor, materials, and equipment necessary to install the stone work in locations indicated on the plans; including, bioswales, waterfall feature, dry creek, playground, and elsewhere as indicated on drawings. Ensure all work is done in accordance with this special provision and accompanying drawings, Local and State Codes, and the standard specifications.

### **MATERIALS**

Provide the following stone materials:

- a. General Site Stonework

This item includes the placement of 12" depth, 4-8" diameter glacial cobblestone matrix accent boulders 12-36" in bioswales, 2-6" diameter, 4" depth river rock mulch and 2" peastone bedding layer for waterfall feature, accent boulders ranging in size from 1-2', 2-3', 3-4' and 4-5' diameters for the dry creek feature and waterfall, and flat boulders or slate for waterfall.

Basis of Design Manufacturer:

Rock Shoppe  
6275 Gotfredson Rd  
Plymouth, MI 48170  
Ph. No.: (734) 455-3923  
<https://www.rock-shoppe.com/contact-us.html>

- b. Playground Stonework

This item includes the placement of quarried stone and fieldstone boulders within the playground area, as specified and shown on plan. This includes:

"Boulder Cave" Boulders  
Cut Stone Seat  
Boulders/Fieldstone Boulders  
Outcrop Stone  
Stone Steps

**CONSTRUCTION**

Native Michigan river rock, boulders and stone shall be washed and free of dirt and other construction debris. River rock mulch shall be placed as indicated on the landscape plans. Rock shall be dry-stacked and hand-placed for a natural appearance. Contractor to meet with Landscape Architect prior to beginning construction for direction.

**MEASUREMENT AND PAYMENT**

The completed work as measured for Stonework will be paid for at the contract unit prices for the following contract pay items and includes all material, equipment and labor to complete these items.

<b><u>PAY ITEM</u></b>	<b><u>PAY UNIT</u></b>
Glacial Cobblestone	TON
River Rock Mulch	TON
Peastone Bedding Layer	TON
1'-2' Dia Granite Boulders	TON
2'-3' Dia Granite Boulders	TON
3'-4' Dia Granite Boulders	TON
4'-5' Dia Granite Boulders	TON
Flat Boulders or Slate	TON
<u>In Play Area:</u>	
"Boulder Cave" Boulders	TON
Cut Stone Seat Stone	TON
Outcrop Stone	TON
Stone Steps	TON
Boulders/Fieldstone Boulders	TON

**SPECIAL PROVISION  
FOR  
GLOW AGGREGATE PAVING DETAIL**

NFE/GO

1 of 1

02-02-26

**DESCRIPTION**

The work of this section shall consist of the construction of glow aggregate sidewalks details. This work shall include the provision of all labor, materials, equipment, and supervision required, including excavation, bedding, forming, pouring and finishing, plus other incidental work necessary to complete the work.

**CONSTRUCTION**

The item includes the installation of a 4" wide band, and one of three designs; dog paw print (dog park entry); City Logo Bebb Oak (community bldg.); and butterfly (playground) located inside a 7' diameter circle. The image and banding shall be concrete pavement with exposed glowing aggregate. All concrete paving shall be 6" depth, as specified in the civil engineering drawings. A full scale mock up pattern of the images shall be approved by the Owner's representative prior to the placement of any concrete. Glow stone aggregate shall be seeded at a rate by manufacturer to provide high definition glow effect, after concrete is placed, worked so they are just covered by the concrete. Retarder (Preco EAC-S or equal) shall be sprayed and the concrete allowed to cure. Pressure wash the concrete to remove any residue covering the concrete. Apply a light acid wash to fully expose the glow aggregate to the surface.

**MEASUREMENT AND PAYMENT**

The completed work as measured for Glow Aggregate Sidewalk Details will be paid for at the contract unit price for the following contract pay items and includes all material, equipment and labor to complete this item.

**PAY ITEM**

**PAY UNIT**

Glow Aggregate Paving Detail

Each

**CITY OF ROCHESTER HILLS  
SPECIAL PROVISION  
FOR  
DRY CREEK**

NFE/GO

1 of 1

02/02/26

**DESCRIPTION**

- a. This work consists of providing all labor, materials, and equipment necessary to install the dry creek feature as shown on the plans; including, stone placement, accent boulders, plant material, drain and outlet pipe, and finish grading. Ensure all work is done in accordance with this special provision and accompanying drawings, Local and State Codes, and the standard specifications.

**CONSTRUCTION**

This item includes the furnishing and installation of materials as identified on the landscape drawings, necessary to construct the dry creek feature.

**MATERIALS**

All materials specified shall be as specified and detailed in civil engineering and landscape plan drawings.

**MEASUREMENT AND PAYMENT**

Measurement shall be as indicated for each item. The costs associated with fully constructing the dry creek shall be included in the unit price bid for each item. Stonework and plantings shall be included as a part of this work but paid for separately under the Stone work, and Nursery Stock provisions. Refer to drawings for all locations, and supplemental information.

**PAY ITEM**

**PAY UNIT**

Dry Creek

LS

**CITY OF ROCHESTER HILLS  
SPECIAL PROVISION  
FOR  
ENTRY STRUCTURES**

NFE/GO

1 of 1

02/02/26

**DESCRIPTION**

- a. This work consists of providing all labor, materials, and equipment necessary to install the entry structures at the dog park and playground as shown on the plans; including, foundations, masonry work, timbers, steel and/or wood laminated beams and ancillary materials. Ensure all work is done in accordance with this special provision and accompanying drawings, Local and State Codes, and the standard specifications.

**CONSTRUCTION**

This item includes the furnishing and installation of materials as identified on the landscape drawings, necessary to construct the entry structures at the dog park and the playground.

**MATERIALS**

All materials specified shall be as specified and detailed in civil engineering and landscape plan drawings.

**MEASUREMENT AND PAYMENT**

Measurement shall be as indicated as a lump sum for the construction of each structure. The costs associated with fully constructing a complete, structurally-sound entryway shall be included in the price bid for the item.

**PAY ITEM**

**PAY UNIT**

Dog Park Entry Structure  
Playground Entry Structure

Lump Sum  
Lump Sum

**CITY OF ROCHESTER HILLS  
SPECIAL PROVISION  
FOR  
HAMMOCK GROVE**

NFE/GO

1 of 1

02/02/26

**DESCRIPTION**

- a. This work consists of providing all labor, materials, and equipment necessary to install the hammock grove which consists of three separate structures of three timbers around a central taller timber, as shown on the plans; including, black locust timbers, foundations, hardware, sealers and finishes Ensure all work is done in accordance with this special provision and accompanying drawings, Local and State Codes, and the standard specifications.

**CONSTRUCTION**

This item includes the furnishing and installation of materials as identified on the landscape drawings, necessary to construct the hammock grove.

**MATERIALS**

All materials specified shall be as specified and detailed in civil engineering and landscape plan drawings.

**MEASUREMENT AND PAYMENT**

Measurement shall be as indicated as a lump sum for the construction of each hammock structure. The costs associated with fully constructing a complete, structurally sound hammock grove shall be included in the price bid for the pay item.

**PAY ITEM**

**PAY UNIT**

Hammock Grove

Lump Sum

Future hammock materials to be provided by others.

**CITY OF ROCHESTER HILLS  
SPECIAL PROVISION  
FOR  
NURSERY STOCK**

NFE/GO

1 of 1

02/02/26

**DESCRIPTION**

- a. This work consists of providing all labor, materials, and equipment necessary to install the plant material as shown on the plans, including, trees, shrubs, perennials, groundcovers and plugs. Ensure all work is done in accordance with this special provision and accompanying drawings, Local and State Codes, and the standard specifications.

**CONSTRUCTION**

This item includes the furnishing and installation of plant material as identified on the landscape drawings.

**MATERIALS**

All materials specified shall be as specified and detailed in the landscape plan drawing. The plant material sizes and cultivars will consist of the following variations:

**MEASUREMENT AND PAYMENT**

Measurement shall be as indicated for each plant species. The cost associated with wrapping, bracing, mulching, staking, fertilizing, and watering shall be included in the unit price bid for each item - planting trees, shrubs, perennials, and plugs. Refer to planting schedule for additional information pertaining to each plant species.

**PAY ITEM**

**Trees and Shrubs**

Acer saccharum 'Green Mountain, 3 inch  
Aesculus flava, 2 inch  
Amelanchier laevis, 3 inch  
Betula nigra, 10-12 foot  
Carpinus caroliniana, 3 inch  
Carya ovata, 2 inch  
Celtis occidentalis, 3 inch  
Cercis canadensis 2 inch  
Cercis canadensis 7-8 foot (clump)  
Cladrastis kentukea, 2 inch  
Gleditsia triacanthos 'Shademaster', 3 inch  
Liriodendron tulipifera Tuliptree, 3 inch

**PAY UNIT**

Each  
Each

Nyssa sylvatica 'Green Gable', 3 inch	Each
Ostrya virginiana, 2.5 inch	Each
Quercus alba, 2 inch	Each
Quercus bicolor 3 inch	Each
Quercus coccinea, 3 inch	Each
Quercus macrocarpa, 3 inch	Each
Quercus x bebbiana, 3 inch	Each
Ulmus davidiana var japonica 'Morton', 3 inch	Each
Abies balsamea, 8-10 foot	Each
Picea abies 'Cuppressina', 10 foot	Each
Picea glauca 'Densata', 8-10 foot	Each
Picea glauca, 8-10 foot	Each
Pinus strobus, 8-10 foot	Each
Tsuga canadensis, 8-10 foot	Each
Taxodium distichum 'Shawnee Brave', 8-10 foot	Each
Amsonia h. 'Halfway to Arkansas', 2 gal.	Each
Amsonia 'Blue Ice', 2 gal.	Each
Amsonia tabernaemontana, 2 gal.	Each
Baptisia australis, 2 gal.	Each
Cephanthus occidentalis, 24 inch ht	Each
Ceanothus americanus, 2 gal.	Each
Conrus sericea 'Arctic Fire', 2 gal.	Each
Cornus sericea 'Baileyii', 30 inch ht	Each
Conrus sericea 'Kelseyii', 30 inch ht	Each
Diervilla x 'Kodiak Orange', 2 gal.	Each
Hammamelis x i. 'Arnold's Promise', 3-4 foot	Each
Hydragea quercifolia, 36 inch ht	Each
Itea virginica 'Scentlania', 2 gal.	Each
Microbiota decussata, 24 inch ht	Each
Myrica pennsylvanica, 30 inch ht	Each
Rhus aromatica 'Grow Low', 2 gal.	Each
Sambucus canadensis, 30 inch ht	Each
Thuja occidentalis 'Nigra', 5 foot ht	Each
Viburnum rhytidophyllum 'Allgheny', 3-4 foot ht	Each

<b>Groundcovers, Perennials and Grasses</b>	Each
Allium 'Summer Beauty', 1 gal.	Each
Andropogon gerardii 'Blackhawks', 2 gal.	Each
Asclepias incarnata 'Cinderella', 2 gal.	Each
Asclepias tuberosa, 2 gal.	Each
Calamagrostis a. 'Karl Foerster', 2 gal.	Each
Calamagrostis brachytricha, 1 gal.	Each
Calamintha nepeta 'Montrose White', 1 gal.	Each
Carex oshimensis 'Everest', 1 gal.	Each
Dechampsia cespitosa 'Goldtau', 1 gal.	Each
Deutzia gracilis 'Nikko', 2 gal.	Each
Echinacea purpurea 'Cheyenne Spirit', 1 gal.	Each
Eupatorium 'Phantom', 3 gal.	Each
Geranium maculatum, 2 gal.	Each
Hemerocallis 'Stella D'Oro', 2 gal.	Each
Lavandula x I 'Violet Intrigue', 2 gal.	Each

Liriope muscari 'Big Blue', 1 gal.	Each
Nepeta faasennii 'Junior Walker', 2 gal.	Each
Panicum virgatum 'Northwind', 2 gal.	Each
Panicum virgatum 'Cape Breeze', 1 gal.	Each
Pennisetum orientale 'Karley Rose', 1 gal.	Each
Penstemon 'Dark Towers', 2 gal.	Each
Perovskia atriplicifolium 'Longin', 3 gal.	Each
Rudbeckia 'American Gold Rush', 2 gal.	Each
Sporobolus heterolepis, 2 gal.	Each
<b>Native Plugs</b>	Each
Acorus americanus, 2-1/4 inch plug	Each
Pontederia cordata, 2-1/4 inch plug	Each
Myrica gale, 2-1/4 inch plug	Each
Carex strictus, 2-1/4 inch plug	Each
Iris versicolor, 2-1/4 inch plug	Each
Iris virginica, 2-1/4 inch plug	Each
Sparganium eurycarpum, 2-1/4 inch plug	Each
Lobelia cardinalis, 2-1/4 inch plug	Each
Eupatorium perfoliatum, 2-1/4 inch plug	Each
Polygatum amphibium, 2-1/4 inch plug	Each

**CITY OF ROCHESTER HILLS  
SPECIAL PROVISION  
FOR  
WATERFALL**

NFE/GO

1 of 1

02/02/26

**DESCRIPTION**

This work consists of providing all labor, materials, and equipment necessary to install the waterfall feature as shown on the plans, including, stone placement, plant materials, submersible pump, electrical connections and water supply lines, EPDM liner and underlayment. Ensure all work is done in accordance with this special provision and accompanying drawings, Local and State Codes, and the standard specifications. Includes 45 mil EPDM liner, 4,000 GPH submersible pump and vault; 2" flexible PVC pipe; and waterproof Light Sensor Outdoor Timer

**CONSTRUCTION**

This item includes the furnishing and installation of materials as identified on the landscape drawings, necessary to construct the waterfall feature. The plans indicate intent images on the drawings, allowing the contractor creative flexibility with the design.

**MATERIALS**

All materials specified shall be as specified and detailed in civil engineering and landscape plan drawings. Where the contractor creatively alters the waterfall design, pump size and capacity shall be verified.

**MEASUREMENT AND PAYMENT**

Measurement shall be as indicated for each item. The costs associated with fully constructing a water-tight water feature with moderate flow, shall be included in the unit price bid for each item. Stonework and plantings shall be included as a part of this work but paid for separately under the Stone work, and Nursery Stock provisions. Refer to drawings for all locations, and supplemental information.

**PAY ITEM**

**PAY UNIT**

Waterfall

LS

CITY OF ROCHESTER HILLS

SPECIAL PROVISION

SITE ELECTRICAL INFRASTRUCTURE (LIGHTING AND FACILITY POWER)

NFE:SWS

1 of 3

01/25/26

**Description:** This work shall consist of furnishing and installing complete site electrical infrastructure, including service equipment, underground and aboveground raceways, conductors, site lighting, facility power distribution, and all appurtenant equipment, in accordance with the plans, standard specifications, and this Special Provision.

Work includes all labor, permitting, materials, equipment, testing, coordination, and incidentals necessary to provide a complete, operational electrical system for site lighting and facility power needs.

**Materials:** Materials shall conform to the current National Electrical Code (NEC), applicable utility company requirements, and all governing codes and standards.

Materials shall include, but are not limited to:

- Conduit (PVC Schedule 40/80, rigid galvanized steel, or HDPE as shown on the plans)
- Conductors (copper type and size as shown on the plans)
- Pull boxes, handholes, and junction boxes
- Electrical service equipment, meters, and disconnects
- Panelboards, breakers, and distribution equipment
- Site lighting fixtures, poles, bases, arms, and foundations
- Grounding and bonding systems
- Controls, photocells, timers, and lighting contactors
- Transformers (if required)
- Warning tape and identification markings

All equipment shall be new, listed, and labeled by a nationally recognized testing laboratory.

**Construction:**

**General**

Perform all electrical work in accordance with NEC, utility provider standards, and applicable federal, state, and local codes. Coordinate all work with the serving utility company and other trades.

Provide a complete and operational system, including all terminations, connections, grounding, labeling, and testing.

### **Electrical Service and Distribution**

Install electrical service, service equipment, meters, disconnects, and distribution panels as shown on the plans and as required by the serving utility. Provide all conduits, conductors, pull boxes, and appurtenances necessary to distribute power to site facilities and equipment.

Provide spare capacity in conduits and panels were indicated on the plans or specified in the contract documents.

### **Underground Conduit / Conductors**

Install underground conduits at the locations and depths shown on the plans or as required by code. Minimum cover shall comply with NEC requirements unless otherwise shown.

Provide warning tape above underground electrical conduits. All underground splices shall be made in approved, accessible handholes or pull boxes.

### **Site Lighting**

Furnish and install site lighting systems including poles, foundations, fixtures, arms, wiring, grounding, and controls as shown on the plans. Lighting fixtures shall be LED type unless otherwise specified.

Provide aiming, adjustment, and final positioning of fixtures to achieve required illumination levels and minimize glare and light trespass.

### **Facility Power**

Provide electrical power to site buildings, pumps, kiosks, and other facilities as shown on the plans. Work includes feeders, branch circuits, disconnects, receptacles, and equipment connections necessary to provide complete and functional power systems.

### **Grounding and Bonding**

Provide grounding and bonding in accordance with NEC requirements. Ground all electrical equipment, metallic raceways, lighting poles, and service equipment. Provide ground rods, grounding conductors, and bonding jumpers as required.

### **Testing and Commissioning**

Test all electrical systems prior to acceptance. Testing shall include continuity, insulation resistance as applicable, and operational testing of lighting controls and equipment.

Demonstrate proper operation of site lighting, facility power systems, and controls to the Engineer.

**Measurement and Payment:** Modified structures will be measured and paid for in accordance with the 2020 Standard Specifications for Construction and as follows:

**Pay Item Pay Unit**

LED Light Pole, Modified .....	Each
DB Cable, #4 AWG, Modified .....	Foot
DB Cable, #4 AWG, Modified.....	Foot
DB Cable, #4 AWG, Modified.....	Foot
DB Cable, #4 AWG, Modified.....	Foot
Conduit, 3/4" to 1", Modified.....	Foot
20A WP GFCI Receptacle.....	Each

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**H BRACKETS**

BFS:JJG

1 of 1

APPR:MWB:AJU:12-08-23  
FHWA:APPR:12-12-23

**Delete subsection 810.04.N, on page 8-58 of the Standard Specifications for Construction, in its entirety and replace with the following:**

- N. **H Bracket.** Provide and install H brackets in accordance with MDOT's Sign Support Standard Plans SIGN 740 series, or as directed by the Engineer.

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**STEEL STRAIN POLE**

SIG:EMS

1 of 3

APPR:MJF:REL:06-20-24  
FHWA:APPR:06-21-24

**a. Description.** This work consists of furnishing, fabricating, and erecting a traffic signal steel strain pole as shown on the plans, in accordance with the standard specifications, and as specified herein. This special provision is for an anchor base type (six anchor bolt system) strain pole and includes all other associated hardware required to complete the work.

**b. Material.** Furnish material in accordance with sections 906, 908 (as modified by 20SP-908A - Miscellaneous Metal Products Revisions), and 921 of the Standard Specifications for Construction and this special provision.

Material specifications for the strain pole are included in Table 1.

**Table 1: Material Specifications**

Component	Specification
Pole Tube	<i>ASTM A572/A572M, Grade 50, ASTM A572/A572M, Grade 65 or ASTM A595/A595M, Grade A</i>
Base Plate	<i>ASTM A36/A36M</i>
Bottom Steel Template	<i>ASTM A36/A36M</i>
Hand Hole Frame	<i>ASTM A705/A705M, ASTM A572/A572M, Grade 50 or ASTM A572/A572M, Grade 65</i>
Hand Hole Cover	<i>ASTM A1011/A1011M Grade 36</i>
Stainless Steel Hardware	<i>AISI 300 SERIES (18-8)</i>
"ANCO" Lock Nuts or Equivalent	<i>ASTM A563/A563M GR DH</i>
Flat Washers	<i>ASTM F436/F436M</i>

Ensure bolts, nuts, and washers meet subsection 906.07 of the Standard Specifications for Construction.

Blast clean fabricated components with a nominal thickness greater than 1/2 inch to remove mill scale and welding slab before galvanizing. For components with a nominal thickness of 1/2 inch or less, blast cleaning can be waived if the galvanizer inspects the material and provides a written statement to the fabricator that blast cleaning is not required. Otherwise blast cleaning is required.

Acceptance of strain pole is based on general certification in accordance with the *MQAP Manual*.

**c. Strength Requirements.** Furnish a strain pole capable of withstanding combined shear force and moment as specified in Table 2 applied at the base of the pole without exceeding the elastic limit. A strain pole connected to a tie-off span is a pole in which any of the connecting span or tether wires connects to a tie-off. Ensure that the deflection of the pole does not exceed

0.40 inch per 100 pounds of transverse load applied at the same point.

**Table 2: Loads for Strength Requirements**

Pole Height	Strain Pole Not Connected to Tie-off Span		Strain Pole Connected to Tie-off Span	
	Shear	Moment	Shear	Moment
30 feet	23.8 kips	521 kip-ft	26.5 kips	542 kip-ft
36 feet	25.5 kips	679 kip-ft	29.7 kips	730 kip-ft
40 feet	26.1 kips	790 kip-ft	30.3 kips	858 kip-ft

**d. Fabrication.** Fabricate and weld in accordance with section 707 of the Standard Specifications for Construction, except as modified herein.

Ensure the strain pole is hot-dip galvanized in accordance with subsection 716.03.B.4 of the Standard Specifications for Construction. If strain poles are required to have a duplex coating, ensure the coating is in accordance with 20SP-716A - Coating of Galvanized Lighting, Signal, Sign, and Miscellaneous Support Structures.

Submit shop drawings in accordance with subsection 707.03.A of the Standard Specifications for Construction.

Perform NDT of welds in accordance with subsection 707.03.D.12 of the Standard Specifications for Construction except ensure MT inspection frequency of fillet welds is increased to 25 percent. Fillet welds used to secure the strain pole cap do not require MT.

1. Base plate warpage must not exceed 1/16 inches per foot.
2. Tolerance for overall length of strain pole is -1/8 inch to +3 inch. Tolerance for sweep and camber of strain pole 1/8 inch per 10 foot. Tolerance for twist of strain pole is  $\pm 10$  degrees.
3. Strain pole wall must be single-ply.
4. Strain pole must be round or 12-sided.
5. Strain poles cannot have more than two longitudinal welds. Transverse welds are prohibited.
6. Provide a hand hole opening and cover. Weld a reinforcing frame to the pole for the hand hole opening. Ensure the placement of the hand hole does not reduce the strength of the pole. Securely fasten the handhole cover using stainless steel hex head cap screws or by an approved locking device.
7. Longitudinal seam welds must have 60 percent minimum penetration or fusion except full penetration groove welds are required for a minimum of 6 inches from tube to baseplate.

**e. Erection.** Ensure anchor bolts are pretensioned using the Turn-of-Nut (TON) method in accordance with subsection 810.03.N.2 of the Standard Specifications for Construction (as modified by 20SP-810H - Permanent Traffic Signs and Supports Revisions).

Furnish the Engineer 5 work days notification prior to the start of installation so they may witness or monitor the Contractor's activities.

**f. Construction.** Ensure all work is in accordance with subsection 810.03 and sections 818 and 820 of the Standard Specifications for Construction and the contract.

Perform repairs to galvanized surfaces in accordance with subsection 716.03.E of the Standard Specifications for Construction.

**g. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<b>Pay Item</b>	<b>Pay Unit</b>
Strain Pole, Steel, 6 bolt, Size __ .....	Each

**Strain Pole, Steel, 6 bolt, Size \_\_** includes furnishing all materials, fabrication, shop cleaning, galvanizing, shipping, and erection.

No extension of time or additional compensation will be granted due to obtaining the proper *AISC* certifications and/or endorsements required for this project.

Construction of the foundation will be included in other items.

MICHIGAN  
DEPARTMENT OF TRANSPORTATION  
  
SPECIAL PROVISION  
FOR  
**ACCESSIBLE PEDESTRIAN SIGNAL SYSTEM**

SIG:EMS

1 of 6

APPR:DJA:NJB:06-11-24  
FHWA:APPR:06-17-24

**a. Description.** This work consists of either furnishing and installing an accessible pedestrian signal system and push button station(s) or removing a system and push button station(s) at locations as shown on the plans.

The following terminology is used in this special provision.

1. Accessible pedestrian signal system, or system hereafter, refers to central control unit (CCU) and multiple push button stations.

2. CCU, refers to the unit installed in an existing traffic signal controller cabinet, frame, and all required mounting hardware and the configurator. The CCU is the power supply and signaling interface, between the intersection traffic signal controller and the push button stations. Configurator refers to a handheld, password secure, infrared device capable of setting and resetting all push button stations on the intersection from a single push button station (global updating). Each CCU will control multiple push button stations. A complete system includes one CCU.

3. Push button station (PBS), refers to a Public Rights-of-Way Accessibility Guidelines (PROWAG) compliant push button station including signs when specified, installed at crosswalk termini, and all required mounting hardware. A system can include 2 to 12 PBS (maximum of 3 per phase).

**b. Materials.** Furnish an accessible pedestrian signal system including CCU and PBS meeting the requirements of this subsection. Furnish all hardware and other appurtenant materials in accordance with sections 918 and 921 of the Standard Specifications for Construction and this special provision.

1. Accessible Pedestrian Signal System.

A. Furnish an accessible pedestrian signal system from the following list.

(1) Polara Navigator.

(2) Approved equal (AE). Ensure the AE is evaluated, tested, and approved per the MDOT New Traffic Signal Device Product Review Guidelines. The review time is not justification to delay the project.

2. The system must:

A. Furnish various audible features including but not limited to locator tones. All

locator tones must emanate from push button stations and be synchronized;

B. Have multiple language capability, selectable by user, and able to play an emergency preemption message;

C. Be able to self-test and report any faults to the traffic controller;

D. Furnish the following audible feature, each with a minimum and maximum volume independently settable using the configurator:

(1) One locating tone;

(2) Five walk sound choices (field selectable);

(3) Three pedestrian - clearance sound choices (field selectable) ensuring one of which is an audible countdown;

(4) Direction of travel (as standard feature with extended push); and

(5) Information message (custom feature with extended push).

E. Automatically adjust audible features to ambient noise levels over a 60 decibel (dB) range; and

F. Mute sounds on all crosswalks except the activated crosswalk (selectable feature).

3. The CCU must meet the following requirements:

A. Be compatible with solid-state pre-timed or actuated traffic signal control equipment and cabinet environments;

B. Be capable of controlling up to and including 12 PBSs and controlling up to and including 4 pedestrian phases;

C. Receive timing from the walk and don't walk signals;

D. Have additional advanced configurations available by using general purpose inputs and outputs;

E. Ensure full optical isolation of all inputs and outputs and include transient voltage protection as follows:

(1) General Purpose Inputs. 10 to 36 VAC/VDC peak with a 10 milli Ampere (mA) maximum.

(2) General Purpose Outputs and Pedestrian Outputs. 36 VAC/VDC peak, 0.3 Ampere (A) solid state fused contact closure.

(3) Fault Output. Normally open and closed relay contacts, 125 VAC/VDC, 1 A maximum.

(4) Pedestrian Hand/Walking Person (Walk/Don't Walk) Inputs. 80-150 VAC/VDC, 5 mA maximum.

(5) A, B, C, D PBS Power Outputs. Nominal 22 VDC, short circuit protected, auto recovering.

(6) Environment Operation and Storage Range. -30 °F to 165 °F (-35 °C to 74 °C), 0 to 100 percent Humidity, Non-condensing.

(7) Line Power. 25 Watt (W) to 75 W typical, 120 W peak with 8 PBSs.

F. Include a 50-pin connector and cable that plugs into the CCU for termination to the traffic signal controller terminal facilities. Ensure the connector is a Positronic MD50F20Z0X or equivalent, provided with 20-24 gauge wire, which complies with the requirements of *UL 1061*.

4. The PBS must meet the following requirements:

A. Design each PBS in accordance with the following:

(1) Produce sounds emanating from the back of the unit via an 8 ohms 15 W, weather-proof speaker protected by a vandal resistant screen;

(2) Require only two wires coming from the traffic control cabinet for each phase/crosswalk;

(3) Include push buttons which are audibly locatable and equipped with tactile arrows pointing in the same direction as the associated crosswalk;

(4) PROWAG compliant, cast aluminum, nickel plated, powder coated with raised tactile arrow on button;

(5) Include solid-state switch rated to 20 million activations (minimum); and

(6) Include a two inch button with a tactile raised directional arrow on the button that can be changed to one of four directions to coincide with the direction of travel of the associated crosswalk.

B. The PBS must include the following standard features:

(1) The arrow/button must vibrate during the walk period, following a button push;

(2) Confirm a button push via a "vibratactile" bounce and a red LED, clearly visible in direct sunlight, which latches ON when the button is pushed;

(3) Indicate the direction of travel with extended button push;

(4) Transmit a standard locating tone, custom sound, or verbal countdown during pedestrian clearance;

(5) Ensure sounds automatically adjust to ambient over 60 dB range;

- (6) Allow sounds to have minimum and maximum volume set independently;
- (7) Synchronize all sounds;
- (8) Extended button push can turn on, boost volumes, and/or mute all sounds except those on activated crosswalk; and
- (9) Include message to clear the intersection when preemption is activated.

C. Ensure the PBS is capable of custom message and sound options for the following features:

- (1) Custom locating tone;
- (2) Custom clearance sound;
- (3) Custom walk sounds/message;
- (4) Informational message;
- (5) Multiple languages (up to three, selected by user); and
- (6) Street name in Braille on the sign.

D. Ensure the PBS is fabricated in accordance with the following:

- (1) Available in three standard colors: Black, Green, and Yellow. The default color is yellow unless specified otherwise;
- (2) Have an operational temperature range of -40 °F to 165 °F (-40 °C to 60 °C);
- (3) Ensure the housing material is cast aluminum;
- (4) Chemically filmed and powder coated;
- (5) Face plate constructed of powder coated aluminum with ink marking; and
- (6) Have pre-drilled mounting holes to hold a 9 inch by 12 inch, R10-3b, 3d, or 3e pedestrian sign.

E. PBS LED display operational requirements:

- (1) Light when the button is pushed and remain lit until the next walk phase.
- (2) Luminous intensity greater than 1200 maximum continuous discharge (mcd), sunlight visible, ultra bright red, with a 160 degree viewing angle.

F. PBS audio operational requirements:

- (1) Audio amplifier power output of 10 W rms into 8 ohms.

(2) Volume control automatic adjustment range of 28 dB (maximum).

(3) Microphone ambient noise frequency range of approximately 170 Hertz (Hz) to 2.3 Kilo Hertz (kHz).

(4) Button tone provides a brief “tick” to confirm each button push.

(5) Audible locating tone operates during the pedestrian-clearance and don't walk interval at an 880 Hz plus harmonic, 0.1 second duration, 1 second interval.

(6) Audible “chirp” operates only during walk intervals at 2700 Hz to 1700 Hz, 0.2 second duration, 1 second interval.

(7) Audible “cuckoo” operates only during walk intervals at 1250 Hz to 1000 Hz, 0.6 second duration, 1.8 second interval.

5. Ensure the configurator meets the following requirements:

A. Be a handheld, password protected, remote that configures the CCU or an individual PBS;

B. Communicate via infrared technology with the CCU and the PBS with an interactive operation to select various configuration options at the intersection(s), by standing adjacent to either the CCU or a PBS;

C. Feature a LCD display, with two 16-character lines, with backlight and adjustable contrast;

D. Be powered by four AA 1.5 Volt cell batteries, include a low battery warning, and have an auto or manual shut-off switch; and

E. Have an operating temperature range of 32 °F to 122 °F (0 °C to 50 °C).

6. Warranty. Furnish a manufacturer's warranty, transferable to the Department or the local agency responsible for the project, that the supplied materials will be free from all defects in materials and workmanship for a 2-year period from the date of shipment. Furnish the warranty and other applicable documents from the manufacturer, and a copy of the invoice showing date of shipment, to the Engineer at the time of delivery.

**c. Construction.** Complete this work in accordance with sections 818 and 820 of the Standard Specifications for Construction, typical signal construction details, and this special provision.

1. Furnish and Install. Furnish and install a system at an intersection as shown on the plans and in accordance with the *MMUTCD*. Ensure that the arrow on the PBS button(s) points in the direction of pedestrian travel for the associated crosswalk.

2. Remove. Remove an accessible pedestrian signal system or a PBS and store, as directed by the Engineer, or dispose of all removed materials.

A. Where removal of an accessible pedestrian signal system is specified on the plans, remove the CCU, hardware, cable, connectors, and other appurtenant material required to complete the work.

B. Where removal of a PBS is specified on the plans, remove the PBS, sign, associated assembly, hardware, cable, connectors, and other appurtenant material required to complete the work.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

<b>Pay Item</b>	<b>Pay Unit</b>
Pedestrian Signal System, Accessible.....	Each
Push Button Station.....	Each
Push Button Station and Sign.....	Each
Pedestrian Signal System, Accessible, Rem .....	Each
Push Button Station, Rem .....	Each

1. **Pedestrian Signal System, Accessible** includes installing the accessible pedestrian signal system at an intersection, including a CCU, configurator, hardware, fittings, conduit(s), wiring, grounding and ground rod(s), and all appurtenant material required to complete the work.

2. **Push Button Station** and **Push Button Station and Sign** includes installing the push button station, sign (when specified), associated assembly, brackets, hardware, fittings, conduit(s), cable to controller, wiring, grounding, ground rod(s), and all other appurtenant material required to complete the work.

3. **Pedestrian Signal System, Accessible, Rem**, includes removing an accessible pedestrian signal system at an intersection including a CCU, configurator, hardware, fittings, hardware, cable, connectors, conduit(s), grounding, and other material required to complete the work. **Pedestrian Signal System, Accessible, Rem** also includes storage or disposal of removed material.

4. **Push Button Station, Rem**, includes removing a push button station, sign, associated assembly, brackets, hardware, fittings, cable, connectors, conduit(s), ground, and other material required to complete the work. **Push Button Station, Rem** also includes storage or disposal of removed material.

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**SPAN WIRE TETHER**

SIG:EMS

1 of 1

APPR:NJB:HLO:03-17-25  
FHWA:APPR:03-17-25

**a. Description.** This work consists of furnishing and installing hardware, connector hangers, fittings, stabilizer bar, pole clamps, tri-stud and 2 nested extension plates, 22 inches minimum length associated stainless steel fasteners and a span wire tether.

Bottom tether or top tether traffic signal heads as shown on plans or as directed by the Engineer.

**b. Materials.** Furnish material meeting the requirements of sections 818, 820, and 921 of the Standard Specifications for Construction.

1. Furnish tether span wire that is 1/4 inch nominal diameter for spans without tie-offs or with tie-offs, extra high-strength grade, 7-strand, galvanized, Class A, zinc-coated steel meeting the requirements of *ASTM A475*. Maintain clearance of 17 feet over roadway.
2. Ensure pole clamps, turnbuckle, tether wire to breakaway link connection, and all other components in the load path from the wire to the pole are galvanized steel.
3. Ensure the bull ring, galvanized or stainless, can resist a single pull load of 10,800 pounds minimum. Ensure breakaway link breaks at 3,325 pounds.
4. Materials will be accepted based on certification and visual inspection.

**c. Construction.** Complete this work in accordance with sections 818, 820 and 921 of the Standard Specification for Construction, as shown on the plans, and as directed by the Engineer.

Where installation is specified, install the span wire tether on existing or new signal head(s) at location(s) shown on the plans. Furnish, install, remove, or install on the project, a span wire tether, as shown on the plans or as directed by the Engineer.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<b>Pay Item</b>	<b>Pay Unit</b>
Span Wire Tether .....	Each

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**SPAN WIRE**

SIG:EMS

1 of 1

APPR:MLO:SCK:07-31-23  
FHWA:APPR:08-08-23

**a. Description.** This work consists of furnishing and installing hardware, connector hangers, fittings, bull rings or three-way pull-off connections, span wire clamps, pole band clamps, associated stainless steel fasteners and a span wire.

**b. Materials.** Furnish material meeting the requirements of sections 818, 820, and 921 of the Standard Specifications for Construction.

1. Furnish span wire that is 5/16 inch nominal diameter for spans without tie-offs and 1/2 inch nominal diameter for spans with tie-offs, extra high-strength grade, 7-strand, galvanized, Class A, zinc-coated steel meeting the requirements of *ASTM A475*. Maintain clearance of 17 feet over roadway.

2. Ensure pole clamps and all other components in the load path from the wire to the pole are galvanized steel, capable of resisting a load of 6,570 pounds minimum for 5/16 inch nominal diameter span wire and 13,705 pounds minimum for 1/2 inch nominal diameter span wire without permanent distortion.

3. Ensure three-way pull-off connection or bull ring, galvanized or stainless steel, can resist a single pull load of 13,705 pounds minimum.

4. Materials will be accepted based on certification and visual inspection.

**c. Construction.** Complete this work in accordance with sections 818, 820 and 921 of the Standard Specifications for Construction, as shown on the plans, and as directed by the Engineer.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<b>Pay Item</b>	<b>Pay Unit</b>
Span Wire .....	Each

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**LONG LIFE LIGHT EMITTING DIODE TRAFFIC SIGNAL**

SIG:EMS

1 of 2

APPR:NJB:HLO:11-17-23  
FHWA:APPR:11-21-23

**a. Description.** This work consists of installing long life LED traffic signals. Adhere to the standard specifications for all other requirements for traffic signals not specifically listed in the requirements of this special provision.

**b. Materials.** Ensure materials are in accordance with sections 918 and 921 of the Standard Specifications for Construction, the *MMUTCD* and the requirements of this special provision.

1. LED Module. Furnish LED modules consisting of high flux LEDs mounted on a metal core circuit board and LED electrical contacts soldered to the circuit board. Furnish all power supplies with conformal coating for additional protection and solid connections (no connectors) between driver and LED light engine. Furnish non-electrolytic capacitors to enhance long life.

Furnish green LEDs that use indium gallium nitride technology. Furnish green LED traffic signal modules that do not illuminate if the applied voltage is less than 35 VAC.

Furnish yellow LEDs that use indium gallium nitride technology, absorbing substrate or transparent substrate. Furnish yellow LED traffic signal modules that do not illuminate if the applied voltage is less than 35 VAC.

Furnish LED modules for traffic signals with the following maximum power consumption:

A. Eight inch and 12-inch red ball traffic signal modules with a maximum power consumption no greater than 8 watts and 9 watts respectively, at 120 VAC, at 77 °F;

B. Eight inch and 12-inch yellow ball traffic signal modules with a maximum power consumption no greater than 8 watts and 13 watts, respectively, at 120 VAC, at 77 °F;

C. Eight inch and 12-inch green ball traffic signal modules with a maximum power consumption no greater than 7 watts and 9 watts, respectively, at 120 VAC, at 77 °F;

D. Twelve inch red arrows with a maximum power consumption no greater than 7 watts at 120 VAC, at 77 °F;

E. Twelve inch yellow arrows with a maximum power consumption no greater than 14 watts at 120 VAC, at 77 °F; and

F. Twelve inch green arrows with a maximum power consumption no greater than 9 watts at 120 VAC, at 77 °F.

2. Lens. Furnish an LED signal module lens made from UV-stabilized polycarbonate. Use lenses that are color tinted red, yellow, and green. Furnish a hard-coated lens or a lens that otherwise complies with the material exposure and weathering effects requirements of *SAE J576*.

For arrows incorporate a black arrow mask behind the outer lens to define the arrow icon. Furnish an outer lens with raised optical detail on the inner surface to distribute the light rays to meet the intensity and distribution standards required by this subsection.

3. Operational Requirements. Furnish LED traffic signal modules that meet the minimum intensity requirements while operating from temperatures of -40 °F to 165 °F for 15 years.

4. Warranty. Furnish materials with a manufacturer’s warranty, transferable to the MDOT, that the supplied materials are free from all defects in materials and workmanship. Furnish the warranty and other applicable documents from the manufacturer, and a copy of the invoice showing the date of shipment, to the Engineer prior to acceptance.

**c. Construction.** Furnish and install the long life LED traffic signals as shown on the plans or as directed by the Engineer. All work must comply with sections 819 and 820 of the Standard Specifications for Construction and this special provision. Storage and/or disposal of removed material is included and must comply with section 204 of the Standard Specifications for Construction or as directed by the Engineer.

Install, direct, and mask the signal indication(s) in accordance with the manufacturer’s recommendation and the visibility requirements as directed by the Engineer.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

<b>Pay Item</b>	<b>Pay Unit</b>
TS, __ Way __ Mtd (LED), Long Life .....	Each
TS, __ Way __ Mtd, __ (LED), Long Life .....	Each

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
STEEL STRAIN POLE FOUNDATION REVISIONS

SIG:EMS

1 of 1

APPR:MLO:REL:11-12-24  
FHWA:APPR:11-21-24

Delete the following pay items in subsection 820.04, on pages 8-200 and 8-201 of the Standard Specifications for Construction.

Pay Item	Pay Unit
Strain Pole Fdn, 6 Bolt.....	Foot
Casing.....	Foot

Add the following pay items in subsection 820.04, on pages 8-200 and 8-201 of the Standard Specifications for Construction.

Pay Item	Pay Unit
Strain Pole Fdn, 6 Bolt, __ inch .....	Foot
Casing, __ inch.....	Foot

Delete the first sentence of the sixth paragraph of subsection 820.04.C, on page 8-204 of the Standard Specifications for Construction, in its entirety and replace it with the following:

**Strain Pole Fdn, 6 Bolt, \_\_ inch** includes disposal of removed material in the pay item.

MICHIGAN  
DEPARTMENT OF TRANSPORTATION  
  
SPECIAL PROVISION  
FOR  
**MISCELLANEOUS METAL PRODUCTS REVISIONS**

STR:REL

1 of 2

APPR:MJF:MLO:08-12-25  
FHWA:APPR:08-12-25

**Delete subsection 908.14, on page 9-63 of the Standard Specifications for Construction, in its entirety and replace with the following:**

- A. **General.** Provide the Engineer with a Mill Test Report (MTR) from the manufacturer's records that indicate the chemical composition and physical properties of the anchor bolt material meets ASTM F1554 for the grade specified in the contract in addition to the following:

1. Heat number;
2. Yield strength;
3. Tensile strength;
4. Elongation;
5. Reduction of area;
6. Charpy V-notch (when applicable); and
7. Furnace lot numbers for heat treatment (when applicable).

Order additional bolts to replace those used for Department testing. Each anchor bolt must be provided with two washers and two nuts unless otherwise required in the contract.

Provide bolts, nuts, and washers in the size and shape shown on the plans and hot-dip galvanized in accordance with ASTM F2329/F2329M. Galvanize the exposed threaded end of anchor bolts a minimum of 20 inches.

Nuts must meet the requirements of ASTM A563/A563M, Grade DH, or ASTM A194/A914M, Grade 2H. Lubricate nuts in accordance with ASTM A563/A563M, supplementary requirement S1 and S2. Re-tap nuts after galvanizing in accordance with ASTM A563/A563M. Provide flat, circular washers meeting the requirements of ASTM F436/F436M.

- B. **Anchor Bolts for Traffic Sign Support Structures (Cantilever, Truss, and Dynamic Message Sign), CCTV Pole, Tower Lighting Unit, Light Standards, and Traffic Signal Mast Pole and Mast Arm.** Steel anchor bolts must meet the requirements of subsection 908.14.A and meet ASTM F1554 Grade 55 with supplemental requirements

S1, S3 and S4.

Bolt threads must conform to Class 2A, Unified Coarse Thread Series of ASME B1.1 before coating. After coating, the pitch and major diameter must not exceed the dimensions specified in ASTM F1554 for allowable zinc build up and corresponding between thread dimensions.

Nut threads must conform to Class 2B, Unified Coarse Thread Series of ASME B1.1 before zinc coating. Zinc coated nuts must be overtapped with the diametral allowance for the thread series listed in ASTM A563/A563M.

- C. **Anchor Bolts for Traffic Signal Strain Poles.** Steel anchor bolts must meet the requirements of subsection 908.14.A and meet ASTM F1554 Grade 105 with supplemental requirements S3 and S4.

Bolt threads must conform to Class 2A, Unified Coarse Thread Series of ASME B1.1 before coating. After coating, the pitch and major diameter must not exceed the dimensions specified in ASTM F1554 for allowable zinc build up and corresponding between thread dimensions.

Nut threads must conform to Class 2B, Unified Coarse Thread Series of ASME B1.1 before zinc coating. Zinc coated nuts must be overtapped with the diametral allowance for the thread series listed in ASTM A563/A563M.

- D. **Anchor Bolts for Other Purposes.** Steel anchor bolts must meet the requirements of subsection 908.14.A and meet ASTM F1554 Grade 36 (Grade 55 supplemental S1 may be substituted at the supplier's discretion).

ROAD COMMISSION FOR OAKLAND COUNTY

SPECIAL PROVISION  
FOR  
**TRAFFIC SIGNAL INSPECTION**

RCOC/TOC

PAGE 1 OF 2

RCOC20SP818A

ORG:05-07-21

REV: 03-01-25

**a. Description**

This work consists of inspection of electrical construction and/or relocation of traffic signal facilities.

**b. Materials**

None.

**c. Construction**

The Road Commission for Oakland County (RCOC) will inspect the installation of all traffic signal equipment. The Contractor will notify RCOC when work is going to be performed. The Contractor must provide three (3) working days' notice (excluding Saturday, Sunday, and Holidays) to RCOC, Signal Systems Division, telephone (248) 858-7250, for the inspection to be performed.

1. Materials Inspection Request

The Contractor is required to schedule inspection by completing an online inspection request form, which is located at

<https://www.rcocweb.org/FormCenter/Traffic-Safety-17/SignStriping-Inspection-Request-Form-76>

Material Inspection:

<https://www.rcocweb.org/FormCenter/Construction-16/Materials-Inspection-Request-73>

Refer to RCOC Special Provision for Division I - General Provisions for additional information.

Work performed without inspection by RCOC, will be rejected and not approved for payment. Rejected work shall be removed and replaced at the sole expense of the Contractor and will not be grounds for an extension of time.

The Contractor will furnish RCOC with the traffic signal controllers and cabinets and all traffic signal timing devices so they can perform final adjustments, set signal timings and bench test the equipment.

Within 10 days of Award, the prime contractor and signal subcontractor shall attend a meeting with the Road Commission for Oakland County (RCOC) Traffic Operations Center. At this meeting, the contractor shall supply the equipment procurement schedule for the traffic signal controller cabinet and internal parts to be delivered to RCOC. Coordinate the meeting with RCOC/TOC Mr. Steve Wheeler (248) 858-7250.

After RCOC has received all equipment, the Contractor must contact the Signal Operations Engineer in the Signal Systems Division at (248) 858-7250, to schedule adjustments, timings, and testing a minimum of three (3) weeks in advance of the required date. Delays resulting from adjustments, timings, and testing shall not be grounds for an extension of time or additional costs.

When the necessary adjustments, timings, and testing have been completed, the contractor must pick up the cabinets and controllers. The Contractor must provide a minimum of seven (7) calendar days' notice prior to picking up cabinets and controllers from RCOC District 8, 2420 Pontiac Lake Rd, Waterford, MI. Coordinate logistics of pick-up with RCOC: Mr. Steve Wheeler (248) 858-7250.

Mast arm inspection is required. The Contractor must contact the Signal Operations Engineer in the Signal Systems Division at (248) 858-7250, to schedule inspection with the RCOC Consultant a minimum of four (4) weeks in advance of the required inspection date. The Contractor must provide the mast arm supplier and manufacturing location.

When a traffic signal installation is completed in accordance with the plans and specifications, the Road Commission's traffic signal inspector will energize the traffic signal equipment.

**d. Measurement and Payment**

The above items of work will not be paid for separately and are considered included in the contract unit price for other items of work.

ROAD COMMISSION FOR OAKLAND COUNTY

SPECIAL PROVISION  
FOR  
**TRAFFIC SIGNAL WORK**  
**CONSTRUCTION METHODS AND GENERAL PROVISIONS**

RCOC/TOC

PAGE 1 OF 8

RCOC20SP818B

ORG:05-07-21

REV: 04-21-25

**a. Description**

This special provision is for electrical construction and/or relocation of traffic signal facilities to be used in addition to the applicable sections of the standard specifications.

The Road Commission for Oakland County (RCOC) document entitled "Standard Construction Details for Traffic Signal Contracts" dated March 2014 is incorporated by reference. Copies of this document are available from the RCOC Signal Systems Division at (248) 858-7250 or on-line at [www.rcocweb.org](http://www.rcocweb.org).

**b. Materials**

1. Furnish new material and equipment, unless specified otherwise, and comply with the contract documents.
2. Materials furnished by RCOC to the Contractor will be picked up by the Contractor at such site as designated by RCOC, with any associated costs included in pay items as indicated on the plans and will not be paid for separately.
3. Service Disconnect  
Disconnect switches (stainless steel) shall be NEMA heavy duty (HD), 4X, unless otherwise noted. The service disconnect is supplied by the contractor when a pay item is included in the project.

**c. Construction**

1. General  
All work on any RCOC facility is subject to their inspection.

The Contractor shall mark the month and year of installation on the back-side (which is inside the signal head) of each LED lens.

If requested by the Engineer, the Contractor shall provide a copy of the cabinet and controller shipper signed by an RCOC representative to the Project Engineer within 3 calendar days of being delivered to the RCOC.

All weather heads and LB's installed on this project shall be new and metal.

The Contractor shall notify the RCOC Signal Department, ten (10) working days' (excluding Saturday, Sunday, and Holidays) in advance of relocation of controllers, shutdown of traffic signals, traffic shifts, and work required in the cabinet/controller by the RCOC Signal Maintenance Department.

Always maintain existing communication lines for controllers.

Within five calendar days after completion of the conduit work or of any portion where a working cable is installed, the Contractor shall furnish to the RCOC (if requested by the Engineer) an as-built record of the length of the duct lines as constructed, clearly showing any departures from the original plans. The lengths shall be measured from the inside walls of manholes and the center of post foundations, cable poles, and handholes. Final payment shall be withheld until work is completed and accepted.

2. Signal cutovers

All traffic signal cut-overs, modifications of any signal configuration, traffic switches, and stage changes must occur on Monday through Thursday between 9:00 a.m. and 3:00 p.m. unless otherwise directed by the Engineer. Cut-overs are not permitted on Holidays.

3. Insulators and electrical protection devices

Where required by the local Utility Company or applicable electrical Code, install or have installed all necessary insulators or electrical protection devices and/or coordinate with the local Utility Company to install required protective devices on the Utility Company's facilities. The cost of any protective devices or insulators shall be included in the cost of performing this signal work and not paid for separately. The contractor is responsible for scheduling this work.

When insulators or electrical protection devices are not sufficient, the contractor shall provide a Qualified Person and Qualified Linemen to construct the proposed work. The cost shall be included in the other contract items and not paid for separately.

Delay of any Utility Company installation on any portion of this project may be considered the basis for a claim for an extension of time for completion as determined reasonable by the Engineer but will not be considered the basis for a claim for extra compensation or an adjustment in contract unit prices.

#### 4. Submittals

A. On each submittal page, list the pay item name, material, unique proposal line number, and MDOT item code that applies.

B. If there are multiple products, materials, sizes, etc. on one page, the pay item/material must be clearly identified.

C. Submittals / shop drawings are not considered a substitute for the materials certification procedures required in the contract documents.

D. The Signal Contractor is required at each submission to provide a transmittal cover letter which includes the following:

- (1) Each specific variation that the Shop Drawings may have from the requirements of the contract plans, specifications, and contract documents.
- (2) In addition, the drawings will contain a specific notation that explicitly and prominently calls out all deviations as indicated in the cover letter.
- (3) RCOC may or may not accept deviations or variations to the contract documents.
- (4) Each variation shall provide supporting documentation why the variation is equal to or greater than the requirements of the contract documents.  
For some variations, as-directed by the engineer, the Contractor must ensure that a Professional Engineer, licensed in the State of Michigan, seals all working drawings, documentation, and design calculations submitted. RCOC, at its sole discretion, may or may not accept variations.
- (5) When deviations do not exist, it shall be stated in the cover letter.
- (6) The supplier of the shop drawings shall also provide a transmittal cover letter of the same required content as described above.

The review of a submittal will not be considered to be approval of a variation in which the project requirements are affected unless specifically so noted in the review comments as returned with the submittal.

The review of a signal submittal may be returned with a Road Commission for Oakland County cover letter and each page may be numbered with the shop drawing number and page number. A stamp will not be included.

E. The Contractor shall also prepare and submit shop drawings in accordance with the Special Provision entitled "Submittals" included elsewhere in the Contract documents.

## 5. Traffic Loops / Wireless Detection / Wireless Vehicle Sensor Nodes

A. RCOC will lay out all traffic loops and/or wireless detection nodes prior to installation.

B. No detector loop shall be installed unless the roadway surface temperature is 40 degrees Fahrenheit or above.

C. Traffic loops must be placed in the leveling course of asphalt, milled surface under proposed asphalt, or as-directed by the engineer. Place the sealant below the surface of the asphalt to prevent bleeding into the next layer of asphalt. Allow the sealant to fully cure according to manufacturer's recommendations before placing a layer of asphalt over the loops. Sawing slurry shall be completely cleaned and removed prior to opening to traffic and placing next lift of asphalt.

### D. Install traffic loops

- After the proposed curb, concrete flatwork, sawing, and all other proposed construction is completed in order to prevent damage to the proposed traffic loops.
- After the completion of all traffic signal underground work, no sooner than 3 weeks prior to the start of signal overhead work, and within 3 weeks after the traffic signal cutover.

The RCOC Maintenance Department may be performing maintenance and asphalt milling/overlays in the construction zone which may damage proposed traffic loops. Coordination shall be required with RCOC Maintenance and the RCOC Signal Field Operations Engineer.

## 6. Utility coordination

Schedule, coordinate, install, and pay for work provided by the local utility company(s), as indicated on the plans or as directed by the Engineer. The Engineer will not authorize payment for delay caused by the Contractor's failure to properly schedule and coordinate any utility work.

## 7. 107.12 – Contractor's Responsibility for Utility Property and Services

Backfill for utility location per section 107.12 (Contractor's Responsibility for Utility Property and Services) of the Standard Specifications for Construction:

Use Granular Material Class III in accordance with section 902 of the Standard Specifications for Construction for backfill. If compaction of each layer to at least 95% of the maximum unit weight cannot be achieved, use Aggregate, 6A or 34R as directed by the Engineer.

When pavement coring is required by the Engineer, core hole backfill shall require multiple materials as-directed by the Engineer including self-compacting aggregate (6A or 34R), two-part epoxy non-shrink grout, asphalt to match existing pavement, concrete to match existing pavement, and existing pavement core material (if structurally sound).

Use material removed during exploratory investigation for backfill only if approved by the Engineer.

8. Agency Coordination

Secure all necessary permits covering the operations, including permits from the Public Authorities having jurisdiction over the streets, or other Public Properties in which the work is located, and the improvements therein. Obtain the amount of any charges for payment, including fees or inspection charges required by such authorities, and include the cost of these fees in the bid prices.

The local traffic authority may impose restrictions regarding particular times of certain days of the week wherein the Contractor cannot perform work and may, in fact, be required to clear the area of work obstacles or construction equipment. The Contractor must take note of this and there will be no extra payment to perform the work with possible restrictions imposed. The Engineer will not authorize extra payment if the Contractor chooses to perform work during overtime status.

9. Anchor bolt testing

This work consists of the contractor's responsibility to test the strain pole and mast arm anchor bolts. The contractor shall also test the mast arm A449 clamp bolts, rods, studs, nuts, washers, and lock washers.

Provide anchor bolts, nuts, and washers in accordance with subsections 105.10, 820, and 908.14 (or MDOT 20SP-908A current edition if included in proposal) of the Standard Specifications for Construction and all contract documents.

Anchor bolts shall be marked (color coded ends and non-removable casting (heat) stamp) to provide traceability during testing and installation. Include pictures (or other proposed method) with the testing results of the materials at the contractor's yard and lab for traceability in the field. The testing results (bolts, nuts, and washers) shall include all product markings, color coding, lot number, heat number, and manufacturer documented directly on the test results. The contractor may propose alternates for traceability prior to sampling and testing.

The Contractor shall provide testing (bolts, nuts, and washers), per subsection 908.14 (or MDOT 20SP-908A current edition if included in proposal) of the Standard Specifications for Construction and all contract documents, for the anchor bolts from an RCOC approved independent lab. MDOT does not test for Local Agency projects.

The RCOC approved independent labs can be found:

RCOC Notice to Bidders, Anchor Bolt Testing - Approved RCOC Independent Labs

<https://www.rcocweb.org/561/Frequently-Used-Special-Provisions>

Provide Test Data Certification to the engineer according to the *MDOT Materials Source Guide*.

Anchor bolt testing is not paid for separately and is included in other items of work.

#### 10. Density

At the sole discretion of the Engineer, density/compaction as specified in traffic signal related subsections 820.03. A. 3. and 820.03 B. of the Standard Specifications for Construction, as determined by the Engineer, will be accepted by one of the following two methods, in lieu of percent density/compaction specified elsewhere in the contract.

##### A. Visual Inspection

Documented by the Engineer, based upon number of roller/plate compactor passes and roller/plate compactor pattern acceptable to the Engineer. Another compaction equipment may be approved by the engineer.

##### B. Proof Roll

Complete a proof roll using equipment approved by the Engineer. The Engineer must witness and document the proof roll and will determine the proper course of action to maintain compaction until pavement is placed and correct any observed rutting or displacement.

#### 11. Protection of work

The contractor must protect all signal related items until final satisfactory final inspection. This includes protecting signal foundations, strain poles, mast arms, pedestals, pushbuttons, concrete foundations, etc. Contractor must repair damage to highway and signal facilities caused by work not protected properly from naturally occurring events and roads open to traffic at no additional cost to the Department. Payment for a pay item does not represent acceptance of an item or satisfactory final inspection.

#### 12. Delivery Claims for Extensions of Time

Delivery delay claims by the Contractor for Extensions of Time will not be considered unless two or more letters from different local traffic signal suppliers (Metro Detroit area) are supplied to the engineer within 14 calendar days of contract award.

Any delay (material shortages, pandemics, shipment delays, supply chain delays, delayed deliveries as a result of an industry-wide shortage, wars, etc.) will not be considered unless the contractor/supplier letter is accompanied by an FHWA letter and Michigan Department of Transportation (MDOT) letter declaring a nationwide shortage of a specific material.

Delivery claims may be considered for a claim for an extension of time for completion as determined reasonable by the Engineer, but shall not be considered the basis for a claim for extra compensation or an adjustment in contract unit prices.

#### 13. Materials Certification Procedures – Signal Materials

Unless specified elsewhere in the contract documents, provide at a minimum:

- General Certification documentation according to the *MDOT Materials Source Guide*
- In addition to the *MDOT Materials Source Guide* requirements, provide the RCOC name of material designation on each certification. If requested by the contractor, the RCOC Engineer will provide the material designations on the project.

#### 14. Material Source List

- Provide RCOC name of material designation. If requested by the contractor, the RCOC Engineer will provide the material designations on the project.

#### 15. Prior to ordering proposed materials, the contractor shall field measure and field verify all existing conditions.

For retrofit and salvage type work, existing material sizes, material types/brands/manufacturers must be measured and determined by the contractor prior to ordering materials.

#### 16. TS, \_\_, Rem

The unit price for relevant removal pay items include the cost of removing and disposing of traffic signals, pedestrian signals, cables, and other materials.

#### 17. Special Tools

No special tools shall be required for any proposed material, repair application, assembly, or installation/maintenance of any material/equipment.

#### 18. Compatibility

The equipment and materials supplied shall be compatible and interchangeable with the equipment commonly in use in the Road Commission for Oakland County's system.

**d. Measurement and Payment.**

The above items of work will not be paid for separately and are considered included in the contract unit price for other items of work.

ROAD COMMISSION FOR OAKLAND COUNTY

SPECIAL PROVISION  
FOR  
**HANDHOLE, ROUND**

RCOC/TOC

PAGE 1 OF 4

RCOC20SP818F

ORG:05-07-21

REV: 05-05-25

**a. Description**

This work consists of constructing a round handhole, and providing hardware, connectors, fittings, cast iron frame, cast iron ring and cover, mastic sealer, excavation, backfill, and removal of waste excavated material, and all materials necessary to complete the work.

This work must be done in accordance with sections 818, 820, and 918 of the Standard Specifications for Construction, except as herein provided.

**b. Materials**

Provide material in accordance with section 918 of the Standard Specifications for Construction.

1. Provide handhole with live loads in accordance with the requirements of AASHTO HS 20 for wheel loading.
2. Provide Grade 4500 concrete in accordance with section 1004 of the Standard Specifications for Construction.
3. Provide smooth or deformed welded wire fabric in accordance with *ASTM A185/A185M or ASTM A497/A497M*.
4. Provide reinforcing steel in accordance with the requirements of *ASTM A615/A615M*, Grade 60 rebar, if required. Bend bars and place in accordance with the latest *ACI* standards.
5. Provide integral wall and base.
6. Provide round frame and round cover:
  - A. Provide a heavy-duty frame and cover manufactured by East Jordan, Neenah Foundry, or a Department approved equal, with "TRAFFIC SIGNAL" cast into the cover.

7. Provide 2-foot diameter precast handhole with the following characteristics:

A. Construct per MDOT detail SIG-240-A dimensions except as herein provided:

- (1) One, 6-inch opening in the base for a sump drain hole.
- (2) Walls with four tapered knock-outs for conduits entering the handhole, 12 inches in diameter.

8. Provide 3-foot diameter precast handhole with the following characteristics:

A. Construct per MDOT detail SIG-240-A dimensions except as herein provided:

- (1) One, 6-inch opening in the base for a sump drain hole.
- (2) Walls with four tapered knock-outs for conduits entering the handhole, 12 inches in diameter.

9. Grounding Rod

A. Provide a copper clad steel grounding rod with a diameter of at least  $\frac{3}{4}$  inch and a length of at least 10 feet, with no more than 10 ohms resistance to ground.

Use a ground rod that meets the requirements of subsection 918.02.C of the Standard Specifications for Construction.

10. Granular Material Class II – per section 902 of the Standard Specifications for Construction

11. Butyl rubber sealant that conforms to ASTM C990 - Place the butyl sealant between the bottom of the heavy-duty frame and concrete.

### **c. Construction**

Complete this work in accordance with sections 818, 820, and 918 of the Standard Specifications for Construction, as shown on the plans, and as directed by the Engineer.

1. Submittals / Working Drawings

If requested by the Engineer, submit a detailed dimensional drawing of all equipment, material specification list which shows the materials to be used, equipment to be furnished, and assembly/installation method.

2. General

Construct the handhole to accept a heavy-duty frame and cover centered on top of the handhole. Ensure the inner surface of handhole is smooth.

The handhole must be delivered and unloaded at the job site in good condition. Any cracked or otherwise damaged units shall not be accepted, nor shall any reimbursement be made for delivery or pick-up of damaged units.

The handhole must be installed so the top of the frame and cover is level or flush with finish grade level, as directed by the Engineer.

All conduits entering the handhole must be installed in the provided terminators or in individually bored holes. Conduits installed in bored holes must be properly spaced, cut flush with the interior face on the wall and must be grouted from the outside of the handhole. Attach end bells on the ends of conduits entering handholes to prevent damage to the cable.

3. Grounding Rod

The grounding rod must be installed centered in the sump opening. The ground rod must be installed with 12 inches of exposed rod above the bottom of the handhole.

4. Backfill

Install the handhole on compacted 6 inches of Class II granular material. Granular Class II material shall be used in backfilling all handholes that fall within the 1:1 influence lines from the edge of pavement or back of curb. All material must be compacted. The Engineer will determine whether excavated material meets the backfill requirement. Use Class II granular material if the Engineer determines that excavated material does not meet the backfill requirement.

**d. Measurement and Payment**

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item(s):

<b>Pay Item</b>	<b>Pay Unit</b>
Hh, Round, 2 foot dia, RCOC .....	Each
Hh, Round, 3 foot dia, RCOC .....	Each

**Hh, Round, \_\_ foot dia, RCOC (Ea)** includes all costs for, but not limited to, constructing a round handhole and providing hardware, connectors, fittings, cover and all material necessary to complete the work. The contract unit price shall be payment in full for furnishing and installing all materials including frame and cover, ground rod(s), steel reinforcement and sewer grade ring, sealing the joints with mortar, and all required material to build the structure complete. Where existing cables are maintained in new manholes or handholes additional cable shall be spliced into the cable for proper racking on the manhole or handhole walls. Excavation, granular material backfill, compaction, breaking away concrete encasement and conduit where new manholes or handholes are broken into an existing conduit run and disposal of waste excavated material is also included in the item and will not be paid for separately. The unit prices for handhole pay items include the cost of removing concrete encasement and conduit where new manholes or handholes access an existing conduit run as indicated on the plans and installing cable racks and hooks.

ROAD COMMISSION FOR OAKLAND COUNTY

SPECIAL PROVISION  
FOR  
**TRAFFIC SIGNAL BACKPLATES**

RCOC/TOC

PAGE 1 OF 3

RCOC20SP820B

ORG:05-07-21

REV: 03-01-25

**a. Description**

This work consists of completing one or more of the following work types at location(s) shown on the plans according to the plans and sections 204, 818, 820, and 921 of the Standard Specifications for Construction except as herein provided.

1. Furnishing and installing a traffic signal backplate.
2. Removing and disposing of an existing traffic signal backplate.

As applicable, this work includes removal or installation of hardware, connectors, fittings, mounting hardware, and all material necessary to complete the work.

**b. Materials**

Material must meet section 921 of the Standard Specifications for Construction.

1. Provide backplates with a 3M 4081 ASTM Type XI reflective fluorescent yellow tape border. Ensure that a one-inch border is used with yellow signal heads and visors.
2. Do not cut the backplate for installation.
3. The backplates must be one-piece construction unless otherwise directed by the engineer.
4. Provide a one-piece backplate for three or four section traffic signal heads as indicated on the plans or as directed by the Engineer. Ensure that five section (doghouse) signal head combinations are provided with no more than three vacuum formed pieces.
5. Provide backplates that are designed to precisely fit the manufacturer's signal heads and supplied with necessary hardware to attach the backplate to the signal.
6. Provide backplates that are vacuum formed from 0.125-inch-thick black acrylonitrile butadiene styrene (ABS) plastic with a hair cell finish on the front side (facing approaching traffic) to reduce glare.

Use 0.156-inch-thick ABS plastic for 5 section and HAWK.

7. Provide backplates that are constructed with a minimum 5/8-inch flange on all sides to provide structural rigidity. Ensure the backplates are provided with a three-inch corner radius.
8. Ensure that all backplates extend five inches around the perimeter of the traffic signal combinations after installation.
9. Proposed backplates must accommodate case signs on traffic signal heads.

#### 10. Warranty and Guarantee

Provide materials with a manufacturer's warranty/guarantee, transferable to the Road Commission for Oakland County, that the supplied materials will be free from all defects in materials and workmanship for one (1) year from the date of final project acceptance. If requested by the Engineer, supply manufacturer's warranty and guarantee documents from the manufacturer and a copy of the invoice showing date of shipment.

The contractor shall repair and replace any backplates that the reflective fluorescent yellow tape border has been removed from the backplate prior to final project acceptance.

11. Backplates shall be attached with stainless steel bolts, washers, and lock nuts; or self-tapping screws and washers, or as directed by the Engineer. The washer should be 1 inch by 0.5 inch or as directed by the Engineer.
12. Acceptance  
Provide General Certification per the *MDOT's Materials Quality Assurance Procedures Manual* to the Engineer that the materials meet the requirements specified herein.

#### **c. Construction.**

Complete this work in accordance with sections 818 and 820 of the Standard Specifications for Construction, as shown on the plans, and as directed by the Engineer. Remove, store, and dispose of material in accordance with section 204 of the Standard Specifications for Construction.

##### 1. Special Tools

No special tools shall be required. If special tools are required for any other application in the repair, assembly, or installation of this equipment, forty (40) complete sets of such tools shall be furnished.

##### 2. Submittals / Working Drawings

If requested by the Engineer, submit a detailed dimensional drawing of all equipment, material specification list which shows the materials to be used, equipment to be furnished, and assembly/installation method.

3. Samples

If required, a complete sample backplate must be delivered within seven (7) working days after the request is submitted.

Special consideration shall be given to workmanship, materials and superior features demonstrated by the sample.

**d. Measurement and Payment.**

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item(s).

<b>Pay Item</b>	<b>Pay Unit</b>
Backplate, TS, RCOC.....	Each

**Backplate, TS, RCOC (Ea)** includes installing the backplate on existing or new signal head(s) at location(s) shown on the plans where installation is specified. Furnish and install a traffic signal backplate, as indicated on the plans or as directed by the Engineer. The pay item includes all components and associated hardware to complete the work.

Backplate, TS, Rem will not be paid for separately and is included in other items of work. The removal includes removing the existing backplate, hardware, and other appurtenances, required for a complete removal. Dispose of removed materials.

ROAD COMMISSION FOR OAKLAND COUNTY

SPECIAL PROVISION  
FOR  
**DIGITAL / ITS TYPE NEMA TS2 CABINET**

RCOC/TOC

PAGE 1 OF 25

RCOC20SP820C

ORG:05-07-21

REV: 08-01-25

**a. Description**

This special provision outlines the Road Commission for Oakland County's specifications for the traffic signal cabinet. The traffic signal cabinet must meet or exceed all requirements of the NEMA Standard TS2-2003 specification. Sections A. through K., as detailed below, are exceptions to the NEMA Standard TS2-2003 specification and are specific to the Road Commission for Oakland County.

**b. Materials**

1. Transfer Switch Assembly.

Each control cabinet must be provided with a transfer switch assembly completely wired.

A. Transfer Switch Compartment.

The compartment door must be flush mounted to the outside of the cabinet, located near the top of the right-hand side wall of the cabinet. The compartment door is to be hinged at the top with provisions that allow the generator cord to be plugged in with the door closed. The door will incorporate a piano type hinge utilizing stainless steel hinge pins. The hinge is to be attached in such a manner that no rivets or bolts are exposed. The door must be equipped with a lock, which can be operated by the main cabinet door key. The door opening must be a minimum 9" high by 6" wide to facilitate plugging in the generator cable. The door must include a slot with a sliding cover plate to allow the generator cable to remain plugged in while the door is closed and locked.

B. Transfer Switch Wiring.

A 30 Amp (minimum) rocker-type switch must be provided and installed in the generator transfer switch compartment. When in the "Utility" position power from the load side of the Main circuit breaker is to be routed to the line side of all secondary circuit breakers. When the transfer switch is in the Generator position, power from the transfer switch compartment generator inlet is to be routed to the line side of all secondary circuit breakers except any designated for illuminated signs. An indicator lamp within the compartment must be included and wired such that it is illuminated only if the transfer switch is in the Generator position and Utility power is supplied to the cabinet. A 30A twist-lock flanged inlet with a NEMA rating for L5-30P must be installed in the generator transfer switch compartment.

## 2. Cabinet Lifting Ears.

Each control cabinet must include a pair of permanent lifting ears. The lifting ears are to have the same finish as that provided on the control cabinet. They are to be provided installed on the top right-hand side and top left-hand side of the cabinet in such a manner as to support the cabinet in an upright position when lifted. Each lifting ear must be attached by a single 9/16" (or larger) stainless steel carriage type bolt with nut and washer located on the inside of the cabinet. This is to facilitate rotation of the lifting ear into the storage position without complete removal of the fastening hardware.

## 3. Cabinet Fan Quantity.

The size M30 cabinet is to be equipped with one fan; the size M36 cabinet and size 6 cabinet are to be equipped with two fans. All fans to be provided per NEMA Standard TS2-2003 Section 7.9 specifications. All cabinets must be equipped with an electric heater system. The heater must be a 150W, touch-safe heater, with no motors, convection style heater. The heater must be controlled by a hygrostat that can sense the ambient temperature and humidity in the cabinet.

## 4. Cabinet Ventilation Filter Type.

The filter must meet UL Class 2 filter requirements and include a disposable cardboard type filter. The cabinet must include a louvered metal cover over the air filter. The louvers must be pointed down to direct any incoming water away from the cabinet equipment. Water shall not enter the cabinet.

## 5. **Power Distribution.**

Panel must be provided as follows:

### A. Circuit Breakers.

Provisions must be made for mounting and wiring up to nine circuit breakers in the terminal facility. A quantity of nine circuit breakers must be provided with ampacity as noted in table 1. Circuit breakers are to be installed on the power panel near the top, arranged from left (Circuit Breaker 1) to right.

**Table 1: Power Panel Circuit Breakers**

<b>Circuit Breaker ID</b>	<b>Size (Amps)</b>	<b>Label</b>	<b>Function</b>
1	30	MAIN	Service Connection
2	20	LOAD SWITCH	Signal Bus
3	15	FLASHER	Flash Power
4	15	ELECTRONIC	CU and MMU
5	15	MISC	Fans, heater, cabinet lights
6	15	ENCLOSURE	Digi/External Enclosure/Other
7	15	PWR STRIP	Power Strip/Other
8	15	AUX	Illuminated Signs/Other
9	15	AUX	Illuminated Signs/Other

The main circuit breaker must be wired to protect the entire facility and must be identified as the "MAIN" breaker. The load side of the Main circuit breaker must feed the "Utility" termination of the transfer switch (if used) and the line side of the Aux circuit breakers. The Load Switch breaker is connected to the load side of the solid-state bus relay and must provide power to the load switches. The Flasher breaker must have the flasher connected to its load side. The miscellaneous breaker must have the cabinet fan, light, and door mounted duplex GFCI receptacle connected to its load side. The AUX breakers must be available to powering auxiliary devices such as illuminated signs. The circuit breakers must be capable of manual operation with markings to indicate rating and whether it is in the open or closed position. Square D series QO circuit breakers (or approved equal) are to be used and mounted on a QON2ACL (or approved equal) breaker block.

Provide an encapsulated 3-electrode gas tube surge arrestor, engineered to protect equipment from lightning and induced surges. The 3-electrode gas tube surge arrestor must be installed in a line arrestor line fashion. The arrestor must have a current rating of 40,000 amp (8/20 impulse).

The M30-ITS, M36-ITS, and the 6- ITS cabinets will include an additional 30-amp circuit breaker mounted on the main cabinet power panel, utilizing a single phase of the AC power to power the ITS compartment devices. Two 15 Amp and one 10 Amp circuit breakers will be provided in the ITS compartment, wired to the load side of the 30 Amp breaker. This 30 Amp breaker will have a separate surge protection device wired to its load side. The breakers in the ITS portion of the cabinet must be mounted in a way so that there are no exposed electrical connections.

#### B. Service Connections.

The incoming AC power service must terminate in compression fittings capable of accepting a #4 AWG or #6 AWG conductor for AC+ and AC- and accepting a #8 AWG conductor for safety (Earth/Chassis) ground. The AC+ line must terminate directly to the main circuit breaker. The AC- and safety ground lines must terminate directly to their respective bus bars.

### 6. **Detector Assembly.**

All cabinets must include a 20-channel detector assembly that meets NEMA Standard TS2-2003 Section 5.3.4 specifications as a minimum. The detector assembly must accommodate 16 channels of vehicle detection and an additional 4 channels of pedestrian detection push button isolation, or 4 channels of emergency vehicle priority control cards.

#### A. Detector Rack.

The BIU must be located in the first (furthest to the left) slot in the detector rack. The 16 channels of vehicle detection must be located immediately to the right of the BIU. The four channels of pedestrian detection (or emergency vehicle preempt card(s)) must be located in the last (furthest to the right) slot positions.

#### B. Detector Panel.

The detector panel must be provided installed on the lower left wall of the cabinet with components mounted on 1/8-inch (0.125-inch) sheet aluminum. Components on the detector panel include a modular detector input printed circuit card, push button terminal block, ground bus, common bus, and I/O expander harness. All components are to be accessible for ease of maintenance.

(1) The detector panel printed circuit card must have termination points for 16 loop inputs, a DB37F connector that mates with the detector cable, cabinet power supply inputs, and jacks that accept loop detector surge arrestors.

(2) The push button terminal block(s) must be provided located near the bottom of the detector panel. 30-amp terminal blocks are to be provided for push button terminations, with a minimum of 4 positions available for push button common and 2 positions for each of the 4 channels of inputs. A minimum 30 amp 4 position terminal positions must be provided to connect the push button isolator outputs to the BIU pedestrian detector inputs. On the M30 facility, isolator outputs 1 thru 4 are to be wired to BIU pedestrian detector inputs 1 thru 4 respectively. On the Size 6 facility, isolator outputs 1 thru 4 are to be wired to BIU pedestrian detector inputs 2, 4, 6, and 8 respectively. Provisions must be made to easily convert the 4 channels of push button isolation to 4 channels of emergency vehicle priority control.

(3) A ground bus bar is to be provided below the push button terminal block that will accept 4 – 16 American Wire Gage (AWG) copper conductors. This bus bar must be connected to the ground bus on the power panel with an 8 AWG conductor. A minimum of 12 open termination positions to be available for field wiring ground connections.

(4) A common bus bar is to be provided below the push button terminal block that will accept 4 –16 American Wire Gage (AWG) copper conductors. This bus bar must be insulated from the cabinet and be connected to the common bus on the power panel with an 8 AWG conductor. A minimum of 12 open termination positions must be available for field wiring common connections.

(a) Wiring to be provided from the push button terminal block to an I/O expander harness for a minimum of push button inputs 5, 6, 7, 8 to terminal facility BIU #2.

#### **7. Flash-Normal Switch.**

A flash-normal switch must be provided in a panel on the inside of the front cabinet door. The switch and wiring must provide flashing operation as defined for police panel flash-normal switch. This switch must be labeled "flash-normal".

#### **8. Cabinet Lighting Fixture.**

Install two LED lighting panels to illuminate the cabinet.

A door switch to activate the light(s) when the door is opened and off when door is closed must be provided. Install one lighting panel above the top shelf and install the second to the bottom of the lower shelf's storage drawer. Each panel must provide at least 450 lumens of light and consume no more than 15W of power.

The lights shall be installed on rotating clips that can be aimed by hand when working on the cabinet.

Install a third LED lighting panel in the ITS compartment, if an ITS compartment is required.

Wire the switches and lights to the Miscellaneous circuit breaker.

#### **9. Load Resistors.**

Size M30, M30-ITS, M36, M36-ITS, 6, and 6-ITS cabinets must include a .125-inch-thick panel installed on the side wall of the cabinet with surface/panel mount power resistors installed. Provide 50 watt, 3,000 ohm, resistors wired to load switch 1, 3, 5, 7, 13, 14, 15, and 16 green and yellow outputs. A clear heat resistant panel is to be provided over the resistors.

Apply to 8, 12, or 16 load bay cabinets as applicable.

### **10. Auxiliary Input/Output Assembly.**

When called for on the plans an Input/Output assembly is to be provided, consisting of a Bus Interface Unit (BIU), rack, and interface panel with harness.

#### **A. BIU.**

A BIU must be provided that meets Section 8 of NEMA Standard TS2-2003 specifications.

#### **B. Rack.**

A 2 position BIU rack with address easily programmable is to be provided. The rack must be shelf mounted and not exceed 5" H, 6" W, and 8" deep.

#### **C. Interface Panel.**

A modular printed circuit type interface panel with wiring harness is to be provided to access all inputs/outputs available on terminal facility BIU 3 and 4 as specified in NEMA Standard TS2-2003 Section 5.3.1. The panel is to be provided with # 8 size terminal blocks for termination of input/output.

### **11. SDLC Patch Panel.**

To facilitate SDLC communications among devices in the control cabinet, a 6-position printed circuit patch panel and cabling is to be provided installed in each cabinet. The patch panel is to be mounted to the left-hand side wall of the cabinet. A quantity of 5 SDLC communications cables are to be provided complete with 15 pin connectors and latching clips to connect from each device to the patch panel. Communications cable must meet NEMA Standard TS2-2003 Section 5.3.3 specification.

## **12. TRAFFIC CONTROL CABINET**

#### **A. Scope.**

This section defines the minimum acceptable requirements for a series of cabinets that differ in size, to house the CU and related devices. Provide the base mounted size 6 cabinet unless the plans indicate otherwise. Cabinets to be supplied meeting NEMA Standard TS2-2003 Section 7 specifications.

#### **B. Outline Dimensions.**

Minimum outline dimensions are shown in Table 1. These dimensions are outside dimensions exclusive of hinges, handles, overhang(s), vent housing, and adapters. Cabinet heights are measured to the lowest point of the top surface of the cabinet. The combined overhangs of the four sides of the cabinet must not exceed 4 inches.

**TABLE 1: Minimum Outline Dimensions (larger dimensions are acceptable upon written approval)**

Size	Height (inches)	Width (inches)	Depth (inches)
M30	51	30	16
M30-ITS	61	30	16
M36	51	36	19
M36-ITS	61	36	19
6	56	44	25.5
6-ITS	66	44	25.5

### C. Cabinet types and mountings.

#### (1) Base Mounted (Size 6 and 6-ITS).

The size 6 cabinet must be constructed so that it can be mounted on a 30 inch by 48 inch foundation. Anchor bolt mounting provisions for four 3/4 inch bolts on 40 3/4 inch centers (side-to-side) on 18 1/2 inch centers (front-to-back).

#### (2) Pole Mounted/Base Mounted (M30, M36, M30-ITS, and M36-ITS).

Cabinets intended for side of pole mounting must be provided with any necessary adapter, exclusive steel banding, to permit mounting to a 4 1/2 inch or larger diameter pole. The adapter must accommodate lag bolts up to 3/8 inch and steel banding up to 1 inch wide. Mounting points must be provided at or near the top and bottom of the cabinet. The adapter must have provisions for two holes spaced horizontally, which will have a center-to-center distance of 3 1/2 inches. Cabinets must be furnished without conduit holes. In addition, the cabinet must be provided with a removable bottom to enable it to be pole or base mounted.

### D. Materials.

The traffic control cabinet must be constructed of aluminum alloy. The aluminum material must be a minimum of 1/8 inch alloy sheet, ASTM B 209, 5052-H32 or equivalent.

The cabinets shall be weatherproof and impervious to rain, sleet, snow, dripping water, corrosion, hose down, splashed water, oil, and coolant seepage.

### E. Finish and Surface Preparation.

(1) Both the cabinet and base extension are to be unfinished both inside and outside, unless the plans indicate a finishing treatment.

#### F. Top Surface Construction.

The cabinet must be manufactured to prevent the accumulation of water on its top surface.

#### G. Conduit Entrances.

All conduit entrances must be sealed with a non-toxic, non-corrosive, non-staining non-hardening pliable duct seal compound. The duct seal compound must be moisture resistant and prevent the infiltration of moisture, dust and debris. The duct seal compound must be sufficiently applied to fully seal the conduit entrance.

Cap any unused conduit entrances.

#### H. Doors.

##### (1) Main Cabinet Door.

The cabinet must have a main door which permits access to all equipment within the cabinet. Doors must be hinged on the right side of the cabinet as viewed from the outside facing the cabinet door opening. They must have a handle made of one piece construction and swing away from the locking mechanism.

##### (2) Hinges.

All cabinet doors must incorporate a piano type hinge utilizing stainless steel hinge pins.

##### (3) Door Stop.

The cabinet door must be provided with a door stop which holds the door open as a minimum at 90 degrees and 180 degrees ( $\pm 20$  degrees).

##### (4) Latches and Locking Mechanism.

(a) All cabinets must incorporate a main door lock, Corbin No. 15481RS or Pelco (Type II) SM-1025 or equivalent, constructed of nonferrous or stainless materials, which must operate with a Traffic Industry conventional #2 key, Corbin No. 1R6380 or Pelco (Type II) SM-0198-2 or equivalent. A minimum of two keys must be included for the main door of each cabinet.

(b) The cabinet door(s) must be provided with a three-point latch. The top and bottom must have rollers to secure the door in a closed position.

(c) When in the locked position, the lock must prevent the movement of the three-point latching mechanism.

(d) The cabinets must be provided with a means of externally padlocking the latching mechanism. A minimum of 3/8 inch diameter lock shackle must be accommodated.

(5) Door Opening.

The main door opening of all cabinets must be at least 80 percent of the area of the side which the door closes, exclusive of the area of plenums.

(6) Switch Compartment.

(a) A hinged switch compartment door must be mounted to the outside of the main cabinet door. The door must permit access to a switch panel but must not allow access to exposed electrical terminals or other equipment within the cabinet.

(b) In order to allow for the switch controls and storing of the manual control cord (if used), the switch compartment with the door closed must have minimum internal dimensions of 3 1/2 inches high, 7 1/2 inches wide, and 2 inches deep. Additionally, the volume must not be less than 70 cubic inches.

(c) Switch compartment doors must be equipped with a lock, which can be operated by a police key, Corbin Type Blank 04266 or Pelco type SM-0200 long keys, or equivalent. A minimum of two keys must be included for the switch compartment of each cabinet.

(7) The doors shall be weatherproof and prevent water from entering the cabinet.

I. Shelves.

The cabinet must be provided with two shelves for supporting the control equipment. The shelves must be at least 10 inches in depth. All cabinets must have a provision for positioning shelves to within 12 inches of the bottom of the cabinet and to within 6 inches of the top of the cabinet in increments not more than 1/2 inch.

J. Ventilation and Heater System.

All cabinets must incorporate a ventilation system to provide for the circulation of external air through the enclosure to remove excess heat, fumes, or vapors.

(1) Fan System

(a) Fan Type. The electric fan used in the cabinet must have a capacity of at least 100 cubic feet of air per minute. The fan must be rated a minimum

of 100 cubic feet per minute as designated by NEMA Standard TS2-2003, Section 7.9.1.

(b) Fan Controls. All cabinets must have a thermostat device to control the operation of the fan(s). The device switch-on point must be manually adjustable at least in the range from 80 degrees Fahrenheit to 120 degrees Fahrenheit. The device must have a differential between its switch-on point and its switch-off point. This differential must not be greater than 25 degrees Fahrenheit. The device must be located in the inside of the top of the cabinet not lower than 6 inches from the top of the cabinet.

(c) The filter size will be according to the provisions for the type of cabinet as stated in NEMA Standard TS2-2003, Section 7.9.2.3 and must be a replaceable pleated air filter with a Minimum Efficiency Reporting Value (MERV) rating of 5 or higher as defined by the ASHRAE 52.2-1999 specification.

## (2) Heater System

(a) Provide a DIN Rail mounted touch-safe 150 W Convection style Heater for all cabinets.

(b) The heater must be operated via an electrical hygrotherm device. The hygrotherm device must have an adjustable temperature range from 32 to 140 degrees Fahrenheit, adjustable humidity range from 50 to 90% RH. The output relay must have a rate of 6 amps resistivity with a SPDT relay type.

(c) Mount the heater within 18 inches of the cabinet bottom away from any warm temperature sensitive equipment.

## K. Intelligent Transportation System (ITS) Compartment

(1) When called for on the plans include a hinged compartment door mounted to the outside front of the cabinet, above the main door. The door will provide access shelf and DIN rail mounted ITS devices and electrical power components to power these devices.

(2) The ITS compartment door will have a minimum opening size:

	Height	Width
M30-ITS	8"	27"
M36-ITS	8"	33"
6-ITS	8"	41"

The depth of the compartment will be the full depth of the cabinet.

(3) The ITS compartment door is to be equipped with a Type 2 lock, cut for the Traffic Industry standard #1 key. A minimum of two keys must be included for the ITS compartment.

(4) Accommodations will be made to allow free air movement from the ITS compartment to the lower signal controller compartment.

(5) The ITS compartment will include U-channels mounted to the side of the compartment for mounting panels and DIN rails. Provide 2 channels on each side wall and on the back wall.

(6) Flexible conduit must be field installed from the bottom of the main signal cabinet section to the upper ITS compartment. The flexible conduit must be installed in such a way that wires and cables can be run in to the ITS compartment from the outside of the cabinet without accessing the main signal compartment.

#### L. Terminals and Facility.

##### (1) Scope.

This section defines the minimum acceptable requirements for terminal and facilities to interconnect the related devices within a traffic control cabinet. The terminal facility must conform to NEMA Standard TS2-2003 Section 5, Type 1 specifications.

##### (2) Mechanical Construction.

The terminal facility must conform to the following mechanical requirements.

###### (a) Terminal Identification.

All terminals must be permanently identified in accordance with the cabinet wiring diagram. Where through-panel terminal blocks are used, both sides of the panel must have the terminals properly identified with the terminal position number.

Identification must be permanently attached and close as possible to the terminal strip and must not be affixed to any part which is easily removable from the terminal block panel.

Each input or output terminated on a terminal block must be identified on the front of the panel by position number and function terminology (e.g., Ph 1 Red, Ph 2 Hold, etc.). The same identification must be used consistently on the cabinet wiring diagram.

(b) Component Identification.

All components which make up the basic terminal facility must be permanently identified in accordance with the cabinet wiring diagram. The following components are considered part of the basic terminal facility:

- (i) Load Switch Sockets.
- (ii) Flash Transfer Relay Sockets.
- (iii) Flasher Socket.
- (iv) Main and Auxiliary Circuit Breakers.
- (v) Radio Interference Suppressor and Surge Protector.
- (vi) Solid State Signal Power Relay.
- (vii) Power Terminal Bus Bars.

Where through-panel components are used, both sides of the panel must have the components properly identified by relative symbols (e.g., FRI, LS1, etc.).

Identification must be permanently attached and as close to the component as possible and must not be affixed to any part which is easily removable from the panel.

Each component must be identified on the front of the panel by symbol and function terminology (e.g., LF1 Filter, BR1 Signal Bus, etc.).

(c) Load Switch and Flasher Support.

Load switch and flasher bases must be so designed and constructed as to receive all such devices which may be manufactured to the maximum size requirements permitted under the NEMA TS2-2003 Standards Publication. All support(s) must be provided so that, as a minimum, it is supporting the flasher and load switch of the maximum size at some point(s) between 3 inches and 7 inches from the panel. At least 90 percent of the area beneath the load switch or flasher must be open to allow for the free flow of air across the load switches or flasher. There must be no obstruction within 1 inch above or below the units within the open area.

(d) Load Switch, Flasher, Flasher Transfer Relay, BIU Positions.

Wired load switch, flasher, flash transfer relay, and BIU sockets must be provided on the main load bay in the quantities listed below:

**TABLE 2: Load Switch, Flasher, Flash Transfer Relay and BIU Socket Quantities**

<b>Configuration</b>	<b>Load Switch</b>	<b>Flasher</b>	<b>Flash Transfer</b>	<b>TF BIU</b>
M30 and M30-ITS	12	1	6	2
M36 and M36-ITS	16	1	8	2
6 and 6-ITS	16	1	8	2

The flasher socket must be wired for a Type 3 solid state flasher conforming to Section 6.3 of NEMA Standard TS2-2003 specifications. Flashing of even numbered load switch output indications must be placed on one circuit and flashing for odd numbered load switch output indications must be placed on the other circuit. It must be possible to flash either the amber or red indication on any load switch outputs. It must be possible to easily change the flash indication from the front side of the panel using simple tools without the need to unsolder or re-solder connections.

Rack style mounting must be provided on the main panel to accommodate the two required terminal facility BIU's, consisting of a dual-row 64-pin female DIN 41612 Type B connector for each BIU rack position and card guides for top and bottom edges of the BIU. Terminal Facilities BIU mounting must be an integral part of the main panel.

(e) Terminal Blocks.

Terminal blocks must have mechanical characteristics to properly support the wiring connected without warping the terminal block. All materials including screws and threaded portions used in terminals and terminal blocks must be stainless steel or nickel plated brass.

(i) Field Terminal Blocks.

Field terminal blocks for all inputs and outputs for a fully expanded CU must be included. These blocks must be either single terminal type with through-panel connection on the rear side of the mounting panel or double binder head screw terminals. Either type of terminal block used must be of the correct ampacity for the application. Minimum acceptable ratings are 30 amperes, 300 V, with 10 - 32 binder head screws.

(ii) Control Terminal Blocks.

Control terminal blocks for inputs and outputs of the CU, MMU, flash transfer relays, load switches, etc., must be included. These blocks must be either single terminal type with through-panel connections or double binder head screw terminals. Either type of terminal block used must be

of the correct ampacity for the application. Minimum acceptable ratings are 15 amperes, 250 V, with 6-32 x 1/4 inch pan or binder screws.

Control terminal blocks for controller unit inputs and outputs must be provided on the main terminal facility panel and must be single terminal type with through-panel connections with a minimum acceptable rating of 15 amperes, 250 volts, with 6-32x1/4 pan or binder screws

Terminal blocks for monitor control circuits and main terminal facility panel electrical distribution must be provided on the main terminal facility panel and be a single terminal type with through-panel connections with minimum acceptable rating of 15 amperes, 250 volts, with 6-32x1/4 pan or binder screws. These terminals must be organized in a logical manor on the right-hand side of the load switches.

(iii) Detector Terminal Blocks.

Detector terminal blocks for loop and push button inputs must be included. These blocks must be either single terminal type with through-panel connections or double binder head screw terminals. Either terminal block must be of the correct ampacity for the application. Minimum acceptable ratings are 20 amps, 250 V with 8 - 32 pan or binder screws.

(f) Wiring Harnesses.

The CU, Cabinet Power Supply, and MMU harnesses must be neatly arranged and provided with the flexibility for the connectors to reach at least 40 inches from the top of the terminal block panel which must be mounted directly below the CU shelf. The harness connectors must not have any sharp edges and the stress relief attachment screws must not extend greater than 1/4 inch beyond the stress relief.

Terminal positions must be provided, completely wired and neatly arranged, providing access to inputs and outputs in the MMU. All MMU inputs must be terminated. Type select and port one disable inputs must be terminated.

Terminal positions must be provided, completely wired and neatly arranged, providing access to all inputs and outputs for the cabinet power supply.

Terminal positions must be provided, completely wired and neatly arranged, providing access to all inputs and outputs defined in NEMA Standard TS2-2003 Section 5.3.1 for Type 3 and Type 4 facilities. Additionally Input/Output terminal positions must be provided for quantity 8 pedestrian detect inputs.

Terminal positions must be provided, completely wired and neatly arranged, providing access to the CU TS2 inputs and outputs including AC line, AC neutral, Ground, Logic Common, and Fault Monitor. This harness is to be wired to a 55 position MSA type socket for connection directly to the controller unit without the need for an adapter.

(g) Power Distribution panel must be provided per NEMA Standard TS2-2003 Section 5.4.1 The panel must contain one 10-ampere circuit breaker to provide overload protection to the CU, MMU, BIU, +12/24 VDC cabinet power supply, and detection devices. It must also contain one main circuit breaker of 35 or 40 ampere, to provide over-load protection to the signal and flash buss load. All breakers must have line and load terminals clearly labeled.

The signal bus must be connected to the incoming AC line through a mercury contact switch or a solid-state control device functionally equivalent to the NEMA Standard TS2-2003 Section 5.4.2.3 specified contact switch. The terminals for AC line and AC neutral to the cabinet must be capable of accepting a No. 6 wire. With the CA 10 ampere and Main 35-40 ampere circuit breakers off (tripped), all units inside the cabinet and the intersection display must be off. With the 10-amp breaker on and main 35-40 ampere circuit breaker off, the signal output must be off and the major units within the cabinet must function. With the 10-amp breaker off and main 35-40 ampere circuit breaker on, the intersection must be in flash mode and all units within the cabinet will be off.

(i) Cabinet Surge Protection and Filtering.

A RFI Line Filter must be installed on the power panel per NEMA Standard TS2-2003 Section 5.4.2. The ampacity of the filter must be equal to or greater than the ampacity of the main circuit breaker. The filter must attenuate signals both line to load and vice versa. The attenuation in both directions to be a minimum of 50 decibels over the frequency range of 200 kHz to 75 MHz.

A Line Arrestor device must be installed and wired on the power panel per NEMA Standard TS2-2003 Section 5.4.2. The line arrestor is jack mounted using a 12 pin Beau type connector for ease of replacement and includes two LEDs for failure indicators. This device must be rated for 20,000 amps peak current, less than 3 nanosecond response time, and provide a minimum of 15 amps continuous current filtered power.

Provide a switched, surge protected, metal enclosed outlet strip. For the M30-ITS, M36-ITS, and 6-ITS include an additional outlet for the ITS compartment. This outlet strip is to provide a minimum 3,300 joule

suppression rating and is wired to the load side of one of the 15 amp compartment breakers. Ensure the outlet strip is mounted on the rails on the back of the cabinet in the compartment.

Provide a 3-electrode gas tube surge arrestor to the line of the compartment breakers which will be used for miscellaneous or auxiliary uses. The gas tube arrestor must be rated at 40,000 amps (8/20 impulse) with a 300-500 VDC break down voltage.

(ii) Solid State Signal Power Relay.

The terminal facility must include a SPST-NO signal power relay wired to provide power from the main circuit breaker and RFI filter to the AC signal power bus bar and load switches. The solid-state relay must be energized to provide power to the signal bus and have ampacity of 75 amps. It must provide zero voltage switching from 47 - 63Hz. The Signal Power Relay must be mounted on a panel on the lower right side of the controller cabinet and easily accessible for replacement.

(iii) AC-Common Bus Bar.

The AC-common (Neutral) must be terminated on a solid metallic multi-terminal bus bar that will accept 4 - 16 American Wire Gage (AWG) copper conductors. This bus bar must be insulated from the cabinet. Separate wires must be run from this bus bar to each unit or group of similar units in the terminal facility which requires AC-common connection. A quantity of one conductor only must be allowed in each termination position. A minimum of 12 open termination positions must be available for field wiring common return connections. A single lug attached to the Common Bus that accepts 2 AWG conductors must be provided.

(iv) Safety Ground Bus Bar.

The safety (Earth/Chassis) ground must be terminated on a solid metallic multi-terminal bus bar that will accept 4 - 16 AWG copper conductors. This bus bar must be connected to the cabinet. A quantity of one conductor only must be allowed in each termination position. A minimum of 12 open termination positions must be available for field wiring ground connections. Separate wires must be run from this bus bar to each unit or group of similar units in the terminal facility which requires safety ground connection. A single lug attached to the Ground Bus that accepts 2 AWG conductors must be provided.

(v) In addition to the three breakers and surge protected outlet strip, ensure the upper ITS compartment includes: GFI outlet wired to the load side of one of the 15 amp ITS compartment breakers, a minimum

6 position ground bus, LED lighting mounted above the air plenum above the door power via a door switch and the 10 amp ITS compartment breaker, and a minimum 12" long piece of DIN rail mounted across the channels on the back of the cabinet.

(h) Conductors.

All conductors used in the terminal facility wiring must be #22 AWG, or larger, with a minimum of 19 strands. Conductors terminated on the AC-Common Bus Bar and Safety Ground Bus bar must be tinned and a minimum size of #16 AWG. Conductors must conform to Military Specification MIL-W-16878, Type B or D. The insulation must have a minimum thickness of 10 mils and must be nylon jacketed polyvinyl chloride or must be irradiated cross-link polyvinyl chloride. Conductors #8 AWG must be UL Type THHN. All conductors used in the terminal facility wiring must conform to the following color-code requirements:

(i) The AC-common conductor of a circuit must be identified by a continuous white color.

(ii) The safety (Earth/Chassis) ground conductor of a circuit must be identified by a continuous green color or a continuous white color with one or more green stripes.

(iii) The AC line power conductor of a circuit must be identified by a continuous black color.

(iv) The low-level DC (+24 or less) conductor of a circuit must be identified by a continuous blue color.

(v) Other conductors, not conforming to one of the above, must be identified by any continuous color not defined above.

(i) Wiring (Power Distribution within the Facility).

All terminal facility wiring must be neat, firm, and routed, where practical, to minimize crosstalk and electrical interference.

All terminal facility conductors must be of sufficient size to carry the maximum current of the circuit or circuits they are provided for. They must be sized based on the ampacity ratings as follows:

**Table 5: Terminal Facility Conductor Size**

<b>AWG Wire Size</b>	<b>Ampacity Rating</b>
#22	5 Amps
#16	10 Amps
#14	15 Amps
#12	20 Amps
#10	30 Amps
#8	50 Amps

The ampacity ratings are calculated based on the current required to raise the temperature of a single insulated conductor in free air (86 degrees Fahrenheit ambient) to the limit of the insulation and applying a bundle de-rating factor of 0.5 for wires #22 AWG through #10 AWG and a de-rating factor of 0.7 for wires #8 AWG and #6 AWG.

The conductor feeding power from the main circuit breaker to the auxiliary breakers, solid state signal power relay, primary and secondary SPD terminal blocks, and AC+ signal power bus bar must have an ampacity of 40 amps.

The conductor feeding power to the flasher socket must have, as a minimum, an ampacity of 30 amperes.

The conductor feeding power from the AC+ signal power bus bar to each load switch socket must have an ampacity of 10 amperes and must be capable of being easily programmed to supply the load switch from another point or interrupt AC+ signal power to an individual load switch for special applications.

The conductors feeding power from the load switch to the field signal terminals must have an ampacity of 10 amperes.

The conductors feeding power from the flasher socket to the flash transfer relay sockets, which feed flashing power to same, must have an ampacity of 15 amperes. The remaining wires to and from the flash transfer relay socket, which are in the circuit between the load switch socket and the field signal terminals, are covered in the previous paragraph.

(j) Control Circuits.

(i) Flash Transfer Control.

The control circuit to the flash transfer relay sockets must be such as to provide flashing operation when the MMU or optional auxiliary

equipment calls for flash (e.g., police panel flash switch and/or maintenance panel). The flash transfer control must also conform to the following:

The flash transfer relay socket must be wired so the coil of the relay(s) must be de-energized for flashing operation. The flash transfer relay sockets must be located in close proximity to the load switches, flasher, and field signal terminals.

(ii) MMU Control.

The MMU must be wired to provide flashing operation when the fault relay de-energizes or if the MMU is disconnected. It must also provide AC line power to the CU by via the Start Delay contacts.

(iii) Logic Common, +24 volts, and AC common must be wired from the source in a "loop" to each load switch so that an open fault at any one point will not prevent the load switches from working properly.

AC common and 120 volts AC to the coils of the Flash Transfer relays must be wired in a "loop" from the source so that an open fault at any one point will not prevent the relays from working properly.

(3) Field Wire Terminal Locations.

The terminal facility must provide Field Wire Terminals located to conform to the following requirements:

- (a) AC Service Hookup. Incoming AC power service must terminate on the right side of the cabinet on the power distribution panel.
- (b) Signal Hookup. Signal wires must terminate on terminal blocks on the back of the cabinet at least 3 inches but not over 6 inches from the bottom of the cabinet.

Signal terminals must be directly accessible from the front of the cabinet. One terminal must be provided for each load switch output.

- (c) All cabinets must incorporate a 16-channel detector rack and panel, configuration #2, as per NEMA Standard TS2-2003 Section 5.3.4

(4) Auxiliary Equipment.

- (a) The terminal facility must include provisions for the following equipment in a panel accessible from a police door on the front of the cabinet.

(i) Signals On-Off Switch.

A signals on-off switch must be included, installed, and wired. The switch and wiring must energize or de-energize the solid-state signal power relay. AC signal power must not be routed through this switch. The switch must be labeled "Signal-Off". When in the "Off" position, all signal field terminal must be de-energized and the Red Enable input to the MMU must be inactive.

(ii) Flash Normal Switch.

A flash-normal switch must be included. When in the Flash position, the flash transfer relays and solid-state signal power relay must be de-energized, resulting in flash being displayed to traffic. Neither AC signal power nor flashing power must be routed through this switch. The switch must be labeled "flash-normal". When the switch is returned to the "Normal" position, the signals must return to the initialization phase and begin cycling.

Operation of the signal-off switch must override this switch. That is, when in the "Off" position, the signal-off switch prevents flashing operation as called for by all flash control circuits.

(b) Maintenance Panel Options.

(i) Stop Time Switch.

A stop time switch must be provided in a panel on the inside of the front cabinet door. The switch and wiring must provide three modes of operation which are:

1) Normal.

"Stop time" to the CU must be provided as required by the MMU.

2) Run.

"Stop time" is prevented from being applied to the CU from other devices.

3) Stop.

"Stop time" is applied to the CU.

This switch must be labeled "Stop-Run-Normal".

(ii) Duplex Receptacle.

A duplex receptacle of a three-wire ground fault interrupter (GFI) type must be provided in a panel on the inside of the front cabinet door per NEMA Standard TS2-2003 Section 5.4.2.6.

## (c) Cabinet Lighting.

(i) An LED lighting panel with door actuated switch per NEMA Standard TS2-2003 Section 5.4.2. is to be provided. The LED lighting panel must have an operating temperature range of -40 to 150 degree Fahrenheit. The panel must operate at not more than 9 watts and produce not less than 115 lumens per watt and be rated for a minimum of 90,000 hours of continuous operation.

## (5) Prints, Functional Data, and Parts List.

The manufacturer must supply each of the following items with each cabinet:

(a) Two complete set of schematic and wiring diagrams of the cabinet and terminal facilities.

(b) Cabinet mounting diagram.

(c) Complete parts list of cabinet and accessories.

Each of these items must apply directly to the cabinet with which it is applied. One set is to be put in the installed cabinet, and one set is to be furnished to the maintaining agency.

## 2. Traffic Control Cabinet Accessories

For projects bidding through RCOC for the sole purpose of RCOC Signal Maintenance Department (District 8) stock: Pack all cabinet accessories in separate boxes and label with accessory description.

## A. Scope.

This section defines the minimum acceptable requirements for plug-in accessories for the traffic controller assembly within a traffic control cabinet. Accessories are to be provided in quantities listed in table 6 below.

**Table 6: Accessory Quantities (ea)**

Cabinet	CPS	MMU	Flasher	Flash Relay	Load Switch	BIU
M30 and M30-ITS	1	1	1	4	12	3
M36 and M36-ITS	1	1	1	6	16	3
6 and 6-ITS	1	1	1	6	16	3

B. A shelf mount Cabinet Power Supply (CPS) is to be provided with each controller assembly and is to adhere to the guidelines of NEMA Standard TS2-2003 Section 5.3.5. The power supply must be encased on all sides so that no circuitry is exposed to the user.

C. A Malfunction Management Unit (MMU) is to be provided with each controller assembly. The MMU must be in accordance with the standards of NEMA Standard TS2-2003 Section 4. The MMU is to be wired to monitor each load switch output.

D. A two-circuit flasher is to be provided with each controller assembly. The flasher will conform to Section 6.3 of the NEMA Standard TS2-2003 Standards Publication. The flasher must be rated at 15 amperes, double pole with a nominal flash rate of 60 flashes per minute.

E. Flash transfer relays must be provided with each cabinet conforming to the requirements of Section 6.4 of the NEMA Standard TS2-2003 specifications. Quantity provided to conform to Table 6.

F. Load switches must be provided with each cabinet conforming to the requirements of NEMA Standard TS2-2003 Section 6.2 specifications. Quantity provided to conform to Table 6.

G. Bus Interface Units (BIU) must be provided with each cabinet conforming to the requirements of NEMA Standard TS2-2003 Section 8 specifications. Quantity provided to conform to Table 6.

### 3. Exceptions

This specification does not include any proprietary items or devices which would preclude any equipment manufacturer from reproducing equipment to meet these specifications. All technical tolerances, ratings, and technically specified criteria contained within these specifications are currently being met by commercially available equipment. The fact that a manufacturer chooses not to produce equipment to meet these specifications, providing the above criteria are met, will not be considered sufficient cause to adjudge these specifications as restrictive.

### 4. Guarantee and Warranty

As a minimum, each control cabinet must be guaranteed against defects in materials and workmanship for a period of 18 months from date of shipment. Details of the manufacturer's guarantees and warranties must be supplied with the bid. The warranty offered by the manufacturer must be assigned to the Road Commission for Oakland County. If requested by the Engineer, supply manufacturer's warranty or

guarantee documents from the manufacturer and a copy of the invoice showing date of shipment.

#### 5. Packing and Marking

Except as otherwise specified in the request for quotation, each control cabinet must be packed separately in such a manner that there will be no injury or defacement to the control cabinet during transportation to the point of destination. Each carton must be legibly marked with the controller description, purchase order number, and vendor's name.

For projects bidding through RCOC for the sole purpose of RCOC Signal Maintenance Department (District 8) stock: Pack all cabinet accessories in separate boxes and label with accessory description.

#### 6. Sampling, Testing and Basis of Acceptance

One or more control cabinets may be selected at random from the shipment and tested in accordance with Road Commission for Oakland County (RCOC) methods for compliance with the requirements of these specifications. If so notified by RCOC, the vendor must complete one controller for preliminary testing and inspection to determine compliance with these specifications. If this one control cabinet conforms to these specifications, the vendor will be notified in writing and must furnish the remainder of the order, which will be subject to testing in accordance with RCOC methods. If the preliminary sample does not conform to these specifications, either the order will be canceled or the vendor will be notified, in writing, of all deficiencies so that the necessary changes or corrections to all cabinets on the purchase order may be made. The entire order will then be subject to testing in accordance with RCOC methods.

The Basis of Acceptance is at the sole discretion of the Road Commission for Oakland County. If the cabinet is not found to be acceptable, the rejected cabinet a new cabinet must be provided at no additional cost. The Contractor/Supplier must provide a detailed accounting (cut sheet) of all equipment supplied with the cabinet.

Acceptance - Provide General Certification per the MDOT's *Materials Quality Assurance Procedures Manual* to the Engineer that the materials meet the requirements specified herein.

At the sole discretion of the Engineer, caulk may be visually inspected.

- Seal the cabinet base to the concrete with a silicone caulk bead.
- Seal any space between conduit entering the controller and the foundation with silicone caulk.

#### 7. Patented Processes and Materials

The vendor must defend any and all patent infringement suits resulting from the use of any design, device, material or process, or portion or phase thereof, employed in the manufacture or use of said controllers in accordance with the Road Commission for Oakland County's plans and specifications, and must save harmless and indemnify RCOC on account of any and all such suits or claims for royalties, damages, or costs.

#### 8. Delivery

The pay item must include the cost of delivery to the Road Commission for Oakland County, 2420 Pontiac Lake Road, Waterford, MI 48328.

#### 9. Delivery Claims for Extensions of Time

Delivery delay claims by the Contractor for Extensions of Time will not be considered unless two or more letters from different local traffic signal suppliers (Metro Detroit area) are supplied to the engineer within 14 calendar days of contract award.

Any delay (material shortages, pandemics, shipment delays, supply chain delays, delayed deliveries as a result of an industry-wide shortage, etc.) will not be considered unless the contractor/supplier letter is accompanied by an FHWA letter declaring a nationwide shortage of cabinets or a specific material.

Delivery claims may be considered for a claim for an extension of time for completion as determined reasonable by the Engineer, but will not be considered the basis for a claim for extra compensation or an adjustment in contract unit prices.

### **c. Construction**

All work must be in accordance with the contract documents.

The cabinet shall be placed on a level concrete foundation for ground mount cabinets.

Caulk base of cabinet per RCOC Signal Details.

**d. Measurement and Payment**

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item(s).

<b>Pay Item</b>	<b>Pay Unit</b>
Cabinet, ITS Type, RCOC.....	Each
Cabinet, ITS Type, Salv, RCOC.....	Each
Cabinet, ITS Type, Delivered, RCOC.....	Each

**Cabinet, ITS Type, RCOC (Ea)** will be measured as a unit. The unit shall be as indicated on plans. The contract unit price each shall be payment in full for installing the traffic signal cabinet, and accessories required to provide the traffic signal control operation as shown on the plans and in accordance with the MMUTCD and this special provision.

**Cabinet, ITS Type, Salv, RCOC (Ea)** will be measured as a unit. The unit shall be as indicated on the plans. The contract unit price each shall be payment in full for pick up and installing the controller and cabinet complete on the steel or wood pole or on a concrete foundation (if required) and furnishing and installing all necessary equipment, hardware, conduit risers, sealing of conduit entrances, cable, wiring, necessary rewiring of signal head(s) and grounding all as specified herein and as shown on the plans.

**Cabinet, ITS Type, Delivered, RCOC (Ea)** will be measured as a unit. The unit shall be as indicated on plans. The contract unit price each shall be payment in full for furnishing and delivering to RCOC for set-up of the cabinet as specified herein and as shown on plans. The unit price shall include transporting the cabinet from RCOC to the job site for installation.

ROAD COMMISSION FOR OAKLAND COUNTY

SPECIAL PROVISION  
FOR  
**DIGITAL TRAFFIC SIGNAL CONTROLLER**

RCOC/TOC

PAGE 1 OF 3

RCOC20SP820G

ORG:04-11-22

REV: 03-01-25

**a. Description**

This work shall be done in accordance with section 818, 819, 820, 918, and 921 of the Standard Specifications for Construction, except as herein provided.

This work consists of furnishing, delivering, and installing a traffic signal controller, *NEMA* Advanced Transportation Controller (ATC) type.

**b. Materials**

All work must be in accordance with the contract documents.

Provide materials meeting the requirements in sections 918 and 921 of the Standard Specifications for Construction and this special provision.

1. Controller Unit (CU)

A. Provide a CU from the following list. Confirm the appropriate firmware version with the Engineer prior to ordering. No additional payment will be made based on the firmware version provided:

(1) Econolite Group, Inc.

- (a.) Controller Software: EOS NEMA TS2 Fully-Actuated Advanced Traffic Controller Software version 03.2.15.
- (b.) Cobalt by Econolite
- (c.) Basic display with text and textual menus only – no touch screen
- (d.) TS2 Type 2 connector

(2) Yunex Traffic/Siemens

- (a.) Controller Software: SEPAC Fully-Actuated Advanced Traffic Controller Software version 3.58d.
- (b.) Siemens m60 Linux Series Controllers

(3) Approved equal. The approval of submitted alternate models may take several months. Requests to use an alternate model will not be justification for project delays.

- B. Provide materials and associated software and drivers conforming to the following:
    - (1) ATC 5201 v06.25 Advanced Transportation Controller (ATC) Standard Version 06 for use in NEMA TS-1 or TS-2 Cabinets.
    - (2) NTCIP 1202 v02, Object Definitions for Actuated Signal Controllers (ASC) Interface Published November 2005.
    - (3) NEMA Standards Publication TS 2-2021 Traffic Controller Assemblies with NTCIP Requirements Version 03.08.
  - C. Controller shall function with RCOC Digital / ITS Type NEMA TS2 Cabinet Special Provision.
2. Delivery
- A. The pay item shall include the cost of delivery to the Road Commission for Oakland County (RCOC), 2420 Pontiac Lake Road, Waterford, MI 48328.
  - B. Packing and Marking. Ensure each CU is packed separately in such a manner that there will be no injury or defacement to the CU during transportation to the point of destination, unless otherwise specified in the contract. Ensure each carton is legibly marked with the CU description, purchase order number, and vendor's name.
3. Warranty and Guarantee
- Provide materials with a manufacturer's warranty/guarantee, transferable to the Road Commission for Oakland County, that the supplied materials will be free from all defects in materials and workmanship for 1 year for CU software and 2 years for CU hardware from the date of final project acceptance. If requested by the Engineer, supply manufacturer's warranty and guarantee documents from the manufacturer and a copy of the invoice showing date of shipment.
4. Acceptance
- Provide General Certification per the MDOT's *Materials Quality Assurance Procedures Manual* to the Engineer that the materials meet the requirements specified herein.

### **c. Construction**

Complete this work in accordance with sections 819, 818, and 820 of the Standard Specifications for Construction, as shown on the plans and as directed by the Engineer.

1. Submittals / Working Drawings

Submit a detailed dimensional drawing of all equipment, material specification list which shows the materials to be used, equipment to be furnished, material documentation that meets this specification, and assembly/installation method.

- A. Submit controller unit
- B. Submit software version

**d. Measurement and Payment**

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item(s):

<b>Pay Item</b>	<b>Pay Unit</b>
Controller, Digital Type, Delivered, RCOC.....	Each
Controller, Digital Type, Delivered, SCATS, RCOC .....	Each

**Controller, Digital Type, Delivered, RCOC and Controller, Digital Type, Delivered, SCATS, RCOC (Each)** will be measured as a unit. The unit shall be as indicated on plans and the contract unit price each shall be payment in full for all labor, equipment, and materials required to:

- 1. Furnishing and delivering the controller to the RCOC for controller timing and setup.
- 2. Transporting the controller from the RCOC to the job site for installation.
- 3. Install the traffic signal controller unit (CU), and accessories required to provide the traffic signal control operation as shown on the plans and in accordance with the MMUTCD and this special provision.

ROAD COMMISSION FOR OAKLAND COUNTY

SPECIAL PROVISION  
FOR  
**PEDESTAL, ALUM**

RCOC/TOC

PAGE 1 OF 2

RCOC20SP820J

ORG:05-07-21

REV: 03-01-25

**a. Description**

This work consists of aluminum pedestals with octagonal base according to the plans and sections 820 and 921 of the Standard Specification for Construction except as herein provided.

This specification is for a pedestal suitable for mounting traffic signals equipped with slip fitters for 4" nominal size pipe. The overall height of the pedestal shall be as shown on the contract documents, typical signal construction details, and to provide the signal mounting height. The pedestal shall conform to the minimum specifications given below, but consideration will be given to features of design, construction, and workmanship.

**b. Materials**

All work must be in accordance with the contract documents.

1. Octagonal Aluminum Pedestal Base

Provide octagonal shape pedestal base.

The octagonal aluminum base shall be fabricated free of voids, pits, dents, molding sand and excessive foundry grinding marks. All corners shall be smooth and intact. Exterior surface finish shall be smooth and cosmetically acceptable by being free of molding fins, cracks and other exterior blemishes.

The octagonal aluminum base shall accommodate bolt circles from 12 inches to 14½ inches. The base shall be designed to accommodate (4) anchor bolts from 5/8 inch to 3/4 inch in diameter. There shall be slots in the bottom of the base 1½ inches wide and 2½ inches long to allow adjustment for anchor bolt placement.

Must meet MDOT Detail SIG-070-A Note #4 for pedestal base requirements:

A. Pedestal base must meet the requirements of National Cooperative Highway Research Program Report 350 (NCHRP 350) or Manual for Assessing Safety Hardware (MASH) and have Federal Highway Administration (FHWA) acceptance. Pedestal base must also be certified to have a 4-inch maximum stub height after the support has broken away from its base, as specified in the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals and the AASHTO Roadside Design Guide.

2. Aluminum Pedestal Poles

Provide aluminum pedestal poles material in accordance with section 921 of the Standard Specification for Construction except as provided in RCOC detail OC-5A.

The aluminum pedestal pole shall consist of aluminum alloy 6063-T6.

The threaded end of the pole shall have a protective cap installed to prevent thread damage. A cardboard sleeve shall cover the entire length of the shaft to protect the surface finish during shipment and storage.

3. Acceptance

Provide General Certification per the MDOT's *Materials Quality Assurance Procedures Manual* to the Engineer that the materials meet the requirements specified herein.

**c. Construction**

All work must be in accordance with the contract documents.

1. Submittals / Working Drawings

Submit a detailed dimensional drawing of all equipment, material specification list which shows the materials to be used, equipment to be furnished, material documentation that meets this specification, and assembly/installation method.

**d. Measurement and Payment**

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item(s).

<b>Pay Item</b>	<b>Pay Unit</b>
Pedestal, Alum, RCOC.....	Each
Pedestal, Alum, Salv, RCOC.....	Each

**Pedestal, Alum, RCOC (Ea)** will be measured as a unit. The contract unit price each shall be payment in full for furnishing and installing pedestal, fittings, ground rod(s), ground wire and such other material as may be required to provide a complete and operating job as specified herein as shown on the plans.

**Pedestal, Alum, Salv, RCOC (Ea)** will be measured as a unit. The contract unit price each shall be payment in full for furnishing and installing (salvaged) pedestal, hardware, connectors, wiring, service cables, conduits, grounding, fittings, ground rod(s), ground wire and such other new material as may be required to provide a complete and operating job as specified herein and as shown on the plans.

## CITY OF ROCHESTER HILLS

### UTILITY COORDINATION

N&F: SWS

1 of 2

02/02/26

The contractor shall cooperate and coordinate construction activities with the owners of utilities as stated in subsection 104.08 of the Standard Specifications for Construction. In addition, for the protection of underground utilities, the contractor shall follow the requirements in subsection 107.12 of the Standard Specifications for Construction. Contractor delay claims, resulting from a utility, will be determined based upon subsection 108.08 and 109.05 of the Standard Specifications for Construction.

#### **Description**

The following public utilities have facilities located within the right of way:

#### **Electric:**

DTE Energy  
37849 Interchange  
Farmington Hills , MI 48335  
Contact: Carl Ford (248) 427-3947  
[FordC@dteenergy.com](mailto:FordC@dteenergy.com)

#### **Telephone:**

AT&T  
54 N. Mill Street  
Pontiac, MI 48342  
Contact: Matthew Sliwa (248) 877-0762  
[ms6913@att.com](mailto:ms6913@att.com)

#### **Cable Television:**

WOW Network  
950 E. Whitcomb  
Madison Heights, MI 48071  
Contact: Frank Binaghi (248) 677-9008  
[FBinaghi@wideopenwest.com](mailto:FBinaghi@wideopenwest.com)

#### **Cable Television :**

Comcast  
25626 Telegraph Road  
Southfield, MI 48033  
Contact: Mike Marlow (248) 809-2707  
[Michael\\_Marlow@comcast.com](mailto:Michael_Marlow@comcast.com)

#### **Cable Television:**

WOW Network  
950 E. Whitcomb  
Madison Heights, MI 48071  
Contact: Frank Binaghi (248) 677-9008

#### **Cable Television:**

AT&T  
54 N. Mill Street  
Pontiac, MI 48342  
Contact: Jeff Heath (248)975-4588  
[jh1786@att.com](mailto:jh1786@att.com)

#### **Natural Gas:**

Consumers Energy Groveland Service Center  
14500 Dixie Highway  
Holly, MI 48442  
Contact: Cheri Payne (248) 769-5704  
[Cheri.payne@cmsenergy.com](mailto:Cheri.payne@cmsenergy.com)

#### **Cable Television / Fiber Conduit:**

123 NET  
24700 Northwestern Hwy  
Southfield, MI 48075  
Contact: Amanda Griffith (248) 228-8286  
[agriffith@123.net](mailto:agriffith@123.net)

On all projects: "Three Working Days before you Dig – Call MISS DIG (800)482-7171" or call 811.

Existing service facilities, which are located within grading limits, will be moved or adjusted by the owners to locations or elevations designated by the Engineer. Owners of public utilities will not be required by the City to move additional poles or structures in order to facilitate the operation of construction equipment unless it is determined by the Engineer that such poles or structures constitute a hazard to the public or are dangerous to the Contractor's operations.

The Contractor shall notify and coordinate with the appropriate utility company representative(s) for raising or lowering of existing utility company manhole castings, prior to construction. Said manhole adjustments are as noted on the plans.

CITY OF ROCHESTER HILLS

SPECIAL PROVISION  
FOR  
**PERMIT / PRIVATE UTILITY FEES**

NFE:SWS

1 of 1

01/25/26

**a. Description.** This special provision describes the way the reimbursement, for permit fees or private service provider fee, as stated in section 107 of the Standard Specifications for Construction, and otherwise noted below, will be paid.

**b. Materials.** None specified.

**c. Construction.** None specified.

**d. Measurement and Payment.** Any permit fees required by outside agencies, or direct costs from service providers for associated work required for the project, as described in section 107 of the Standard Specifications for Construction, will be paid for using the following pay item:

<b>Pay Item</b>	<b>Pay Unit</b>
Permit / Private Utility Fees .....	Dollar

**Permit / Private Utility Fees** includes the reimbursement for the eligible permit or service provider fees with supporting receipts or other proof of payment documentation from the Contractor. No markup of fees will be considered for reimbursement.

CITY OF ROCHESTER HILLS  
SPECIAL PROVISION  
ADAMS ROAD TRAFFIC CONTROL

NFE:SWS

1 of 2

01/25/26

**Description:** This work consists of furnishing, installing, maintaining, relocating, and removing all traffic control required for construction operations on Adams Road, including all barricades, channelizing devices, temporary traffic control devices, and construction signage. All traffic control shall be in accordance with the Michigan Manual on Uniform Traffic Control Devices (MMUTCD) and the requirements of the Road Commission for Oakland County (RCOC). The work on Adams Road will be completed in phases and will require movement, adjustment, and updating of traffic control devices and construction signage.

**Materials / Construction:** All barricades, drums, cones, signs, and channelizing devices shall meet MMUTCD and RCOC standards. Construction signing and traffic control layouts shall be in accordance with the approved plans, typical details, and permit requirements. The Contractor shall install, move, modify, and update traffic control devices and signage as required to accommodate phased construction operations. The Contractor shall maintain all traffic control devices in proper position, clean, and in serviceable condition at all times. The Contractor shall be responsible for providing and maintaining safe access for emergency vehicles, local traffic, and adjacent properties at all times. Any damaged, missing, or non-compliant traffic control devices shall be immediately replaced at no additional cost. Any modifications, relocations, or additional traffic control measures required by the Road Commission for Oakland County shall be implemented by the Contractor at no additional cost to the Owner.

**Measurement and Payment:** Payment shall include all labor, materials, equipment, maintenance, relocations, updates, and incidentals required to provide complete traffic control for Adams Road for the duration of the project, including phased construction and any changes required by RCOC.

**Pay Item Pay Unit**

Traffic Control - Adams ..... Lump Sum

CITY OF ROCHESTER HILLS  
SPECIAL PROVISION  
PAVEMENT REMOVALS

NFE:SWS

1 of 1

01/25/26

**Description:** This work consists of removing existing pavement of any type and any thickness in accordance with the Michigan Department of Transportation (MDOT) Standard Specifications for Construction, except as modified herein. Pavement removal includes, but is not limited to, asphalt pavement, concrete pavement, composite pavement, brick pavers, and other pavement types encountered within the project limits.

**Materials / Construction:**

The Contractor shall remove pavement regardless of thickness without additional compensation.

Removal operations shall be performed in a manner that minimizes damage to adjacent pavement, curbs, sidewalks, utilities, and drainage structures.

The Contractor shall properly dispose of or recycle removed pavement materials in accordance with MDOT and applicable local requirements.

Areas disturbed by pavement removal shall be left in a condition suitable for subsequent construction operations.

Saw cutting will not be paid for separately but shall be included in pavement removal item.

**Measurement and Payment:** Payment shall include all labor, materials, equipment, disposal, recycling, protection of adjacent features, and incidentals required to remove pavement of any type and any thickness.

**Pay Item Pay Unit**

Pavt Rem, Modified ..... Square Yard

CITY OF ROCHESTER HILLS

SPECIAL PROVISION  
FOR

**MACHINE GRADING, MODIFIED**

N&F: SWS

1 of 3

1/25/26

**a. Description**

This work shall be done in accordance with the requirements of the Standard Specifications for Construction, section 205, except as described herein and other earthwork technical specifications within the contract:

This work consists of performing machine grading to construct finished subgrades and finished grades in accordance with the plans and these specifications. The work includes rough grading, fine grading, shaping of slopes, embankments, swales, detention features, and preparation of subgrades for pavements, building pads, playground, trails, landscaped areas, and other park improvements.

**b. Materials**

Furnish embankment material in accordance with section 205 of the Standard Specifications for Construction, Earthwork specification or as approved by the Engineer.

Any of the existing material that is excavated and deemed suitable, as determined by the Engineer, may be used for embankment material. The Contractor shall be responsible for the proper disposal of any existing material that is excavated and deemed unsuitable by the Engineer.

**c. Equipment**

If the earthwork contractor intends to utilize GPS machine control, submit machine control system information, including control points, calibration procedures, and verification methods, prior to use. Maintain conventional survey stakes at critical locations as directed by the Engineer for independent verification. Machine control use does not relieve the Contractor of responsibility for meeting grade tolerances.

**d. Construction**

Complete this work in accordance with the standard specifications. The work includes, but is not limited to, the following:

Strip and stockpile all existing topsoil.

Perform rough grading to bring surfaces to within  $\pm 0.3$  feet of required subgrade elevations.

Shape areas to approximate final lines and grades, maintaining drainage toward designated outlets.

Remove unsuitable materials encountered and replace with approved materials as directed by the Engineer.

Scarify subgrade surfaces to a minimum depth of 6 inches prior to compaction.

Adjust moisture content to achieve specified compaction.

Compact subgrades to the following minimum requirements unless otherwise shown on the plans. Rework areas failing to meet compaction requirements.

Fine grade surfaces to the lines and grades shown on the plans.

Provide smooth, uniform transitions free of abrupt changes, depressions, or irregularities between all new pavement edges or transitions to fences or other site features.

Construct slopes, embankments, and detention basin features to the lines and grades shown on the plans. Placement of pond clay liner is also included,

Place embankment material in lifts not exceeding 8 inches loose thickness unless otherwise approved by the Engineer. Compact each lift to the specified density prior to placement of subsequent lifts.

Dress slopes to a smooth, uniform condition suitable for erosion control, seeding, or turf establishment.

Grade all areas to provide positive drainage and prevent ponding as needed and per drawings.

Protect graded areas from damage due to construction traffic, weather, or erosion. Regrade and recompact areas disturbed by subsequent construction activities at no additional cost to the Owner.

All grading within the playground area to allow for concrete and poured in place materials should be included. Grading as needed to establish building pads is included.

Earthwork required to complete the earth mound as detailed on the construction plans shall be included in Machine Grading, Modified.

**e. Measurement and Payment**

The completed work, as described, will be measured and paid for the contract unit price using the following pay items:

<u>Pay Item</u>	<u>Pay Unit</u>
Machine Grading, Modified.....	Lump Sum

The hauling and installation of any off-site material that may be required for embankment will not be

paid for separately but shall be included in the pay item for Machine Grading, Modified.

The Contractor shall be responsible for determining his own volume of earthwork required to construct the project features to the proposed grade elevations specified in the construction drawings. No additional compensation will be made for the final net amount of earth excavation or imported fill required to construct the project.

All pavement, curb and gutter, and sidewalk removals will be paid for separately under applicable pay items. The Contractor will provide labor, materials, and equipment necessary to meet all applicable Michigan Frost Law requirements, which will not be paid for separately, but will be included in other pay items in the contract. Grading required for Adams Road widening will be paid for separately.

CITY OF ROCHESTER HILLS  
SPECIAL PROVISION  
ADAMS ROAD STATION GRADING

NFE:SWS

1 of 1

01/25/26

**Description:** This work shall consist of performing station grading in accordance with the Michigan Department of Transportation (MDOT) Standard Specifications for Construction, as modified herein, for all grading work within Adams Road right-of-way (ROW). Work includes, but is not limited to, earth excavation, embankment, shaping, trimming, restoration, and final grading necessary to complete the work as shown on the plans.

**Materials / Construction:**

All station grading shall conform to the applicable sections of the MDOT Standard Specifications for Construction, except as modified by this special provision. Grading operations shall be coordinated with phased construction and traffic control requirements for Adams Road. The Contractor shall protect existing pavement, curb and gutter, sidewalks, utilities, drainage structures, and other appurtenances within the ROW. Any damage shall be repaired or replaced at no additional cost. Final grading shall match existing and proposed grades and provide positive drainage. Disturbed areas within the ROW shall be restored in accordance with Road Commission for Oakland County (RCOC) requirements and is to include placement of 3” screened topsoil and placement of Class A Hydroseed. Watering is not paid for separately but shall be completed as needed to meet restoration acceptance criteria as noted in Turf and Grasses.

All roadside ditch grading or fill placement shall be included in Station Grading item. Replacement of any disturbed gravel shoulders shall also be included in the item, in accordance with plan details and sections.

Any grading required in drives or road intersections to prepare for aggregate placement / paving shall be included.

**Measurement and Payment:** Payment shall include all labor, materials, equipment, and incidentals required to provide complete grading and restoration work associated with Adams Road widening.

**Pay Item Pay Unit**

Station Grading, Modified ..... Station

CITY OF ROCHESTER HILLS  
SPECIAL PROVISION  
**EARTHMOUND UNDERDRAIN**

NFE:SWS

1 of 1

01/25/26

**Description:** This work consists of furnishing and installing underdrain piping in accordance with the Michigan Department of Transportation (MDOT) Standard Specifications for Construction, as modified herein, for special placement within an earth mound feature to provide pathway and side slope drainage. Work includes all underdrain pipe, geotextile sock liners, backfill, fittings and outlets / associated appurtenances as shown in the construction plan cross sections.

**Materials / Construction:**

Underdrain pipe shall meet MDOT requirements for underdrain systems and shall be of the size, type, and material shown on the plans.

All underdrain pipe shall be provided with a factory-installed geotextile sock liner meeting MDOT specifications.

Backfill and filter material shall meet MDOT requirements and shall be placed and compacted in accordance with the plans and MDOT specifications.

Installation shall follow the earth mound, pathway, per cross sections shown in the plans to ensure proper drainage and performance.

The Contractor shall ensure positive drainage and proper outlet connections as shown on the plans.

Care shall be taken to prevent contamination of the drainage aggregate and geotextile during construction.

**Measurement and Payment:** Payment shall include all labor, materials, equipment, pipe, geotextile sock liner, granular backfill, placement, compaction, and incidentals required to complete the work in accordance with this provision and the plan cross sections.

**Pay Item Pay Unit**

Underdrain, Subbase, 4 inch, Modified.....Foot

**CITY OF ROCHESTER HILLS**  
**SPECIAL PROVISION FOR**  
**MODIFIED AGGREGATE SURFACE COURSE**

NFE : SWS

1 of 1

01/25/26

**Description:** This special provision describes requirements for furnishing and placing Modified Aggregate Surface Course in accordance with the 2020 Standard Specifications for Construction and as modified by plan cross section and herein. This work includes providing a compacted aggregate surface course for use on paths or designated locations as shown on the plans or directed by the Engineer.

**Materials.** Furnish Modified Aggregate Surface Course meeting the requirements of Section 902 and Section 302 of the 2020 Standard Specifications for Construction, except as modified herein. Aggregate shall be a dense-graded, crushed aggregate material capable of providing a stable, well-compacted surface. The material shall be free of organic matter, debris, and other deleterious substances. In addition to the 21AA aggregate, limestone fines meeting the gradation noted on the plans shall be placed for the final 2”.

**Construction:** Place Modified Aggregate Surface Course in accordance with Section 302 of the 2020 Standard Specifications for Construction, except as modified herein.

Prepare the subgrade in accordance with Section 205. Place aggregate in uniform lifts not exceeding 4 inches in loose thickness. Compact each lift to the satisfaction of the Engineer using approved mechanical compaction equipment.

Shape and fine grade the surface course to the lines, grades, and cross sections shown on the plans. The finished surface shall be smooth, firm, and free of ruts, segregation, or loose material. Add water as necessary to achieve proper compaction and surface stability.

Where specified, place 2” of limestone fines to achieve a tight, stable walking or driving surface.

**Measurement and Payment:** Aggregate Surface Course will be measured and paid for in accordance with Section 302 of the 2020 Standard Specifications for Construction and as follows:

<b>Pay Item</b>	<b>Pay Unit</b>
Aggregate Surface Course, 6 inch, Modified .....	Square Yard

Payment for Modified Aggregate Surface Course includes furnishing, hauling, placing, watering, grading, shaping, compacting, and all labor, equipment, and materials necessary to complete the work as specified.

CITY OF ROCHESTER HILLS

SPECIAL PROVISION  
FOR  
**HELICAL PILES**

NFE: SWS

1 of 11

8-02-24

**a. Description.** This work consists of designing, furnishing, installing, and load testing helical piles and bracket assemblies in accordance with the project plans, industry standard design methodology, the standard specifications, and this special provision. Install each helical pile at the location and to the elevation, minimum length, and load capacities shown on the plans.

The following definitions apply when used herein and on the plans:

**Allowable Pile Capacity.** Ultimate pile capacity divided by a factor of safety as designated on the plans. If the factor of safety is not designated on the plans then the factor of safety will be 2.0.

**Alignment Load (AL).** A small load applied to a helical pile during testing to keep the testing equipment correctly positioned.

**Brackets.** Cap plate or other termination device that is bolted, slipped over, or welded to the end of a helical pile after completion of installation, to facilitate attachments to structures or embedment in cast-in-place structures.

**Designer.** A Professional Engineer, licensed in the State of Michigan, who is retained by the Contractor and is responsible for the design and working drawings required herein.

**Elastic Movement.** The recoverable movement measured during a helical pile test.

**Extension Section.** Helical pile section(s), which follow the lead section into the ground and extend the helical lead to the appropriate depth. Extension section(s) consist of a central shaft and may have helical bearing plates affixed to the shaft.

**Helical Pile.** Manufactured steel foundation element with one or more helical bearing plates that is rotated into the ground to support structures. The element consists of a lead or starter section, extension section(s), brackets, and a pile cap.

**Installation Torque.** The resistance generated by a helical pile when installed into soil. The installation resistance is a function of the soil type and the size and shape of the various components of the helical pile.

**Lead Section.** The first section of a helical pile to enter the ground, lead sections consist of a central shaft with a tapered end and one or more helical bearing plates affixed to the shaft.

**Manufacturer.** The individual or legal entity that performs part of the work required through a contract agreement with the Contractor. This includes an individual or legal entity that owns the patent, product trademark, product copyright, or product name for the approved helical pile system.

**Minimum Pile Penetration Elevation.** The elevation shown on the plans to or below which the bottom of piles must be installed.

**Shop Drawings.** A submittal consisting of drawings and calculations related to the design, installation, and load testing of the helical pile system by the Contractor.

**Torque Strength Rating.** The maximum torque energy you can apply to the helical pile foundation during installation in soil, i.e., allowable or safe torque.

**Unsupported Length.** Unsupported shaft lengths shall include the length of the shaft in air, water, or in fluid soils.

**Verification Load Test.** A helical pile load test performed to verify the helical pile ultimate capacity based on the construction methods proposed. Verification load tests are performed on non-production piles, prior to installation of production piles.

**b. Materials.** Unless noted otherwise, it is the responsibility of the Contractor to select the appropriate type and design strength of helical plates, shaft connections, shafts, brackets, and the overall helical pile system to support the load capacities and criteria specified on the project plans. Materials used for helical piles must meet the requirements of ICC-ES AC358. In addition, all helical piles must be manufactured to the following criteria.

1. Central Steel Shaft. The central shaft must consist of high strength structural steel tube, pipe, or solid steel bars meeting the requirements of *ASTM A 36*, *A 252 Grade 3*, *A 500 Grade C*, or *A 576 Grade 1045* or *Grade 1530*.

2. Helix Bearing Plate. Bearing plate material must conform to *ASTM A 572 Grade 50* or *A 1018 Grade 55*.

3. Bolts, Nuts, and Washers. Must meet the material and hot-dip galvanizing requirements of subsection 906.07 of the Michigan Department of Transportation 2020 Standard Specifications for Construction.

4. Brackets. Bracket must conform to *ASTM A 36*, *ASTM A 572 Grade 50*, or *ASTM A 958 Grade SC 1045*. Piles must have U-shape bracket sleeves to mount lateral support beams for joist and deck structure.

5. Couplings. Couplings, if applicable, must conform to *ASTM A 958*.

6. Corrosion Protection. At minimum, all helical piles and hardware must have corrosion protection consisting of hot-dip galvanization in conformance with *ASTM A 153* and *ASTM A 123*, as applicable.

**c. Construction.** Furnish, design, install, and load test the helical piles in accordance with the project plans, this special provision, and the approved shop drawings.

1. Qualifications.

A. Manufacturer. The manufacturer must be a company specializing in the manufacturing and distribution of these products. Manufacturer's qualifications are to be

submitted to the Engineer in accordance with subsection c.2.A of this special provision. The submittal must include:

(1) A product catalog and evidence showing the manufacturer has at least 10 years of experience in the design and manufacture of helical piles.

(2) Current ICC-ES product evaluation report or complete description of product testing and engineering calculations used to assess product capacity.

B. Contractor. The Contractor performing the work described in the contract must be a company specializing in the installation of helical piles. The submittal must include:

(1) Evidence the Contractor has completed training in the proper methods for installation of helical piles and brackets.

(2) Documentation that the Contractor's fulltime onsite supervisor and drillers performing the work have completed at least 10 projects and have 3 years of experience installing similar types of helical piles in similar subsurface conditions to this project. Documentation must, at minimum, include project name, description, dates, number and type of helical piles, project location, and client contact information.

(3) List of installation equipment and detailed description of proposed method of installation.

C. Designer. The design of the helical piles must be done by a licensed design professional specialized in the engineering and design of helical piles. The designer must have the following qualifications:

(1) A Professional Engineer licensed in the State of Michigan.

(2) Documentation indicating the designer has designed at least five projects utilizing helical piles. Documentation must, at minimum, include project name, description, dates, number and type of helical piles, project location, and client contact information.

## 2. Submittals.

A. Qualifications. Submit manufacturer, Contractor, and designer qualifications in accordance to subsections c.1.A, c.1.B, and c.1.C.

Submit to the Engineer three copies of the project reference list and a personnel list at least 30 calendar days before the planned start of helical pile construction. Provide a summary of each individual's experience in the personnel list and be complete enough for the Engineer to determine whether each individual satisfies the required qualifications. The Engineer will approve or reject the Contractor's and manufacturer's qualifications within 15 calendar days after receipt of a complete submission. Additional time required due to incomplete or unacceptable submittals will not be justification for time extension or impact or delay claims. All such costs associated with incomplete or unacceptable submittals are to be borne by the Contractor.

Work is not to be started, nor materials ordered, until the Engineer's written approval of the

Contractor's, manufacturer's and designer's experience and personnel qualifications is given. The Engineer may suspend the work if the Contractor uses non-approved personnel, manufacturer or designer. If work is suspended, the Contractor is fully liable for all resulting costs, and no adjustment in contract time will accrue due to the suspension.

B. Shop Drawings. Prepare and submit to the Engineer shop drawings for the helical piles intended for use on the project at least 30 calendar days prior to start of installation. The shop drawings must include the following:

- (1) Overall plan drawing showing helical pile location, number, and product identification number(s).
- (2) Type and size of steel shaft and helix configuration (number and diameter of helix plates).
- (3) Maximum allowable mechanical compression and tensile strength of the helical piles. Include the Torque Strength Rating.
- (4) Helical piles respective design capacities from the drawings.
- (5) Planned installation depth and cut-off elevation and the number and type of lead and extension sections.
- (6) Designer's recommended allowable pile capacity to installation torque ratio and minimum final installation torque(s) for the helical test pile(s).
- (7) Product identification numbers and designations for all the brackets and number and size of connection bolts or couplers. Details illustrating helical pile attachment to structure relative to grade beam, column pad, pile cap, etc.
- (8) Corrosion protection coating on helical piles and bracket assemblies.

C. Design Calculations. The designer is to prepare and submit detailed design calculations to the Engineer for the helical piles intended for use on the project. Design must be in accordance with the *AASHTO Standard Specifications for Highway Bridges* and other published design methodologies as approved by the Engineer. All submittals must be sealed and stamped by the designer and submitted at least 30 calendar days prior to the start of installation. The analysis must take into account the notes and design details from the plans and must include, but is not limited to, the following items:

- (1) Reduction in the dimensions of the structural elements based on anticipated corrosion loss over the design life for the subsurface and environmental conditions encountered at the project site.
- (2) Ultimate and allowable pile capacities. Consider affects from down drag, buckling, and expansive soils. The ultimate pile capacity shall be as shown on the plans.
- (3) Minimum installation depth to reach bearing stratum and to achieve pullout capacity, if applicable. At a minimum, the top helical pile shall be installed below the frost depth of 42 inches below ground level.

D. Calibration Reports. Submit to the Engineer calibration information certified by an independent testing agency for the torque measurement device. Calibration information must have been tested within 30 days of the start of helical pile installation. Calibration information must include, but is not limited to, the name of the testing agency, identification number or serial number of device calibrated, calibration data, and the date of calibration.

E. Installation Record. Submit to the Engineer a Daily Installation Log during helical pile installation. This log must contain the following information for each helical pile:

- (1) Name of project and Contractor.
- (2) Name of Contractor's supervisor during installation.
- (3) Date and time of installation.
- (4) Name and model of installation equipment and type of torque indicator used.
- (5) Location of helical pile by grid location or assigned identification number.
- (6) Type and configuration of Lead Section with length of shaft and number and size of helical bearing plates.
- (7) Type and configuration of extension sections, with length and number and size of helical bearing plates, if any.
- (8) Installation duration and observations.
- (9) Total length installed.
- (10) Final elevation of top of shaft and cut-off length, if any.
- (11) Final plumbness or inclination of shaft.
- (12) Installation torque at minimum 3-foot depth intervals.
- (13) Final installation torque.
- (14) Comments pertaining to interruptions, obstructions, or other relevant information.

(15) Verified allowable pile axial load capacity.

3. Subsurface Data. Review the available soil boring logs from the subsurface investigation(s). Upon request, a copy of the geotechnical data report outlining the subsurface exploration conducted during the design phase will be provided. If during construction, the Contractor determines the actual subsurface conditions differ substantially from those reported on the boring logs; notify the Engineer in writing within 48 hours of such determination.

The data indicated on the available boring logs are not intended as representation or warranties of continuity of such conditions. It is expressly understood that the Department will not be responsible for interpretations or conclusions drawn therefrom by the Contractor. Additional soil test borings and other exploratory procedures may be performed by the Contractor at no additional cost to the Department.

4. Installation Equipment. The equipment must be capable of applying adequate down pressure (crowd) and torque simultaneously to ensure normal advancement of the helical piles to the ultimate pile capacities and the minimum pile penetration elevation(s) as shown on the plans. The equipment must be capable of continuous position adjustment to maintain proper alignment and position.

A. Torque Motor. Helical piles are to be installed with high torque, low RPM torque motors, which allow the helical plates to advance with minimal soil disturbance. The torque motor must be hydraulically powered with clockwise and counter-clockwise rotation capability. The torque motor must be adjustable with respect to revolutions per minute during installation. Percussion drilling equipment is prohibited. The torque motor must have a minimum torque capacity 15 percent greater than the torsional strength rating of the central steel shaft to be installed for the project. The connection between the torque motor and the installation rig must have no more than two pivot hinges oriented 90 degrees from each other.

B. Drive Tool. The connection between the torque motor and helical pile must be in-line, straight, and rigid, and must consist of a hexagonal, square, or round kelly bar adapter and helical shaft socket. To ensure proper fit, the drive tool must be manufactured by the helical pile manufacturer and used in accordance with the manufacturer's installation instructions.

C. Connection Pins. Attach the central shaft of the helical pile to the drive tool by smooth tapered pins matching the number and diameter of the specified shaft connection bolts. Maintain the connection pins in good condition allowing safe operations at all times. Inspect the pins regularly for wear and deformation. Replace pins with identical pins when worn or damaged.

D. Torque Indicator. Ensure the torque indicator is capable of providing continuous installation torque measurement during installation. Ensure the torque indicator is capable of torque measurements of 500 ft-lbs or less. Calibrate torque indicators that are mounted in-line with the installation tooling either on-site or at an appropriately equipped test facility. Re-calibrate indicators that measure torque as a function of hydraulic pressure following any maintenance performed on the torque motor. Re-calibrate torque indicators if, in the opinion of the Engineer, reasonable doubt exists as to the accuracy of the torque measurements. If recalibration is directed by the Engineer in writing and the calibration is off by less than 500

ft-lbs, the recalibration will be paid for as extra work. Otherwise recalibrations will be paid for by the Contractor at no cost to the Department.

5. Installation Procedures. The helical pile installation technique is to be determined by the Contractor such that it is consistent with the geotechnical, logistical, environmental, and load carrying conditions of the project.

A. Position the lead section at the location depicted on the working drawings. Battered helical piles can be positioned perpendicular to the ground to assist in initial advancement into the soil before the required batter angle is established. The equipment must be capable of continuous position adjustment to maintain proper helical pile alignment. Apply constant axial force (crowd) while rotating helical piles into the ground. Apply sufficient crowd to ensure the helical pile advances into the ground a distance equal to at least 80 percent of the blade pitch per revolution during normal advancement.

B. Advance the helical pile sections into the soil in a smooth, continuous manner at a rate of rotation between 5 RPM's and 40 RPM's. Adjust the rate of rotation and magnitude of down pressure for different soil conditions and depths.

C. Provide extension sections to obtain the required minimum overall length and installation torque as shown on the shop drawings. Use coupling bolt(s) and nuts torqued in accordance to the manufacturer's guidelines to connect sections together.

D. Do not exceed the manufacturer's Torque Strength Rating of the helical pile during installation.

E. The Contractor must adjust the elevation of the top end of the shaft to the elevation shown on the shop drawings or as required. This adjustment may consist of cutting off the top of the shaft and drilling new holes to facilitate installation of brackets to the orientation shown on the shop drawings. Alternatively, installation may continue until the final elevation and orientation of the pre-drilled bolt holes are in alignment. Do not reverse the direction of torque and back-out the helical pile to obtain the final elevation.

F. Install brackets in accordance with helical pile manufacturer's details or as shown on the shop drawings.

G. Ensure all helical pile components, including the shaft and bracket, are isolated from making a direct electrical contact with any concrete reinforcing bars or other non-galvanized metal objects since these contacts may alter corrosion rates.

H. Obstructions. Terminate the installation and remove the pile if the helical pile encounters refusal or is deflected by a subsurface obstruction. Remove the obstruction if feasible, and reinstall the helical pile. Backfill and compact the resulting excavation before reinstalling the pile. Install the helical pile at an adjacent location, subject to review and approval by the Engineer, if the obstruction can't be removed. Removal of such obstructions will be incidental to helical pile installation.

6. Helical Pile Testing. Perform verification testing of helical piles according to *ASTM D 1143*, except as modified herein. Perform the testing under the direction of a Professional Engineer licensed in the State of Michigan. Determine the site specific K factor based on load test results to correlate torque to allowable pile capacity. Summarize the test data in a report to

be sealed by the Professional Engineer. Submit the report to the Engineer within 24 hours of each load test. Notify the Engineer in writing 3 working days prior to any load test. Do not perform load tests without the Engineer being on site to witness the load test.

Do not exceed 80 percent of the following helical pile structural elements during load testing: steel yield in tension, steel yield in compression, and steel buckling in compression. Costs associated with increasing the strength of the verification test pile structural elements above the strength required for production piles will be borne by the Contractor.

A. Testing Equipment and Data Recording. Testing equipment includes, but is not limited to: dial gauges, dial gauge supports, jack and pressure gauges, electronic load cell, reaction piles, and a reaction frame. The load cell is required only for the creep test portion of the verification test. Submit a written description of the load test setup and jack, pressure gauge and load cell calibration reports according to subsection c.2 herein. Design the testing reaction frame to be sufficiently rigid and of adequate dimensions to prevent excessive deformation of the testing equipment. Align the jack, bearing plates stressing anchorage such that unloading and repositioning of the equipment will not be required during the test. Apply the test load with a hydraulic jack and measure the load with a pressure gauge graduated in no more than 50 psi increments or less. Use a jack and gauge with a pressure range not more than twice the anticipated maximum test pressure. Select a jack with ram travel sufficient to allow the test to be performed without repositioning during the test. Monitor the creep test load hold during verification tests with both the pressure gauge and the electronic load cell. Use the load cell to accurately maintain a constant load hold during the creep test load hold increment of the verification test. Measure the pile top movement with a dial gauge capable of measuring to 0.001 inch and a travel sufficient to allow the test to be performed without having to reset the gauge. Align the gauge to be parallel to the axis of the helical pile. Support the gauge independent from the jack, pile or reaction frame. Use a minimum of four dial gauges evenly distributed around the test pile. Record the load test data.

B. Verification Load Testing. Perform a pre-production verification load test to verify the design of the helical pile and the construction methods used to install the helical pile meet specifications. Do not use production piles as reaction piles during load tests. Unless otherwise specified on the plans, install one sacrificial verification test pile per structure. Install verification test piles at locations approved by the Engineer. The verification helical pile must be identical to those used in production and installed using the same methods to be used for installing production piles.

Do not locate reaction piles closer than 5 feet to the verification pile. Reaction piles must meet the approval of the Engineer. Perform verification load tests by incrementally loading the helical pile in compression according to Table 1. Depending on performance, the Engineer will determine whether a 10 minute or a 60 minute creep load hold is appropriate. If the pile top movement measured between 1 and 10 minutes exceeds 0.04 inches, maintain an additional 50 minutes of load hold during the creep test. Record pile top movements during each hold period at time intervals of 1, 2, 3, 4, 5, 6, 10, 20, 30, 50, and 60 minutes. Reset dial gauges to zero after the initial alignment load (AL) is applied. The acceptance criteria for helical pile verification load tests are:

- (1) Failure of the test pile does not occur before the maximum test load is applied. Failure is defined as the lesser of:

(i) The slope of the load versus deflection curve (at the end of the load increment) exceeds 0.025 inch/kip, or

(ii) Where attempts to further increase the test load simply results in continued pile movement.

(2) Test pile supports the allowable pile capacity with not more than 1.00 inch of total vertical movement at the top of the pile from its position prior to testing.

(3) At the end of the creep test load period, a creep rate not greater than 0.04 inch/log cycle time (1 to 10 minutes) and not greater than 0.08 inch/log cycle time (6 to 60 minutes or the last log cycle if held longer) and linear or decreasing creep rate.

The Engineer will provide written approval or rejection of the helical pile design and construction techniques within 7 working days of the completion of the verification load test.

If site conditions vary across the project limits additional load tests may be necessary as determined by the Engineer.

Verification piles constructed using methods different from the methods submitted for production piles will be rejected and additional verification test pile(s) will be required at no additional cost to the Department. If the verification pile fails to meet the acceptance criteria, the Engineer may modify the design of the production piles, or require the Contractor to make modifications to the construction methods, or both. Modifications may include, but not be limited to, modifying the installation methods, or changing the helical pile materials. Any modification to the construction procedure that necessitates changes to the structure requires the Engineer's review and approval.

Do not install production piles until the verification load test results have been reviewed and accepted by the Engineer. At the completion of verification testing, remove testing equipment and remove test piles and reaction piles or cut off piles to an elevation directed by the Engineer.

**Table 1: Verification Load Test Schedule**

Step	Load (a)(b)	Hold Time, minutes	Step	Load (a)(b)	Hold Time, minutes
1	AL	-	19	AL	1
2	0.10 R <sub>n</sub>	3	20	0.10 R <sub>n</sub>	1
3	0.20 R <sub>n</sub>	3	21	0.20 R <sub>n</sub>	1
4	0.30 R <sub>n</sub>	3	22	0.30 R <sub>n</sub>	1
5	AL	1	23	0.40 R <sub>n</sub>	1
6	0.10 R <sub>n</sub>	1	24	0.50 R <sub>n</sub>	1
7	0.20 R <sub>n</sub>	1	25	0.60 R <sub>n</sub>	1
8	0.30 R <sub>n</sub>	1	26	0.70 R <sub>n</sub>	1
9	0.40 R <sub>n</sub>	3	27	0.80 R <sub>n</sub>	3
10	0.50 R <sub>n</sub>	10 or 60 (creep test)	28	0.90 R <sub>n</sub>	3
11	AL	1	29	1.00 R <sub>n</sub>	10
12	0.10 R <sub>n</sub>	1	30	0.75 R <sub>n</sub>	5
13	0.20 R <sub>n</sub>	1	31	0.50 R <sub>n</sub>	5
14	0.30 R <sub>n</sub>	1	32	0.25 R <sub>n</sub>	5

15	0.40 $R_n$	1	33	AL	5
16	0.50 $R_n$	1			
17	0.60 $R_n$	3			
18	0.70 $R_n$	3			
a. $R_n$ denote nominal resistance (ultimate pile capacity). b. AL denotes alignment load. AL is equal to 0.025 $R_n$ .					

## 7. Production Helical Piles.

A. Advance production helical piles until all of the following criteria are satisfied:

(1) Allowable pile capacity is verified by achieving the required Installation Torque. The required Installation Torque must be determined from the site specific K factor based on the verification load test results. The required Installation Torque is defined as the average of the last three readings recorded at 1 foot intervals, unless a more stringent specification is noted on the designer's shop drawings. The maximum rotational speed must not exceed 12 RPM when torque is monitored.

(2) Minimum depth as depicted on the plans is obtained.

B. If the manufacturer's Torque Strength Rating of the helical pile is obtained during installation and the minimum pile depth has not been reached, the Contractor and designer must submit revised shop drawings and design calculations for review and approval by the Engineer.

If the Contractor chooses to reinstall a pile in the same location, the topmost helix of the new lead section of the helical pile must be terminated at least 3 feet beyond the terminating depth of the original helical pile.

C. If the final Installation Torque is not achieved at the estimated length shown on the shop drawings, the Contractor has the following options:

(1) Install the helical pile deeper using additional extension sections until the required Installation Torque is obtained.

(2) Remove the helical pile and install a new one with additional and/or larger diameter helical bearing plates. This option may require an additional pile load test to determine the new K factor, as determined by the Engineer. No additional compensation for any additional pile load tests will be provided for in this option.

(3) Submit other options to the Engineer in writing for review and approval.

(4) Additional materials and work necessary to reach the required helical pile capacity, including engineering analysis and redesign, is to be furnished without cost to the Department and without an extension of the completion dates for the project.

D. The helical pile must be sized to reach the allowable pile capacity and the minimum helical pile penetration elevation. No additional compensation for changes in the helical pile will be allowed unless differing site conditions are determined by the Engineer.

## 8. Construction Tolerances.

A. Horizontal Alignment. Ensure the helical pile actual centerlines are within 2 inches of plan centerlines at the plan elevation for the top of the shaft. Tolerances for bracket assembly placement are  $\pm 1$  inch in both directions perpendicular to the shaft and  $\pm 1/4$  inch in a direction parallel with the shaft, unless otherwise specified.

B. Plumb. Tolerance for departure from the design orientation angles is  $\pm 5$  degrees.

C. Top of Pile Elevation. Ensure helical pile is cut off at the design cut-off elevation.

D. Submit a plan for remedial action to the Engineer for approval, for helical piles not constructed within the required tolerances which are considered unacceptable. The Contractor is responsible for correcting all unacceptable piles to the satisfaction of the Engineer. Materials and work necessary to complete corrections for out-of-tolerance helical piles, including engineering analysis and redesign, must be furnished without cost to the Department and without an extension of the completion dates for the project. Do not begin repair operations until receiving the Engineer's approval of the remedial action plan.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

<b>Pay Item</b>	<b>Pay Unit</b>
Helical Pile .....	Foot

**Helical Pile** includes all labor, equipment, fabrication, designing, shop drawings, and materials to install the helical pile as shown on the plans and in this special provision, including any removal of obstructions encountered during installation. Helical Pile will be measured vertically along the pile centerline. Boring logs will be reviewed for final measurements.

**CITY OF ROCHESTER HILLS**

**SPECIAL PROVISION**

**DETENTION POND STANDPIPE AND OVERFLOW ASSEMBLY**

NFE:SWS

1 of 1

01/25/26

**Description:** This special provision describes requirements for furnishing and installing a detention pond standpipe and overflow assembly in accordance with the 2020 Standard Specifications for Construction, construction plans and details and as modified herein. This work includes providing a complete, functional outlet control structure for stormwater detention facilities, including standpipe, overflow weir or pipe, connections, and appurtenances, as shown on the plans or as directed by the Engineer.

**Materials:** Furnish materials in accordance with the 2020 Standard Specifications for Construction, the City of Rochester Hills Drainage Standards and Details, construction plan details and as approved by the Engineer. Materials may include, but are not limited to:

All pipe, fittings, and structures shall be of the sizes, types, and wall thickness shown on the plans. All materials shall be new and free from defects. Galvanized or stainless steel hardware shall be used where exposed to corrosive or submerged conditions.

**Construction:** Construct the detention pond standpipe and overflow assembly in accordance with Sections 401, 402, 403, and 706 of the 2020 Standard Specifications for Construction, the City of Rochester Hills Drainage Standards and Details, and except as modified herein.

Excavate, prepare, and stabilize foundations for structures and piping in accordance with Section 206. Set precast structures or form and place structures true to line and grade. Install standpipes, overflow pipes, and outlet connections in a watertight manner.

Provide watertight joints and connections between pipes and structures. Install other appurtenances as detailed on the plans. Seal all penetrations to prevent leakage and soil migration.

Backfill and compact around structures and pipes in accordance with Section 401 and Section 402. Restore disturbed areas as required.

The completed assembly shall be plumb, secure, and fully functional to control detention pond discharge as designed. The Engineer shall inspect and approve the installation prior to final acceptance.

**Measurement and Payment:** Detention Pond Standpipe and Overflow Assembly will be measured and paid for in accordance with the 2020 Standard Specifications for Construction and as follows:

<b>Pay Item</b>	<b>Pay Unit</b>
Detention Stand Pipe / Overflow .....	Lump Sum

CITY OF ROCHESTER HILLS

SPECIAL PROVISION

MODIFIED SIDEWALKS, CURB RAMPS, AND CONCRETE CURB AND GUTTER

NFE:SWS

1 of 2

01/25/26

**Description:** This special provision describes requirements for furnishing and constructing sidewalks, curb ramps, and concrete curb and gutter in accordance with the 2020 Standard Specifications for Construction, City of Rochester Hills standards and details, construction plans and details, and as modified herein. This work includes all concrete, aggregate base, forming, reinforcement, excavation, site preparation, placement, finishing, curing, and incidental work necessary to construct complete sidewalk, curb ramp, and curb and gutter improvements as shown on the plans or as directed by the Engineer.

Sidewalk work shall also include any areas with monolithic curb and shall include the required underlying aggregate base. Curb ramps shall include East Jordan ductile iron detectable warning plates for ADA compliance and underlying aggregate base. Concrete curb and gutter shall be constructed per details on the construction plans and shall include the underlying base leveling pad per details.

**Materials:** Furnish materials in accordance with the 2020 Standard Specifications for Construction, City of Rochester Hills standards and details, construction plan details, and as approved by the Engineer. Materials shall include, but are not limited to:

- Concrete meeting Section 701
- Aggregate base and leveling pad materials meeting Section 902
- Reinforcing steel, if required, meeting Section 905
- Ductile iron detectable warning plates meeting ADA and City of Rochester Hills requirements
- Form materials meeting Section 703
- Joint materials, curing compounds, and embedded items as shown on the plans

All materials shall be new, free of defects, and of the class, size, and type shown on the plans or directed by the Engineer.

**Construction:** Construct sidewalks, curb ramps, and concrete curb and gutter in accordance with Sections 205, 206, 301, 302, 701, 703, 905, and 803 of the 2020 Standard Specifications for Construction, the City of Rochester Hills standards and details, and except as modified herein.

Perform all required excavation, subgrade preparation, and site preparation necessary to construct the work. Proofroll and prepare subgrade to provide a firm, stable foundation. Furnish and place aggregate base and leveling pad materials to the thicknesses and limits shown on the plans or as directed by the Engineer. Compact base materials to provide uniform support for concrete placement.

Furnish, place, and secure all reinforcing steel where required. Furnish, erect, and remove all forms necessary for construction. Place, consolidate, finish, and cure concrete to produce sound, durable, and properly aligned sidewalk, curb ramp, and curb and gutter elements.

Install curb ramps in compliance with ADA requirements, including proper slopes, grades, and alignment. Install ductile iron detectable warning plates where noted in accordance with the plans, City of Rochester Hills standards, and manufacturer’s recommendations.

Construct monolithic curb and sidewalk sections where shown on the plans as part of the sidewalk work, including all required base, reinforcement, forming, and concrete placement.

Construct the 2’ concrete parking area border, per plan locations and per the detail, included in “Curb and Gutter, Conc, Det F2, Modified”

Construct the required and proposed concrete spillways / rip rap outlets within Adams Road, included in “Curb and Gutter, Conc, Det B2, Modified:

Backfill and compact adjacent areas and restore disturbed areas as required.

**Measurement and Payment:** Modified Sidewalks, Curb Ramps, and Concrete Curb and Gutter will be measured and paid for in accordance with the 2020 Standard Specifications for Construction and as follows:

Pay Item Pay Unit

Sidewalk, Conc, 6 inch, Modified .....	Square Foot
Curb Ramp, Conc, 6 inch, Modified .....	Each
Curb and Gutter, Conc, Det F2, Modified.....	Foot
Curb and Gutter, Conc, Det B2, Modified.....	Foot

Payment for the above items includes furnishing all concrete, aggregate base and leveling pad materials, reinforcing steel, detectable warning plates, forms, excavation, subgrade preparation, placement, finishing, curing, backfilling, compaction, disposal of excess material, and all labor, equipment, and incidentals necessary to complete the work as specified.

CITY OF ROCHESTER HILLS

SPECIAL PROVISION

MODIFIED STORM / SANITARY AND WATER MAIN STRUCTURES

NFE:SWS

1 of 2

01/25/26

**Description:** this work consists of furnishing, constructing, and installing storm and sanitary manholes and water main gate wells, including all proposed structure covers, and constructing low-head storm structures where indicated in the plans. All work shall conform to Michigan Department of Transportation (MDOT) standard specifications, details, and requirements, except as detailed in construction plans or herein.

**Materials:** Manholes: Materials for storm and sanitary manholes shall meet MDOT Type A or B concrete, or precast concrete specifications as applicable. All proposed structure covers, frames, and appurtenances shall meet MDOT standards for strength, durability, and traffic loading and be per City of Rochester Hills standards Covers shall be compatible with the intended structure type (storm, sanitary, water main or low-head storm). For all low-head storm structures, materials shall be selected to allow safe access, proper drainage, and durability consistent with MDOT low-head structure recommendations.

**Construction:** Manholes shall be constructed at the locations and elevations shown in the plans, ensuring proper alignment, grade, and structural integrity. All manholes shall include the proposed covers and frames, installed per City / MDOT standards. Low-head storm structures shall be constructed in accordance with the plans and details provided, with special attention to hydraulic performance, safety, and accessibility.

**Measurement and Payment:** Modified structures will be measured and paid for in accordance with the 2020 Standard Specifications for Construction and as follows:

**Pay Item Pay Unit**

Dr Structure, 48 inch dia, Modified .....	Each
Gate Well, 60 inch dia, Modified .....	Each
Gate Well, 72 inch dia, Modified .....	Each
Sanitary Structure, 48 inch dia, Modified .....	Each

CITY OF ROCHESTER HILLS

SPECIAL PROVISION

PAVEMENT MARKING / SIGNAGE – ADAMS ROAD

NFE:SWS

1 of 1

01/25/26

**Description:** This work consists of furnishing and installing both temporary and permanent pavement markings associated with the phased construction of Adams Road, as well as all new permanent signs proposed within the project limits. Temporary pavement markings shall be provided to maintain traffic control, lane delineation, and safety during construction. Permanent pavement markings and signage shall be installed in accordance with the approved plans. All pavement markings shall conform to Michigan Department of Transportation (MDOT) standards, and all signs shall comply with the Michigan Manual on Uniform Traffic Control Devices (MMUTCD).

**Materials:**

Pavement Markings: Materials shall meet MDOT specifications for durability, retro reflectivity, and color.

Signs: All signs shall be fabricated from materials meeting MMUTCD and MDOT standards, including retroreflective sheeting as required. All signposts shall be per City of Rochester Hills standards and plan details are also included.

**Construction:** Temporary pavement markings shall be installed to maintain safe traffic operations during phased construction of Adams Road and shall be removed or replaced as permanent markings are installed. Permanent pavement markings shall be installed according to the approved plans and MDOT guidelines once construction phases allow. All new permanent signs shall be installed at the locations and heights shown in the approved plans, in compliance with MMUTCD requirements. The Contractor shall verify existing conditions prior to installation to ensure proper placement of all temporary and permanent markings and signs. Any damaged or missing temporary or permanent pavement markings or signs shall be promptly replaced at no additional cost.

**Measurement and Payment:** Measurement for this work will be lump sum. Payment shall include all labor, materials, equipment, and incidentals necessary to furnish and install all pavement markings and signage as described in this provision. Pavement markings or removals will not be paid for separately

**Pay Item Pay Unit**

Pavement Marking / Signage - Adams..... Lump Sum

CITY OF ROCHESTER HILLS

SPECIAL PROVISION

PAVEMENT MARKING / SIGNAGE - PARK

NFE:SWS

1 of 1

01/25/26

**Description:** This work consists of furnishing and installing all pavement markings and all signage within the proposed interior areas of the project, excluding any signage located on Adams Road. All pavement markings shall conform to Michigan Department of Transportation (MDOT) standards, and all signs shall comply with the Michigan Manual on Uniform Traffic Control Devices (MMUTCD).

**Materials:**

Pavement Markings: Materials shall meet MDOT specifications for durability, retro reflectivity, and color.

Signs: All signs shall be fabricated from materials meeting MMUTCD and MDOT standards, including retroreflective sheeting as required. All signposts shall be per City of Rochester Hills standards and plan details are also included.

**Construction:** All pavement markings shall be accurately laid out according to the approved plans and in accordance with MDOT guidelines. Striping shall be white and all ADA markings shall be blue, waterborne paint. Signs shall be installed at locations and heights as specified in the project plans and MMUTCD requirements. The Contractor shall verify existing conditions prior to installation to ensure proper placement. Any damaged pavement markings or signs during construction shall be promptly replaced at no additional cost.

**Measurement and Payment:** Measurement for this work will be lump sum. Payment shall include all labor, materials, equipment, and incidentals necessary to furnish and install all pavement markings and signage as described in this provision.

Pay Item Pay Unit

Pavement Marking / Signage - Park..... Square Foot

CITY OF ROCHESTER HILLS

SPECIAL PROVISION  
FOR  
**4-FOOT ORNAMENTAL FENCE AND GATES**

NFE

1 of 1

02/02/26

**a. Description.** The work consists of installing new ornamental aluminum fencing and gates, where noted on the plans, and in accordance with plan details. Ensure the work is done in accordance with sections 204 and 808 of the Standard Specifications for Construction.

**b. Materials.** Furnish materials in accordance with section 808 of the Standard Specifications for Construction.

**c. Construction.** Ensure the work of installation is done in accordance with the requirements of sections 204 and 808 of the Standard Specifications for Construction and per detail on the plans. Locations for fences and gates are shown on the plans and as directed by Engineer.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<b>Pay Item</b>	<b>Pay Unit</b>
Fence, Ornamental Aluminum, 4-foot high, Modified .....	Foot
Fence Double Gate, 10-foot, for 4-foot high Ornamental Fence, Modified .....	Each

**Fence, Ornamental Aluminum, 4-foot, Modified** includes the installation of chain link fence materials, posts, bars, foundations and all hardware / components as shown on plan details.

**Fence, Chain Link, \_\_ inch, Modified** will be measured in feet along the centerline of the fence.

**Fence Double Gate, 10-foot wide, for 4' ht Ornamental Fence Modified** includes the installation of gate panels, posts, and associated hardware as shown on the plan details.

CITY OF ROCHESTER HILLS

SPECIAL PROVISION  
FOR  
6-FOOT ORNAMENTAL FENCE AND GATES

NFE

1 of 1

02/02/26

**a. Description.** The work consists of installing new ornamental aluminum fencing and gates, where noted on the plans, and in accordance with plan details. Ensure the work is done in accordance with sections 204 and 808 of the Standard Specifications for Construction.

**b. Materials.** Furnish materials in accordance with section 808 of the Standard Specifications for Construction.

**c. Construction.** Ensure the work of installation is done in accordance with the requirements of sections 204 and 808 of the Standard Specifications for Construction and per details on the plans. Locations for fence and gates are shown on the plans and as directed by Engineer. Fencing around dog park shall have post top mounted lights which will be provided as 10' high fence posts approx. 56 feet on center, per the electrical drawings,

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<b>Pay Item</b>	<b>Pay Unit</b>
Fence, Ornamental Aluminum, 6-foot high, Modified .....	Foot
Fence Gate, 5-foot, for 6-foot high Ornamental Fence, Modified .....	Each
Fence Double Gate, 10-foot, for 6-foot high Ornamental Fence, Modified .....	Each

**Fence, Ornamental Aluminum, 6-foot, Modified** includes the installation of 8' wide fence panels, both 6' and 10' high posts, foundations and all hardware / components as shown on plan details. **Fence, Chain Link, \_\_ inch, Modified** will be measured in feet along the centerline of the fence.

**Fence Gate, 5-foot wide, for 6-foot Ornamental Fence Modified** includes the installation of gate panels, posts, and associated hardware as shown on the plan details.

**Fence Double Gate, 10-foot wide, for 6' ht Ornamental Fence Modified** includes the installation of gate panels, posts, and associated hardware as shown on the plan details.

CITY OF ROCHESTER HILLS

SPECIAL PROVISION  
FOR  
**PRESSURE TREATED WOOD BOARDWALK & RAILING**

NFE / SWS

1 of 2

02-02-26

- a. **Description.** This work consists of providing all labor, materials, and equipment necessary to construct the boardwalk as shown on the plans; including all wood, cable railing, hardware, fasteners, hinges, hardware, and related construction materials as called for on the plans. Ensure all work is done in accordance with this special provision and accompanying drawings, Local and State Codes, the Americans with Disabilities Act, and the standard specifications.
- b. **Structural Load Requirements:** 20 psf Pedestrian
- c. **Materials.** Provide materials in accordance with the following:

Miscellaneous Metals .....	908
Hardware.....	908
Structural Timber and Lumber.....	912

1. Lumber. All lumber must be dressed S4S (surfaced four sides) in accordance with *ASTM D 245*. All lumber sizes are nominal. All glulam sizes are net.

- A. Wood Deck: per detail, Southern Pine No. 2, treated.
- B. Wood Joists: per detail, Southern Pine No. 1, treated.
- D. Wood Blocking: per detail, Southern Pine No. 2, treated.
- E. Wood Railing: per detail
- F. Cable Railing: per detail

All exposed edges must be free from splinters and have sharp edges sanded smooth.

2. Hardware. Provide all hardware and accessories required to properly and completely execute the carpentry for this project, including, but not limited to: screws, bolts, nuts, washers, straps, and similar items, whether specifically mentioned herein or not.

A. Fasteners. Regular hexagon-head hot dipped galvanized *ASTM A307* steel bolts, nuts and washers; *ASTM A 123* for bolts and *ASTM A 153* for washers.

B. Screws. Hot dipped galvanized, *ASTM A 653*, batch or post-dipped process, with a minimum coating thickness of 1.85 ounces of Zinc per square foot of surface area (G185), of type and size indicated on the contract plans.

C. Joist Hangers. Hot dipped galvanized, *ASTM A123*. Simpson JB212A 2x12 top flange, G90 joist hanger. Hanger for fastening joists to beams below. Hanger fastens to side of joist, and top of beam.

D. Submittals. Product data conforming to the materials listed above.

**c. Construction.** Furnish and install all materials in accordance with the plans, this special provision and sections 709 and 912 of the Standard Specifications for Construction. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit.

Framing Standard: Comply with *American Wood Council/American Forest & Paper Association (AF&PA's) "Details for Conventional Wood Frame Construction"*.

Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects. Lumber with wane will not be allowed to be used for exposed edges of railing or deck materials. Comply with AWPA M4 for applying a field treatment of copper naphthenate to cut surfaces of preservative-treated lumber. Attach joists by using metal joist tie-downs as indicated on the plans. Install deck boards with annular rings downward. Do not install boards with knot holes or defects that will affect the walking surface.

Install the boardwalk within the construction area with the least amount of disturbance to the wetlands possible.

Field Storage and Handling. If products are stored temporarily at the job site after arrival, wood members must be placed on blocking, well off the ground and be separated by wood blocking so air can circulate around each member. Place water resistance paper over the top but do not use opaque polyethylene.

**d. Measurement and Payment.** The completed work, as described, will be measured along the centerline and paid for at the contract price using the following pay item:

<b>Pay Item</b>	<b>Pay Unit</b>
Pressure Treated Wood Boardwalk & Railing, 6 foot Wide .....	Foot
Pressure Treated Wood Boardwalk & Railing, 10 foot Wide .....	Foot
Pressure Treated Wood Boardwalk & Railing, 16 foot Wide .....	Foot

**Pressure Treated Wood Boardwalk & Railing, 10 foot Wide** includes all miscellaneous metals and hardware to complete the work described herein. Helical piers will be paid for under separate item.

CITY OF ROCHESTER HILLS

SPECIAL PROVISION  
FOR  
**CONCRETE EDGE DETAIL**

1 of 1

02-02-26

**a. Description.** This work consists of installing concrete edge detail in accordance with section 802 of the Standard Specifications for Construction, except as modified by the details on the plans, this special provision and other concrete technical specifications within the contract.

**b. Materials.** Provide materials in accordance with subsection 802.02 of the Standard Specifications for Construction.

**c. Construction.** Construct the concrete curb in accordance with subsection 802.03 of the Standard Specifications for Construction, except as modified by the details on the plans and this special provision.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<b>Pay Item</b>	<b>Pay Unit</b>
Thickened Edge .....	Foot
Turned Down Edge, 12" depth.....	Foot
Turned Down Edge, 15" depth.....	Foot
Turned Down Edge, Per Each 4" Additional Depth .....	Foot
Concrete Play Border (flush), 16" Ht.....	Foot
Concrete Play Border (6" raised), 22" Ht.....	Foot
Concrete Play Border, Per Each 2" Additional Depth.....	Foot
Play Border at Sand Pit .....	Foot

CITY OF ROCHESTER HILLS

SPECIAL PROVISION  
FOR  
**SITE FURNISHINGS**

NFE

1 of 2

02/02/26

**a. Description.** This work consists of furnishing and installing site furnishings including benches, bike racks, trash receptacles, shade structures, and tables, at locations as shown on the plans.

**b. Materials.** Provide the following trailway amenities:

Bike racks with surface mounting. Racks to be Hoop Rack manufactured by Dero Bike Racks, surface mount with black powder coat finish. Hoop rack, manufactured by Dero Bike, a PlayCore Co., or approved equal.

Bench to be 6' surface mount recycled plastic resinwood bench with armrest, manufactured by Belson Outdoors, Model PB6-JAM with PB1178 arm rest, cedar color slats, black arm rest and frame.

Glider Bench to be Winston poly recycled plastic glider bench, as manufactured by A&L Furniture Co, Model AL872, cedar color, or approved equal

Picnic Table to be 6' long galvanized frame table with recycled plastic resinwood slats, as manufactured by Frog Furnishings, Model PB 6CEDGFPIIC, slat color cedar and frame color black.

ADA Picnic Table to be 6' long galvanized frame table with recycled plastic resinwood slats, as manufactured by Frog Furnishings, Model PB 6CEDGFPIICADA, slat color cedar and frame color black.

Trash Receptacle to be 32-gallon round trash receptacle with recycled plastic slats, manufactured by Belson Outdoors, Model No. PB32R.

Hex table to be six-seater, recycled plastic resinwood table with cedar slat color and black frame, as manufactured by Frog Furnishings, Model PB6HEXCED, and four-seater model, with cedar slats and black frame.

Dog park shade structure to be 12'X12' hip roof square shelter, with multi-rib metal roof, as manufactured by Poligon, Model SSH-12, structure color bumper black and roof color buckskin, or approved equal.

Pet waste station, to be Bark Park station w/ bags and can, as distributed by Parks+Docks Supply Co., Model PBARK-490, color green, or approved equal.

Dual Dog Wash Station, to be 32" high, Dual Dog Wash Station, as manufactured by Dog-On-It-Parks, Model No. 7220, color EG-08, Onyx Black.

Drinking Fountain, to be Bottle Filler with Barrier Free Fountain and Pet Bowl, as manufacturer by Dog-On-It-Parks, Model No. 7219, color EG-08, Black Onyx.

Flagpole to be 40' high aluminum, internal halyard, ground set and 8'x12' flag, Sentry Flagpole, as manufactured by American Flagpole and Flag Co., or approved equal.

The materials and workmanship must be in accordance with sections 901, 902, 903, and division 10 of the Standard Specifications for Construction.

**c. Construction.** Coordinate this work with the Engineer before construction to establish locations and review proposed installation methods. Install items listed above, in locations shown on the plans or field located with the Engineer, according to the manufacturer's specifications and recommendations.

**d. Measurement and Payment.** The completed work, as described, including all installation, preparation, and necessary hardware, will be measured and paid for at the contract unit price using the following pay items:

<b>Pay Item</b>	<b>Pay Unit</b>
Bike Rack .....	Each
Bench, 6' .....	Each
Glider Bench.....	Each
Picnic Table.....	Each
ADA Picnic Table .....	Each
Trash Receptacle .....	Each
Hex Table, six-seater.....	Each
Hex Table, four-seater.....	Each
Dog Park Shade Structure.....	Each
Pet Waste Station.....	Each
Dual Dog Wash Station .....	Each
Drinking Fountain .....	Each
Flagpole .....	Each

## **SPECIAL PROVISION FOR STONE WORK**

NFE/GO

1 of 1

02/02/26

### **DESCRIPTION**

- a. This work consists of providing all labor, materials, and equipment necessary to install the stone work in locations indicated on the plans; including, bioswales, waterfall feature, dry creek, playground, and elsewhere as indicated on drawings. Ensure all work is done in accordance with this special provision and accompanying drawings, Local and State Codes, and the standard specifications.

### **MATERIALS**

Provide the following stone materials:

- a. General Site Stonework

This item includes the placement of 12" depth, 4-8" diameter glacial cobblestone matrix accent boulders 12-36" in bioswales, 2-6" diameter, 4" depth river rock mulch and 2" peastone bedding layer for waterfall feature, accent boulders ranging in size from 1-2', 2-3', 3-4' and 4-5' diameters for the dry creek feature and waterfall, and flat boulders or slate for waterfall.

Basis of Design Manufacturer:

Rock Shoppe  
6275 Gotfredson Rd  
Plymouth, MI 48170  
Ph. No.: (734) 455-3923  
<https://www.rock-shoppe.com/contact-us.html>

- b. Playground Stonework

This item includes the placement of quarried stone and fieldstone boulders within the playground area, as specified and shown on plan. This includes:

"Boulder Cave" Boulders  
Cut Stone Seat  
Boulders/Fieldstone Boulders  
Outcrop Stone  
Stone Steps

**CONSTRUCTION**

Native Michigan river rock, boulders and stone shall be washed and free of dirt and other construction debris. River rock mulch shall be placed as indicated on the landscape plans. Rock shall be dry-stacked and hand-placed for a natural appearance. Contractor to meet with Landscape Architect prior to beginning construction for direction.

**MEASUREMENT AND PAYMENT**

The completed work as measured for Stonework will be paid for at the contract unit prices for the following contract pay items and includes all material, equipment and labor to complete these items.

<b><u>PAY ITEM</u></b>	<b><u>PAY UNIT</u></b>
Glacial Cobblestone	TON
River Rock Mulch	TON
Peastone Bedding Layer	TON
1'-2' Dia Granite Boulders	TON
2'-3' Dia Granite Boulders	TON
3'-4' Dia Granite Boulders	TON
4'-5' Dia Granite Boulders	TON
Flat Boulders or Slate	TON
<u>In Play Area:</u>	
"Boulder Cave" Boulders	TON
Cut Stone Seat Stone	TON
Outcrop Stone	TON
Stone Steps	TON
Boulders/Fieldstone Boulders	TON

**SPECIAL PROVISION  
FOR  
GLOW AGGREGATE PAVING DETAIL**

NFE/GO

1 of 1

02-02-26

**DESCRIPTION**

The work of this section shall consist of the construction of glow aggregate sidewalks details. This work shall include the provision of all labor, materials, equipment, and supervision required, including excavation, bedding, forming, pouring and finishing, plus other incidental work necessary to complete the work.

**CONSTRUCTION**

The item includes the installation of a 4" wide band, and one of three designs; dog paw print (dog park entry); City Logo Bebb Oak (community bldg.); and butterfly (playground) located inside a 7' diameter circle. The image and banding shall be concrete pavement with exposed glowing aggregate. All concrete paving shall be 6" depth, as specified in the civil engineering drawings. A full scale mock up pattern of the images shall be approved by the Owner's representative prior to the placement of any concrete. Glow stone aggregate shall be seeded at a rate by manufacturer to provide high definition glow effect, after concrete is placed, worked so they are just covered by the concrete. Retarder (Preco EAC-S or equal) shall be sprayed and the concrete allowed to cure. Pressure wash the concrete to remove any residue covering the concrete. Apply a light acid wash to fully expose the glow aggregate to the surface.

**MEASUREMENT AND PAYMENT**

The completed work as measured for Glow Aggregate Sidewalk Details will be paid for at the contract unit price for the following contract pay items and includes all material, equipment and labor to complete this item.

**PAY ITEM**

**PAY UNIT**

Glow Aggregate Paving Detail

Each

**CITY OF ROCHESTER HILLS  
SPECIAL PROVISION  
FOR  
DRY CREEK**

NFE/GO

1 of 1

02/02/26

**DESCRIPTION**

- a. This work consists of providing all labor, materials, and equipment necessary to install the dry creek feature as shown on the plans; including, stone placement, accent boulders, plant material, drain and outlet pipe, and finish grading. Ensure all work is done in accordance with this special provision and accompanying drawings, Local and State Codes, and the standard specifications.

**CONSTRUCTION**

This item includes the furnishing and installation of materials as identified on the landscape drawings, necessary to construct the dry creek feature.

**MATERIALS**

All materials specified shall be as specified and detailed in civil engineering and landscape plan drawings.

**MEASUREMENT AND PAYMENT**

Measurement shall be as indicated for each item. The costs associated with fully constructing the dry creek shall be included in the unit price bid for each item. Stonework and plantings shall be included as a part of this work but paid for separately under the Stone work, and Nursery Stock provisions. Refer to drawings for all locations, and supplemental information.

**PAY ITEM**

**PAY UNIT**

Dry Creek

LS

**CITY OF ROCHESTER HILLS  
SPECIAL PROVISION  
FOR  
ENTRY STRUCTURES**

NFE/GO

1 of 1

02/02/26

**DESCRIPTION**

- a. This work consists of providing all labor, materials, and equipment necessary to install the entry structures at the dog park and playground as shown on the plans; including, foundations, masonry work, timbers, steel and/or wood laminated beams and ancillary materials. Ensure all work is done in accordance with this special provision and accompanying drawings, Local and State Codes, and the standard specifications.

**CONSTRUCTION**

This item includes the furnishing and installation of materials as identified on the landscape drawings, necessary to construct the entry structures at the dog park and the playground.

**MATERIALS**

All materials specified shall be as specified and detailed in civil engineering and landscape plan drawings.

**MEASUREMENT AND PAYMENT**

Measurement shall be as indicated as a lump sum for the construction of each structure. The costs associated with fully constructing a complete, structurally-sound entryway shall be included in the price bid for the item.

**PAY ITEM**

**PAY UNIT**

Dog Park Entry Structure  
Playground Entry Structure

Lump Sum  
Lump Sum

**CITY OF ROCHESTER HILLS  
SPECIAL PROVISION  
FOR  
HAMMOCK GROVE**

NFE/GO

1 of 1

02/02/26

**DESCRIPTION**

- a. This work consists of providing all labor, materials, and equipment necessary to install the hammock grove which consists of three separate structures of three timbers around a central taller timber, as shown on the plans; including, black locust timbers, foundations, hardware, sealers and finishes Ensure all work is done in accordance with this special provision and accompanying drawings, Local and State Codes, and the standard specifications.

**CONSTRUCTION**

This item includes the furnishing and installation of materials as identified on the landscape drawings, necessary to construct the hammock grove.

**MATERIALS**

All materials specified shall be as specified and detailed in civil engineering and landscape plan drawings.

**MEASUREMENT AND PAYMENT**

Measurement shall be as indicated as a lump sum for the construction of each hammock structure. The costs associated with fully constructing a complete, structurally sound hammock grove shall be included in the price bid for the pay item.

**PAY ITEM**

**PAY UNIT**

Hammock Grove

Lump Sum

Future hammock materials to be provided by others.

**CITY OF ROCHESTER HILLS  
SPECIAL PROVISION  
FOR  
NURSERY STOCK**

NFE/GO

1 of 1

02/02/26

**DESCRIPTION**

- a. This work consists of providing all labor, materials, and equipment necessary to install the plant material as shown on the plans, including, trees, shrubs, perennials, groundcovers and plugs. Ensure all work is done in accordance with this special provision and accompanying drawings, Local and State Codes, and the standard specifications.

**CONSTRUCTION**

This item includes the furnishing and installation of plant material as identified on the landscape drawings.

**MATERIALS**

All materials specified shall be as specified and detailed in the landscape plan drawing. The plant material sizes and cultivars will consist of the following variations:

**MEASUREMENT AND PAYMENT**

Measurement shall be as indicated for each plant species. The cost associated with wrapping, bracing, mulching, staking, fertilizing, and watering shall be included in the unit price bid for each item - planting trees, shrubs, perennials, and plugs. Refer to planting schedule for additional information pertaining to each plant species.

**PAY ITEM**

**PAY UNIT**

**Trees and Shrubs**

Acer saccharum 'Green Mountain, 3 inch	Each
Aesculus flava, 2 inch	Each
Amelanchier laevis, 3 inch	Each
Betula nigra, 10-12 foot	Each
Carpinus caroliniana, 3 inch	Each
Carya ovata, 2 inch	Each
Celtis occidentalis, 3 inch	Each
Cercis canadensis 2 inch	Each
Cercis canadensis 7-8 foot (clump)	Each
Cladrastis kentukea, 2 inch	Each
Gleditsia triacanthos 'Shademaster', 3 inch	Each
Liriodendron tulipifera Tuliptree, 3 inch	Each

Nyssa sylvatica 'Green Gable', 3 inch	Each
Ostrya virginiana, 2.5 inch	Each
Quercus alba, 2 inch	Each
Quercus bicolor 3 inch	Each
Quercus coccinea, 3 inch	Each
Quercus macrocarpa, 3 inch	Each
Quercus x bebbiana, 3 inch	Each
Ulmus davidiana var japonica 'Morton', 3 inch	Each
Abies balsamea, 8-10 foot	Each
Picea abies 'Cuppressina', 10 foot	Each
Picea glauca 'Densata', 8-10 foot	Each
Picea glauca, 8-10 foot	Each
Pinus strobus, 8-10 foot	Each
Tsuga canadensis, 8-10 foot	Each
Taxodium distichum 'Shawnee Brave', 8-10 foot	Each
Amsonia h. 'Halfway to Arkansas', 2 gal.	Each
Amsonia 'Blue Ice', 2 gal.	Each
Amsonia tabernaemontana, 2 gal.	Each
Baptisia australis, 2 gal.	Each
Cephanthus occidentalis, 24 inch ht	Each
Ceanothus americanus, 2 gal.	Each
Conrus sericea 'Arctic Fire', 2 gal.	Each
Cornus sericea 'Baileyii', 30 inch ht	Each
Conrus sericea 'Kelseyii', 30 inch ht	Each
Diervilla x 'Kodiak Orange', 2 gal.	Each
Hammamelis x i. 'Arnold's Promise', 3-4 foot	Each
Hydragea quercifolia, 36 inch ht	Each
Itea virginica 'Scentlania', 2 gal.	Each
Microbiota decussata, 24 inch ht	Each
Myrica pennsylvanica, 30 inch ht	Each
Rhus aromatica 'Grow Low', 2 gal.	Each
Sambucus canadensis, 30 inch ht	Each
Thuja occidentalis 'Nigra', 5 foot ht	Each
Viburnum rhytidophyllum 'Allgheny', 3-4 foot ht	Each

<b>Groundcovers, Perennials and Grasses</b>	Each
Allium 'Summer Beauty', 1 gal.	Each
Andropogon gerardii 'Blackhawks', 2 gal.	Each
Asclepias incarnata 'Cinderella', 2 gal.	Each
Asclepias tuberosa, 2 gal.	Each
Calamagrostis a. 'Karl Foerster', 2 gal.	Each
Calamagrostis brachytricha, 1 gal.	Each
Calamintha nepeta 'Montrose White', 1 gal.	Each
Carex oshimensis 'Everest', 1 gal.	Each
Dechampsia cespitosa 'Goldtau', 1 gal.	Each
Deutzia gracilis 'Nikko', 2 gal.	Each
Echinacea purpurea 'Cheyenne Spirit', 1 gal.	Each
Eupatorium 'Phantom', 3 gal.	Each
Geranium maculatum, 2 gal.	Each
Hemerocallis 'Stella D'Oro', 2 gal.	Each
Lavandula x l 'Violet Intrigue', 2 gal.	Each

Liriope muscari 'Big Blue', 1 gal.	Each
Nepeta faasennii 'Junior Walker', 2 gal.	Each
Panicum virgatum 'Northwind', 2 gal.	Each
Panicum virgatum 'Cape Breeze', 1 gal.	Each
Pennisetum orientale 'Karley Rose', 1 gal.	Each
Penstemon 'Dark Towers', 2 gal.	Each
Perovskia atriplicifolium 'Longin', 3 gal.	Each
Rudbeckia 'American Gold Rush', 2 gal.	Each
Sporobolus heterolepis, 2 gal.	Each
<b>Native Plugs</b>	Each
Acorus americanus, 2-1/4 inch plug	Each
Pontederia cordata, 2-1/4 inch plug	Each
Myrica gale, 2-1/4 inch plug	Each
Carex strictus, 2-1/4 inch plug	Each
Iris versicolor, 2-1/4 inch plug	Each
Iris virginica, 2-1/4 inch plug	Each
Sparganium eurycarpum, 2-1/4 inch plug	Each
Lobelia cardinalis, 2-1/4 inch plug	Each
Eupatorium perfoliatum, 2-1/4 inch plug	Each
Polygatum amphibium, 2-1/4 inch plug	Each

**CITY OF ROCHESTER HILLS  
SPECIAL PROVISION  
FOR  
WATERFALL**

NFE/GO

1 of 1

02/02/26

**DESCRIPTION**

This work consists of providing all labor, materials, and equipment necessary to install the waterfall feature as shown on the plans, including, stone placement, plant materials, submersible pump, electrical connections and water supply lines, EPDM liner and underlayment. Ensure all work is done in accordance with this special provision and accompanying drawings, Local and State Codes, and the standard specifications. Includes 45 mil EPDM liner, 4,000 GPH submersible pump and vault; 2" flexible PVC pipe; and waterproof Light Sensor Outdoor Timer

**CONSTRUCTION**

This item includes the furnishing and installation of materials as identified on the landscape drawings, necessary to construct the waterfall feature. The plans indicate intent images on the drawings, allowing the contractor creative flexibility with the design.

**MATERIALS**

All materials specified shall be as specified and detailed in civil engineering and landscape plan drawings. Where the contractor creatively alters the waterfall design, pump size and capacity shall be verified.

**MEASUREMENT AND PAYMENT**

Measurement shall be as indicated for each item. The costs associated with fully constructing a water-tight water feature with moderate flow, shall be included in the unit price bid for each item. Stonework and plantings shall be included as a part of this work but paid for separately under the Stone work, and Nursery Stock provisions. Refer to drawings for all locations, and supplemental information.

**PAY ITEM**

**PAY UNIT**

Waterfall

LS

CITY OF ROCHESTER HILLS

SPECIAL PROVISION

SITE ELECTRICAL INFRASTRUCTURE (LIGHTING AND FACILITY POWER)

NFE:SWS

1 of 3

01/25/26

**Description:** This work shall consist of furnishing and installing complete site electrical infrastructure, including service equipment, underground and aboveground raceways, conductors, site lighting, facility power distribution, and all appurtenant equipment, in accordance with the plans, standard specifications, and this Special Provision.

Work includes all labor, permitting, materials, equipment, testing, coordination, and incidentals necessary to provide a complete, operational electrical system for site lighting and facility power needs.

**Materials:** Materials shall conform to the current National Electrical Code (NEC), applicable utility company requirements, and all governing codes and standards.

Materials shall include, but are not limited to:

- Conduit (PVC Schedule 40/80, rigid galvanized steel, or HDPE as shown on the plans)
- Conductors (copper type and size as shown on the plans)
- Pull boxes, handholes, and junction boxes
- Electrical service equipment, meters, and disconnects
- Panelboards, breakers, and distribution equipment
- Site lighting fixtures, poles, bases, arms, and foundations
- Grounding and bonding systems
- Controls, photocells, timers, and lighting contactors
- Transformers (if required)
- Warning tape and identification markings

All equipment shall be new, listed, and labeled by a nationally recognized testing laboratory.

**Construction:**

**General**

Perform all electrical work in accordance with NEC, utility provider standards, and applicable federal, state, and local codes. Coordinate all work with the serving utility company and other trades.

Provide a complete and operational system, including all terminations, connections, grounding, labeling, and testing.

### **Electrical Service and Distribution**

Install electrical service, service equipment, meters, disconnects, and distribution panels as shown on the plans and as required by the serving utility. Provide all conduits, conductors, pull boxes, and appurtenances necessary to distribute power to site facilities and equipment.

Provide spare capacity in conduits and panels were indicated on the plans or specified in the contract documents.

### **Underground Conduit / Conductors**

Install underground conduits at the locations and depths shown on the plans or as required by code. Minimum cover shall comply with NEC requirements unless otherwise shown.

Provide warning tape above underground electrical conduits. All underground splices shall be made in approved, accessible handholes or pull boxes.

### **Site Lighting**

Furnish and install site lighting systems including poles, foundations, fixtures, arms, wiring, grounding, and controls as shown on the plans. Lighting fixtures shall be LED type unless otherwise specified.

Provide aiming, adjustment, and final positioning of fixtures to achieve required illumination levels and minimize glare and light trespass.

### **Facility Power**

Provide electrical power to site buildings, pumps, kiosks, and other facilities as shown on the plans. Work includes feeders, branch circuits, disconnects, receptacles, and equipment connections necessary to provide complete and functional power systems.

### **Grounding and Bonding**

Provide grounding and bonding in accordance with NEC requirements. Ground all electrical equipment, metallic raceways, lighting poles, and service equipment. Provide ground rods, grounding conductors, and bonding jumpers as required.

### **Testing and Commissioning**

Test all electrical systems prior to acceptance. Testing shall include continuity, insulation resistance as applicable, and operational testing of lighting controls and equipment.

Demonstrate proper operation of site lighting, facility power systems, and controls to the Engineer.

**Measurement and Payment:** Modified structures will be measured and paid for in accordance with the 2020 Standard Specifications for Construction and as follows:

**Pay Item Pay Unit**

LED Light Pole, Modified .....	Each
DB Cable, #4 AWG, Modified .....	Foot
DB Cable, #4 AWG, Modified.....	Foot
DB Cable, #4 AWG, Modified.....	Foot
DB Cable, #4 AWG, Modified.....	Foot
Conduit, 3/4" to 1", Modified.....	Foot
20A WP GFCI Receptacle.....	Each