

**SPECIAL PROVISIONS
FOR THE
BLOCK 11 PUBLIC IMPROVEMENTS**

SPECIAL EXCAVATION

This item includes all excavation necessary to complete the work as shown on the Plans or as directed by the Engineer and shall conform to Articles 202.03, 202.07, and 501 of the "Standard Specifications" except as modified herein.

All debris from demolition shall be hauled off-site and disposed of by legal means at a licensed facility in accordance with IEPA regulations for clean construction or demolition debris (CCDD). The Contractor is prohibited from burning any material within or adjacent to the improvement. All excess or waste material shall be hauled away from the site of the improvement by the Contractor and deposited at locations provided by him, or disposed of within the right-of-way in a manner other than burning, subject to the approval of the Engineer. No extra compensation will be allowed the Contractor for any expense incurred by complying with the requirements of this Special Provision.

The following is an estimated list of major items of work for bidding information purposes only, which are included in the item of SPECIAL EXCAVATION.

<u>ITEM</u>	<u>UNIT</u>	<u>QUANTITY</u>
Concrete Removal (Retaining Wall)	L SUM	1
Wood Retaining Wall Removal	L SUM	1
Modular Block Retaining Wall Removal	L SUM	1
Concrete Removal	SQ YD	33 40
Remove Landscape Stone	L SUM	1
Remove Abandoned Gas Main	L SUM	1
Guardrail Removal	L SUM	1
Curb and Gutter Removal	FOOT	85
Saw Cutting	FOOT	709
Remove Sanitary Sewer	FOOT	415
Remove Cleanout and Cap at Main	EACH	1
Remove Grease Trap	EACH	1
B-Box Removal, Cap Water Service at the Main	EACH	3
Remove 3/4" Type "K" Copper Water Service	EACH	1
Removal of Existing Structures - Watermain	EACH	1
Removal of Existing Structures - Storm	EACH	1
Storm Sewer Removal	FOOT	26
Pavement Removal	SQ YD	1,993
Earth Excavation	CU YD	2,208 2,705
Traffic Sign Removal	EACH	3

~~The above items of work are approximate and do not constitute all of the work as defined under Section 501 of the "Standard Specifications."~~ The listing of these items of work is intended to describe the essential parts of the item of Special Excavation and no additional compensation will be allowed for any variance in either the items or quantities of work shown in the above mentioned listing.

~~Storm sewer~~ Underground utilities (storm, sanitary, water, gas, etc.) shall be removed in accordance with Section 551 of the Standard Specifications. Trench backfill will be required as backfill material in all trenches located under proposed pavement, curb and gutter, or sidewalk. The Contractor shall note that trench backfill for underground utility and structure removal areas will not be paid for separately but shall be considered incidental to SPECIAL EXCAVATION. At locations on the plans where CLSM backfill is required, it shall be paid for separately as CONTROLLED LOW-STRENGTH MATERIAL (CLSM).

Special Excavation shall include all materials encountered except rock and removal items for staging of construction listed in the Summary of Quantities, and no other classification of excavated materials will be made.

TREE REMOVAL

This work shall consist of the cutting, grubbing, removal (including stump), and disposal of trees at the locations shown on the plans or specified by the engineer. No trees shall be removed without the approval of the engineer. Tree removal methods shall be in conformance with Article 201.04 of the Standard Specifications.

Tree removal will be paid for at the contract unit prices for lump sum TREE REMOVAL, which shall be full compensation for all materials, labor, equipment and appurtenances necessary to complete the work.

TEMPORARY STONE

This work shall consist of furnishing, placing, and maintaining aggregate for temporary roads and approaches as shown on the Plans or as directed by the Engineer.

The material for this item shall be restricted to CA-1 or as directed by the Engineer. The Contractor shall be required to maintain the Temporary Stone during the construction period.

This work will be paid for at the Contract unit price per ton for TEMPORARY STONE. The Contract unit price shall be include the cost of removing and disposing of the material used for Temporary Stone.

DUST CONTROL WATERING

This work shall consist of the exclusive control of dust resulting from construction operations. It shall be clearly understood by the Contractor that this item of work is not intended for use in the compaction of earth embankment as specified under Article 205.06 of the Standard Specifications.

Dust shall be controlled by the uniform application of sprinkled water, applied only when directed by the Engineer and in a manner meeting his approval and shall be equipped with adequate measuring devices for metering the exact amount of water discharged. All water used shall be properly documented by ticket or other approved means.

This work will be measured in units of water applied. One unit will be equivalent to 1,000 gallons of water.

This work will be paid for at the Contract unit price per unit for DUST CONTROL WATERING, which price shall be payment in full for furnishing all labor equipment and water for adequate control of dust as herein specified.

VALVE IN BOX, 6"

Gate valves shall meet the requirements of the latest revision of AWWA C509. Gate valves shall open to the left (counter clockwise) and shall have mechanical joints ends. Gate valves through 12" in diameter shall have resilient seats. Gate valves installed in fire hydrant leads shall have "0" ring stuffing box. Gate valves shall be as manufactured by ~~Clow~~, American Flow Control Waterous, or ~~Kennedy~~. Stem, indicators, and all working parts shall be fully protected from moisture or weather damage by complete enclosure. Operating nuts shall be bronze. Operating nuts shall be 2 inches square. Valves boxes shall be Tyler Series 6850 or approved equal.

All excavation around the valve shall be backfilled to the natural line or finished grade as rapidly as possible. The backfill material shall consist of the excavated material or trench backfill as herein specified.

All backfill material shall be deposited in the excavation in a manner that will not cause damage to the valve. Any depressions, which may develop within the area involved in a construction operation due to settlement of backfill material, shall be filled in a manner consistent with standard practice.

All retainer glands when required to restrain valves, fittings, and pipe joints shall be mechanical joint wedge action type MEGALUG 1100 Series as manufactured by EBBA Iron, Inc. or UNI-FLANGE BLOCKBUSTER 1400 SERIES as manufactured by Ford Meter Box Co. and shall be for use on ductile iron pipe conforming to ANSI/AWWA C151/A21.51, for nominal pipe sizes 3" through 48".

Measurement for the valve and box complete and including all appurtenances shall be measured on a per each basis at each location. Payment for furnishing and installing the valve and box, drainage stone, thrust block, all appurtenances and backfilling shall be at the contract unit price per each bid for VALVE IN BOX, 6".

8" TAPPING VALVE IN 5' DIA. VAULT WITH R1530 FRAME AND LID

Tapping valves shall be constructed of cast or ductile iron to allow full size cutters to be used. Seating of the disc gate shall not require any sliding or wedging to achieve a zero leakage, bottle-tight seal. A maximum of (3) internal moving parts shall be required for operation of the valve. The stem collar must be protected from outside grit, sand, etc., by dual O-rings above the stem collar. There shall also be an O-ring below the stem collar sealing off the lubrication chamber from the line fluid. Pressure energized O-rings to be used in place of flat gaskets on flanged joints in valve body/bonnet.

The tapping sleeve shall be mechanical joint made of ~~cast iron~~ stainless steel (Clow F-5205 or approved equal). After the existing water main pipe surface has been properly disinfection, the tapping sleeve shall be mounted to the main and tapping valve to form a pressure-tight connection. The installation shall be pressure tested at operating pressure plus 50 percent, to insure the integrity of the installation. This shall be a hydrostatic test, introduced through a port on the tapping machine, or through a tapped mechanical joint plug on the outlet side of the tapping valve. The tapping machine and the tapping valve and sleeve assembly shall be externally supported so that no additional weight is placed upon the main(s).

All tapping valves shall be opened to the left (counterclockwise). Valves shall be manufactured by Clow (F-5093 or approved equal) ~~American, Waterous, or Kennedy~~. All nuts and bolts on the valve shall be stainless steel. Vaults shall be constructed of precast concrete sections conforming to ASTM C-478 and in accordance to the detail provided on plans. The frame and lid shall be as indicated in the plan details. See Village of Oswego Standard Details in the plan sheets for further information.

The Contractor shall note that at some valve vault locations, he/she will be required to provide 2" two (2) 1" copper service for flushing purposes. This will not be paid for directly but shall be included in the unit price bid for the size and type of valve and valve vault specified.

Valve vaults shall be constructed with a precast base section or monolithic base structure as shown on the plans on a compacted ~~6" 4"~~ 4" crushed aggregate base (~~CA-7~~ CA-6). Contractor shall excavate the proposed area for the pressure connection prior to installing water main to confirm no pipe joint exists, otherwise, a new roadway crossing alignment will be agreed upon to avoid any existing pipe joints. All lift holes on precast elements shall be thoroughly wetted and filled with mortar, smoothed inside and out. The first barrel section shall be uniformly supported by the base concrete and shall not bear directly on any of the pipes. Castings shall be set in preformed non-hardening butyl mastic rope and shall be shop painted with an asphaltic base paint. Valves shall be installed in accordance with the manufacturer's recommendations.

Payment for valve vault with tapping valve shall be made at the contract unit price per each for 8" TAPPING VALVE IN 5' DIA. VAULT WITH R1530 FRAME AND LID. Payment shall be full compensation for excavation, removal of spoils, tapping valve, tapping sleeve, valve vault, frame and lid, copper service, blocking, bedding, backfill, and all labor materials, equipment and incidentals as shown on the plans and as specified herein to install the valve with valve vault.

WATER SERVICE LINE, TYPE "K" COPPER, ¾"

WATER SERVICE LINE, TYPE "K" COPPER, ¾" WITH B-BOX & HOSE BIB

WATER SERVICE LINE, TYPE "K" COPPER, 2" WITH B-BOX

This work shall consist of furnishing all material, equipment and labor for the connection of existing water services to the proposed water main. All services shall be equipped with corporation stop, curb stop and curb box per the standard detail. Curb boxes shall be arch type two (2") inch I.D. box with rod for two (2") inch curb stop, and a three-quarters (3/4") inch I.D. curb box for a three-quarters (3/4") inch curb stop or larger with no rod, of such construction that shall be capable of extensions and installed at finished grade; conforming to a minimum depth of bury of the service line as provided on the plans. Curb stops are to be compression type by ~~Mueller or Ford~~ A.Y. McDonald.

Water services shall be size specified, type "K" copper tubing of sufficient length to connect the proposed water main to the proposed buffalo box; no service couplings shall be allowed. They shall be connected to the corporation stop in accordance with the manufacturer's recommendations. Proposed buffalo boxes shall be placed adjacent to existing buffalo boxes so that existing service lines from buffalo box to residence can be reconnected. Reducer couplings required to connect to existing services smaller than 2 inches shall be included in the unit price bid for the services.

Re-excavation of trench backfill (placed after water main installation, permanent or for temporary access) for water service installation shall be considered incidental to the contract.

Payment for water service installation shall be made at the contract unit price per each for WATER SERVICE LINE, TYPE "K" COPPER, ¾"; WATER SERVICE LINE, TYPE "K" COPPER, ¾" WITH B-BOX & HOSE BIB and WATER SERVICE LINE, TYPE "K" COPPER, 2" WITH B-BOX. Payment shall be full compensation for excavation, directional boring, tapping of the proposed water main, copper service line, curb box, buffalo box, reconnecting existing service, removal of spoils, backfill, and all labor materials, equipment and incidentals as shown on the plans and as specified herein to provide a working system.

STORMTRAP UNDERGROUND DETENTION FACILITY

The Contractor will be required to furnish and install the StormTrap precast concrete, modular stormwater detention/retention per the manufacture's specifications and the details on the

plans. This shall include all excavation, aggregate stone foundation, backfill, removal of spoils, and all labor materials, equipment and incidentals as shown on the plans and as specified herein to provide a working system as required to complete the installation.

REMOVE AND RELAY BRICK PAVER WALK

This item shall consist of the removal and replacement of an existing brick paver sidewalk.

The brick pavers shall be removed within the proposed construction limits and stored in a secure location for future re-installation. Upon completion of the work in the effected area shall be completely backfilled with 6" compacted aggregate material (CA-6). Compaction is recommend by mechanical means to prevent consolidation or settlement. A minimum ~~1-1/2"~~ 2" lift of compacted fine aggregate (sand) shall be provided for setting the salvaged brick pavers. The brick pavers shall be placed to match the existing pattern of the sidewalk prior to construction. Any additional bricks required to complete the sidewalk shall be of the same type and color of the existing sidewalk and shall be approved by the Engineer prior to installation. Paver units requiring cuts shall be done with a concrete saw. Upon completion of cutting, the area must be swept clean of all debris to facilitate inspection and to ensure pavers are not damaged during compaction. A low amplitude, high frequency plate compactor shall be used to compact the pavers. The pavers shall be compacted and the bedding aggregates shall be swept into all joints and void openings until they are full. This will require at least two or three passes with the compactor. Do not compact within 3 feet of the unrestrained edges of the paving units.

This work shall be paid for at the contract unit price per square foot for REMOVE AND RELAY BRICK PAVER WALK, which price shall include removal and replacement of existing pavers, and all materials, labor, equipment and appurtenances required for a complete item.

TRAFFIC CONTROL AND PROTECTION

The Village of Oswego considers the safety of the motoring public, pedestrians, contractors and Village employees within the construction zone of utmost importance. The IDOT Standards Specifications and Village of Oswego specifications outline the general minimum requirements.

The Contractor shall recognize that the actual requirements will be based on field conditions, the actual location of the ongoing work zone, staging of the work, work by other Contractors, etc... and that adjustments will be necessary. The Contractor shall cooperate fully with the Engineer in set up of a functional, safe work zone. Failure to address concerns or repeated violations of a similar nature will result in assessment of traffic control deficiency charges.

Special attention is called to Articles 107.09, 107.11, 107.12, ~~and 107.14,~~ and 107.25 of the Standard Specifications for Road and Bridge Construction and the following additional items relating to traffic control:

IDOT Standards

701501 701602 701606 701801 701901 704001

Special Provisions

Maintenance of Roadways
Traffic Control
Traffic Control Deficiency
Keeping the Road Open to Traffic
Protection and Restoration of Traffic Signs
Flashing Lights on Signs

Supplemental Specifications and Recurring Special Provisions

Legal Relations and Responsibility to Public.

Maintenance of Roadways

At the pre-construction meeting, the Contractor shall furnish the name of the individual in his direct employ who is to be responsible for the installation and maintenance of the traffic control for this project. If the actual installation and maintenance are to be accomplished by a sub-contractor, consent shall be requested of the Village at the time of the pre-construction meeting in accordance with Article 108.01 of the IDOT Standard Specifications. This shall not relieve the Contractor of the foregoing requirement for furnishing the name of its representative who will be responsible for the administration of the TRAFFIC CONTROL AND PROTECTION. The Village will provide the Contractor the name of its representative who will be responsible for the administration of the Traffic Control and Protection Plan.

Traffic Control and Protection

This item of work shall include furnishing, installing, maintaining, relocating and removing all traffic control devices used for the purpose of regulating, warning or directing traffic during the construction or maintenance of this improvement.

Any and all costs incurred in connection with these requirements shall be considered included in the contract lump sum price for TRAFFIC CONTROL AND PROTECTION.

The traffic control price shall include two portable message boards for the duration of the project. Message boards shall be installed at the time and location as directed by the Engineer.

Traffic Control and Protection shall be provided as called for in the plans, these special provisions, applicable Highway Standards, applicable sections of the IDOT Standard Specifications, or as directed by the Engineer.

The governing factor in the execution and staging of work for this project is to provide the motoring public with the safest possible travel conditions along the roadway through the construction zone. The Contractor shall arrange his operations to keep the closing of any lane of the roadway to a minimum.

All traffic control devices used on this project shall conform to the plans, special provisions, traffic control standards, Traffic Specifications and the "Illinois Manual on Uniform Traffic Control Devices for Streets and Highways." No modification of these requirements will be allowed without prior written approval of the Village.

Traffic Control Devices include signs and their supports, signals, pavement markings, temporary concrete barriers, barricades with sand bags, channelizing devices, warning lights, arrow boards, flaggers, or any other device used for the purpose of regulating, warning or guiding traffic through the construction zone.

The Contractor shall be responsible for the proper location, installation and arrangement of all traffic control devices. Special attention shall be given to advance warning signs during construction operations in order to keep lane assignment consistent with barricades with barricade placement at all times. The Contractor shall cover all traffic control devices that are inconsistent with detour or lane assignment patterns during the transition from one construction stage to another.

Construction signs referring to daytime lane closures during working hours shall be removed or covered during non-working hours.

The Contractor shall coordinate all traffic control work on this project with adjoining or overlapping projects, including barricade placement necessary to provide a uniform traffic detour pattern. When directed by the Village, the Contractor shall remove all traffic control devices that were furnished, installed and maintained by him under this contract, and such devices shall remain in place until specific authorization for relocation or removal is received from the Owner.

The Contractor shall ensure that all traffic control devices installed by him are operational 24 hours a day, including Sundays and holidays.

The Contractor shall provide a name and a telephone number where a responsible individual can be contacted on a 24 hour-a-day basis to receive notification of any deficiencies regarding traffic control and protection. The Contractor shall dispatch men, materials and equipment to correct any such deficiencies.

The Contractor shall respond to any call from the Village concerning any request for improving or correcting traffic control devices and begin making the requested repairs within two hours from the time of notification.

When traveling in lanes open to public traffic, the Contractor's vehicles shall always move with and not against or across the flow of traffic. These vehicles shall enter or leave work areas in a

manner that will not be hazardous to, or interfere with, traffic and shall not park or stop except within designated work areas.

Personal vehicles shall not park within the right of way except in specific areas designated by the Village.

Any drop off greater than three inches, but less than six inches within eight feet of the pavement edge shall be protected by Type I or II barricades equipped with mono-directional steady burn lights at 50 foot center to center spacing. If the drop off within eight feet of the pavement edge exceeds six inches, the barricades mentioned above shall be placed at 25 foot center to center spacing. Barricades that must be placed in excavated areas shall have leg extensions installed such that the top of the barricade is in compliance with the height requirements of Standard 701901. Vertical panels or other delineating devices may be substituted for Type I or II barricades with the approval of the Village. Excavation areas greater than ~~14"~~ 12" and less than 3' in depth shall be ~~completely fenced~~ protected by temporary longitudinal traffic barriers (IDOT F-shape TCB). Excavations greater than 3' shall be plated.

Check barricades shall be placed in work areas perpendicular to traffic every 400 feet, one per lane and per shoulder, to prevent motorists from using work areas as a traveled way. Additional check barricades shall be placed in advance of any hazard in the work area which would endanger a motorist. Check barricades shall be Type I or II and equipped with a flashing light.

Placement of all signs and barricades shall proceed in the direction of flow of traffic. Removal of all signs and barricades shall start at the end of the construction areas and proceed toward oncoming traffic unless otherwise directed by the Village.

Delays to the Contractor caused by complying with these requirements will be considered incidental to the item for TRAFFIC CONTROL AND PROTECTION, and no additional compensation will be allowed.

Flaggers

Flaggers shall be provided in accordance with Section 701.13. Flaggers shall either be certified in accordance with Section 701.13 or the Contractor shall provide documentation that certifies flagger has equivalent training and experience.

In accordance with IDOT and Village Standards, flaggers will be required on an intermittent short term basis to control traffic at any time when two-way traffic cannot be maintained, such as when construction equipment is operating outside designated construction zones or entering and leaving construction zones. The Contractor can utilize other construction personnel experienced in traffic control for this short term use. This short term flagger requirement shall not be paid separately. The contractor shall be subject to the Traffic Control Deficiency charge for failure to utilize flaggers as required.

Traffic Control Deficiency

The Contractor is expected to comply with the IDOT Standard Specifications, contract plans and these Special Provisions concerning traffic control and protection. All traffic control devices shall be kept clean and neat appearing, and shall be replaced immediately if they become ineffective due to damage or defacement.

The Village shall be the sole judge as to acceptability of placement and maintenance of all traffic control devices. If the Contractor fails to comply with the IDOT Standard Specification, contract plans, or these Special Provisions concerning traffic control, the Village shall execute such work as may be deemed necessary to correct deficiencies and the cost thereof shall be deducted from compensation due or which may become due the Contractor under the contract.

Failure to comply with directions from the Village for corrections or changes to traffic control devices will result in a charge of \$500.00 per incident. This charge shall also apply for work performed on equipment operating outside of designated work hours.

Keeping the Road Open to Traffic

When the roadways are to be closed to thru traffic, limited local access shall be as specified. Construction Staging: Contractor shall submit in writing a sequence of construction to the Village for their approval. Contractor sequence of construction shall take into consideration emergency and local access as described below.

a.) Emergency Vehicle Access: A ten (10) foot access lane shall be maintained by the contractor at all times for emergency vehicles in areas of reconstruction when pavement removal has been completed. When temporary trench crossings are necessary and emergency access can not be maintained, the Contractor shall contact the appropriate authorities a minimum of two (2) hours prior to excavating the trenches. The trenches shall be backfilled as soon as it is practical.

At the end of each construction day, temporary driveway access will be made available to local residents and businesses with the exception of those days during curing periods for concrete driveways, sidewalks, curbs and gutters.

The Contractor shall notify the Village's Resident Project Representative seventy-two (72) hours prior to construction of those residences and businesses that will not have access due to the Contractor's construction operations.

b.) Immediate access will be constructed of an aggregate surface of the same type and gradation as the surface aggregate, or with steel plates of suitable strength and size and properly anchored. Costs for maintaining immediate access shall be considered incidental to the utility being installed of the diameter specified.

c.) ~~Constructing staging shall be arranged so as to maintain a minimum of one access point for ingress and egress at all times including the DuPage Children's Museum, Washington Junior High School, and the Metra Commuter Parking Lot. U.S. 34 is a significant route at this location. Any necessary lane closures shall take place during non-peak hours.~~

Applicable articles of Section 440 of the IDOT Standard Specifications shall also apply. Revisions in the phasing of construction or maintenance operations, requested by the Contractor, may require traffic control to be installed in accordance with standards and/or designs other than those included in the plans. Revisions or modifications to the traffic control shown in the contract shall be submitted by the Contractor for approval by the Engineer. No additional payment will be made for a Contractor-requested modification.

In the event the sum total value of all the work items for which TRAFFIC CONTROL AND PROTECTION is required is increased or decreased by more than ten percent (10%), the Contract bid price for Traffic Control will be adjusted as follows:

$$\text{Adjusted Contract price} = .25P + .75P (1 +/- (X-0.1))$$

Where "P" is the Contract price for TRAFFIC CONTROL AND PROTECTION

Difference between original and final sum total value of all the work items
for which traffic control and protection is required

Where "X" = Original sum total value of all work items for which traffic
control and protection is required.

The value of the work items used in calculating the increase or decrease will include only items which have been added to or deducted from the Contract under Article 104.03 of the IDOT Standard Specifications and only items which require use of Traffic Control and Protection.

In the event the Village cancels or alters any portion of the Contract which results in elimination or non-completion of any portion of the work, payment for partially completed work will be made in accordance with Article 109.06 of the Standard Specifications.

The Contractor shall not park any equipment or vehicles unnecessarily on the shoulder. Whenever work is in progress adjacent to the traveled way, the Contractor shall provide necessary traffic signs to warn the public and protect the work as required herein or as

provided in the Standards. The Contractor shall keep all equipment within the right of way at all times.

No road closure or restriction shall be permitted except those covered by standard designs without written approval by the Village of Oswego.

Any costs incurred in connection with these requirements shall be considered included in the contract lump sum price for TRAFFIC CONTROL AND PROTECTION.

Protection and Restoration of Traffic Signs

Prior to the beginning of construction operations, together with the Engineer, the Contractor shall develop a sign log of all existing signs within the limits of the construction zone. The Contractor is responsible for verifying the accuracy of the sign log. Throughout the duration of this project, all existing traffic signs shall be maintained by the Contractor. All provisions of Article 107.25 of the IDOT Standard Specifications shall apply except the third paragraph shall be revised to read: "The Contractor shall maintain, furnish and replace at his own expense, any traffic sign or post which has been damaged or lost by the Contractor or a third party.

Portable Changeable Message Signs

The message sign(s) shall be trailer mounted. The message panel shall be at least 2.1m (7ft.) above the pavement, present a level appearance, and be capable of displaying up to 8 characters in each of 3 lines at a time. Character height shall be 450 mm (18 inches).

The message panel shall be of either a bulb matrix or disc matrix design controlled by an onboard computer capable of storing a minimum of 99 programmed messages for instant recall. The computer shall also be capable of being programmed to accept messages created by the operator via an alpha-numeric keyboard and able to flash any 6 messages in sequence. The Contractor is required to promptly program and/or reprogram the computer to provide the messages as directed by the Engineer.

The message panel shall be visible from 400m (1/4 mile) under both day and night conditions. The letters shall be legible from 250m (750 ft.). Whenever the sign(s) are displaying messages, they shall be considered a traffic control device. At all times when no message is displayed, they shall be considered equipment.

The message sign shall include automatic dimming for nighttime operation and a power supply capable of providing 24 hours of uninterrupted service.

The Contractor is required to provide all preventive maintenance efforts he/she deems necessary to achieve uninterrupted service. If service is interrupted for any cause and not restored within 24 hours, the Engineer shall cause such work to be performed as may be necessary to provide this service. The cost of such work shall be borne by the Contractor or deducted from current or future compensation due Contractor.

Flashing Lights on Signs

Flashing lights shall be used on each approach in advance of the work area during the hours of darkness and installed above the first two signs in each series.

Payment Adjustments

The Village may require additional traffic control or protection to be installed in accordance with standards and/or designs other than those included in the plans. In such cases, the standards and/or designs will be made available to the Contractor at least one week in advance of the change in traffic control. Payment for any additional traffic control required will be in accordance with Article 109.04 of the IDOT Standard Specifications.

Method of Measurement: This item of work will be measured on a lump sum basis for furnishing, installing, maintaining, relocating and removing the traffic control devices, including temporary concrete barriers, required in the plans and these special provisions. The TRAFFIC CONTROL AND PROTECTION line item shall not exceed 10% of the overall contract price.

Upon initial construction mobilization, 10% of the total TRAFFIC CONTROL AND PROTECTION line item will be paid as the initial TRAFFIC CONTROL AND PROTECTION payment.

The remaining 90% will be recovered in accordance with the following schedule:

- a) When 25% or more of the original contract is earned, a cumulative 1/2 of the original TRAFFIC CONTROL AND PROTECTION payment will be paid.
- b) When 50% or more of the original contract is earned, a cumulative 3/4 of the original TRAFFIC CONTROL AND PROTECTION payment will be paid.
- c) When 85% or more of the original contract is earned, the remaining balance of the original TRAFFIC CONTROL AND PROTECTION payment will be paid.

Basis of Payment: This work will be paid for at the contract lump sum price for TRAFFIC CONTROL AND PROTECTION, which price shall be payment in full for all labor, materials, transportation, handling and incidentals necessary to furnish, install, maintain and remove all traffic control devices indicated in the plans and specifications. The salvage value of the materials removed shall be reflected in the bid price for this item.

REMOVE AND RE-SPREAD GRAVEL/STONE

This item shall consist of the removal and replacement of the existing gravel/stone south of Firehouse Pizza (outdoor patio area).

The gravel/stone shall be removed within the proposed construction limits and stored at a location for future re-installation. Upon completion of the work in the effected area the gravel/stone shall re-spread to the existing limits. Additional gravel/stone of the same gradation and color shall be provided if required, so that the disturbed area is restored to the existing condition.

This work shall be paid for at the contract unit price per square foot for REMOVE AND RE-SPREAD GRAVEL/STONE, which price shall include removal and replacement of the existing gravel/stone, and all materials, labor, equipment and appurtenances required for a complete item.

CONSTRUCTION LAYOUT AND RECORD DRAWINGS

The Contractor will be required to furnish and place construction layout stakes for this project. The Village has referenced the ~~centerline~~ baseline of construction and has established benchmarks along the line of the improvement outside construction limits. Locating and referencing the centerline of construction consists of locating and referencing control points such as property corners, point of curvature or of tangent, and sufficient points on tangent to provide a line of sight. Control points set by the Village shall be identified in the field to the Contractor.

The Contractor shall provide competent field forces directed by a Professional Land Surveyor or Registered Professional Engineer, and shall set all additional stakes for this project, lines and any other horizontal or vertical controls, including supplementary benchmarks, necessary to secure a correct layout of the work.

The Contractor shall be responsible for having the finished work substantially conform to the lines, grades, elevations and dimensions called for in the plans. Any inspection or checking of the Contractor's layout by the Engineer and the acceptance of all or any part of it shall not relieve the Contractor of his responsibility to secure the proper dimensions, grades and elevations of the several parts of the work. The Contractor shall exercise care in the preservation of stakes and benchmarks, and shall have them reset at his expense when any are damaged, lost, displaced or removed.

The Contractor shall be required to provide Record drawings with surveyed GPS coordinates for all structures installed (vaults, manholes, handholes, etc.) The coordinates shall be based on Village of Oswego datum. Conduit elevations and bends do not require GPS coordinates, but actual installed elevations and locations of bends and fittings shall be determined and recorded on the Record Drawings. In lieu of GPS coordinates, locations for bends shall have one measurement along the centerline of the watermain and a minimum of one additional measurement from another fixed point. As-built information shall include, but is not limited to, elevations and location of all valve vaults, fire hydrants, and vertical and horizontal alignment of the watermain, ~~and top of casing pipes~~. Top of pipe elevations of all utilities at proposed crossings shall be shown on the Record Drawings. All deviations from the proposed plan shall also be noted within the Record Drawings. Dimensions shall be recorded on the Record Drawings. Record Drawings shall be kept up to date throughout the construction.

This work will be paid for at the contract lump sum for CONSTRUCTION LAYOUT AND RECORD DRAWINGS, which shall include establishing, maintaining and correcting, if necessary, the lines and grades as described herein, reestablishing lost or damaged control points and property corners, survey crew and equipment, traffic control for surveying as-built information and all materials, equipment, labor and incidentals as needed to complete the item as specified.

TEMPORARY CHAIN-LINK CONSTRUCTION FENCE, 6'

This work shall consist of furnishing and installing a chain-link fence in accordance with Section 664 of the Standard Specifications at locations as depicted on the plans. The fence will be removed and replaced as required during construction to allow for utility installations, roadway work, etc. during work hours, but shall be reinstalled at the end of each day.

This work shall be paid for at the contract unit price per lineal foot for TEMPORARY CHAIN-LINK CONSTRUCTION FENCE, 6', which price shall include removal and replacement of the fence as needed, and all materials, labor, equipment and appurtenances required for a complete item.

SPECIAL WASTE DISPOSAL

Although there is no indication within the soils report, a quantity for SPECIAL WASTE DISPOSAL has been included in the Summary of Quantities in the event that regulated substances are encountered on the project. The Contractor shall review the project site and the enclosed soil report prior to finalizing his unit price bid.

After the Engineer has made the determination that the material qualifies as a regulated substance, the Contractor shall remove and dispose of the waste in accordance with Section 669 of the Standard Specifications.

Payment shall be made at the Contract unit price per cubic yard for SPECIAL WASTE DISPOSAL. These prices shall be full compensation for furnishing all materials; for all preparation, removal, and disposal of the waste; and for all labor, equipment, tools and incidentals necessary to complete the item.

REMOVAL AND REPLACEMENT OF MODULAR BLOCK WALL AND RAILING

This item shall consist of the removal and replacement of an existing modular block wall and railing.

The modular block units and railing shall be removed within the proposed construction limits and stored in a secure location for future re-installation. Upon completion of the work the effected area shall be completely backfilled with 6" compacted aggregate material (CA-6). Compaction is

recommend by mechanical means to prevent consolidation or settlement. The modular block units shall be placed to match the existing pattern of the retaining wall prior to construction. Any additional blocks required to complete the retaining wall shall be of the same type and color of the existing wall and shall be approved by the Engineer prior to installation. The railing shall also be reinstalled to match existing. Any additional hardware required to reinstall the railing shall be of the same style and color of the existing railing.

This work shall be paid for at the contract unit price per lump sum for REMOVAL AND REPLACEMENT OF MODULAR BLOCK WALL AND RAILING, which price shall include removal and replacement of existing modular block wall units and railing; and all materials, labor, equipment and appurtenances required for a complete item.

PRECAST MODULAR BLOCK RETAINING WALL

PART 1 – GENERAL

1.01 SUMMARY

- A. This Section includes furnishing all materials and labor required for the design and construction of a precast concrete modular block (PMB) retaining wall with geosynthetic reinforcement. Precast modular block retaining wall blocks under this section shall be cast utilizing a wet-cast concrete mix and exhibit a final handling weight in the range of 1,000 pounds (450 kg) per unit.
- B. Scope of Work: The work shall consist of furnishing materials, labor, equipment and supervision for the construction of a precast modular block (PMB) retaining wall structure in accordance with the requirements of this section and in acceptable conformity with the lines, grades, design and dimensions shown in the project site plans.
- C. Signed and sealed design drawings shall be required.

1.02 PRICE AND PAYMENT PROCEDURES

- A. Allowances. No allowance shall be made in the price of the retaining wall for excavation beyond the limits required for retaining wall construction as shown on the project plans. Removal of unsuitable soils and replacement with select fill shall be as directed and approved in writing by the Owner or Owner's representative and shall be paid under separate pay items.
- B. Unit Prices. The basis of payment shall be per square foot of wall face and includes all materials, labor and any other incidentals for the complete wall construction as detailed in the plans and in this specification.
- C. Measurement and Payment.
 - 1. The unit of measurement for furnishing the precast modular block retaining wall system shall be the vertical area of the wall face surface as measured from the top of the leveling pad to the top of the wall including coping. The final measured quantity shall include

supply of all material components and the installation of the precast modular block system.

2. The final accepted quantities of the precast modular block retaining wall system will be compensated per the vertical face area as described above. The quantities of the precast modular block retaining wall as shown on the plans and as approved by the Owner shall be the basis for determination of the final payment quantity. Payment shall be made per square foot of vertical wall face.

1.03 REFERENCES

- A. Where the specification and reference documents conflict, the Owner's designated representative will make the final determination of the applicable document.
- B. Definitions:
 1. Precast Modular Block (PMB) Unit – machine-placed, “wet cast” concrete modular block retaining wall facing unit.
 2. Geotextile – a geosynthetic fabric manufactured for use as a separation and filtration medium between dissimilar soil materials.
 3. Geogrid – a geosynthetic material comprised of a regular network of tensile elements manufactured in a mesh-like configuration of consistent aperture openings. When connected to the PMB facing units and placed in horizontal layers in compacted fill, the geogrid prevents lateral deformation of the retaining wall face and provides effective tensile reinforcement to the contiguous reinforced fill material.
 4. Drainage Aggregate – clean, crushed stone placed within and immediately behind the precast modular block units to facilitate drainage and reduce compaction requirements immediately adjacent to and behind the precast modular block units.
 5. Unit Core Fill – clean, crushed stone placed within the hollow vertical core of a precast modular block unit. Typically, the same material used for drainage aggregate as defined above.
 6. Foundation Zone – soil zone immediately beneath the leveling pad and the reinforced zone.
 7. Retained Zone – soil zone immediately behind the drainage aggregate and wall infill for wall sections designed as modular gravity structures. Alternatively, in the case of wall sections designed with geosynthetic soil reinforcement, the retained zone is the soil zone immediately behind the reinforced zone.
 8. Reinforced Zone – structural fill zone within which successive horizontal layers of geogrid soil reinforcement have been placed to provide stability for the retaining wall face. The reinforced zone exists only for retaining wall sections that utilize geosynthetic soil reinforcement for stability.
 9. Reinforced Fill – structural fill placed within the reinforced zone.
 10. Leveling Pad – hard, flat surface upon which the bottom course of precast modular blocks are placed. The leveling pad may be constructed with crushed stone or cast-in-place concrete. A leveling pad is not a structural footing.
 11. Wall Infill – the fill material placed and compacted between the drainage aggregate and the excavated soil face in retaining wall sections designed as modular gravity structures.

C. Reference Standards

1. Design

- a. AASHTO LRFD Bridge Design Specifications, 7th Edition, 2014.
- b. Minimum Design Loads for Buildings and Other Structures – ASCE/SEI 7-10.
- c. International Building Code, 2012 Edition.
- d. FHWA-NHI-10-024 Volume I and GEC 11 Design of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes.
- e. FHWA-NHI-10-025 Volume II and GEC 11 Design of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes.

2. Precast Modular Block Units

- a. ACI 201 – Guide to Durable Concrete
- b. ACI 318 – Building Code Requirements for Structural Concrete
- c. ASTM C33 – Standard Specification for Concrete Aggregates
- d. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
- e. ASTM C94 – Standard Specification for Ready-Mixed Concrete.
- f. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- g. ASTM C143 – Standard Test Method for Slump of Hydraulic-Cement Concrete.
- h. ASTM C150 – Standard Specification for Portland Cement
- i. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- j. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
- k. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.
- l. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
- m. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- n. ASTM C666 – Standard Test Method for Concrete Resistance to Rapid Freezing and Thawing.
- o. ASTM C845 - Standard Specification for Expansive Hydraulic Cement.
- p. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
- q. ASTM C989 - Standard Specification for Slag Cement for Use in Concrete and Mortars.
- r. ASTM C1116 – Standard Specification for Fiber-Reinforced Concrete.
- s. ASTM C1157 - Standard Performance Specification for Hydraulic Cement.
- t. ASTM C1218 - Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
- u. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
- v. ASTM C1611 – Standard Test Method for Slump Flow of Self-Consolidating Concrete.
- w. ASTM C1776 – Standard Specification for Wet-Cast Precast Modular Retaining Wall Units.
- x. ASTM D6638 – Standard Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks).

- y. ASTM D6916 – Standard Test Method for Determining Shear Strength Between Segmental Concrete Units (Modular Concrete Blocks).
3. Geosynthetics
- a. AASHTO M 288 – Geotextile Specification for Highway Applications.
 - b. ASTM D3786 – Standard Test Method for Bursting Strength of Textile Fabrics Diaphragm Bursting Strength Tester Method.
 - c. ASTM D4354 – Standard Practice for Sampling of Geosynthetics for Testing.
 - d. ASTM D4355 – Standard Test Method for Deterioration of Geotextiles
 - e. ASTM D4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - f. ASTM D4533 – Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 - g. ASTM D4595 – Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
 - h. ASTM D4632 – Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
 - i. ASTM D4751 – Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 - j. ASTM D4759 – Standard Practice for Determining Specification Conformance of Geosynthetics.
 - k. ASTM D4833 – Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.
 - l. ASTM D4873 – Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.
 - m. ASTM D5262 – Standard Test Method for Evaluating the Unconfined Tension Creep and Creep Rupture Behavior of Geosynthetics.
 - n. ASTM D5321 – Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method.
 - o. ASTM D5818 – Standard Practice for Exposure and Retrieval of Samples to Evaluate Installation Damage of Geosynthetics.
 - p. ASTM D6241 – Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.
 - q. ASTM D6637 – Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method.
 - r. ASTM D6706 – Standard Test Method for Measuring Geosynthetic Pullout Resistance in Soil.
 - s. ASTM D6992 – Standard Test Method for Accelerated Tensile Creep and Creep-Rupture of Geosynthetic Materials Based on Time-Temperature Superposition Using the Stepped Isothermal Method.
4. Soils
- a. AASHTO M 145 – AASHTO Soil Classification System.
 - b. AASHTO T 104 – Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.

- c. AASHTO T 267 – Standard Method of Test for Determination of Organic Content in Soils by Loss of Ignition.
 - d. ASTM C33 – Standard Specification for Concrete Aggregates.
 - e. ASTM D422 – Standard Test Method for Particle-Size Analysis of Soils.
 - f. ASTM D448 – Standard Classification for Sizes of Aggregates for Road and Bridge Construction.
 - g. ASTM D698 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort. (12,400 ft-lbf/ft (2,700 kN-m/m)).
 - h. ASTM D1241 – Standard Specification for Materials for Soil-Aggregate Subbase, Base and Surface Courses.
 - i. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.
 - j. ASTM D1557 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort. (56,000 ft-lbf/ft (2,700 kN-m/m)).
 - k. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - l. ASTM D2488 – Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).
 - m. ASTM D3080 – Standard Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions.
 - n. ASTM D4254 – Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
 - o. ASTM D4318 – Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 - p. ASTM D4767- Test Method for Consolidated-Undrained Triaxial Compression Test for Cohesive Soils.
 - q. ASTM D4972 – Standard Test Method for pH of Soils.
 - r. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Aggregate by Nuclear Methods (Shallow Depth).
 - s. ASTM G51 – Standard Test Method for Measuring pH of Soil for Use in Corrosion Testing.
 - t. ASTM G57 – Standard Test Method for Field Measurement of Soil Resistivity Using the Wenner Four-Electrode Method.
5. Drainage Pipe
- a. ASTM D3034 – Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - b. ASTM F2648 – Standard Specification for 2 to 60 inch [50 to 1500 mm] Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage Applications.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preconstruction Meeting. As directed by the Owner, the contractor shall schedule a preconstruction meeting at the project site prior to commencement of retaining wall construction. Participation in the preconstruction meeting shall be required of the General Contractor, Retaining Wall Design Engineer, Retaining Wall Installation Contractor, Grading Contractor and Inspection Engineer. The General Contractor shall provide notification to all parties at least 10 calendar days prior to the meeting.
1. Preconstruction Meeting Agenda:
 - a. The Retaining Wall Design Engineer shall explain all aspects of the retaining wall construction drawings.
 - b. The Retaining Wall Design Engineer shall explain the required bearing ~~capa~~capacity of soil below the retaining wall structure and the shear strength of in-situ soils assumed in the retaining wall design to the Inspection Engineer.
 - c. The Retaining Wall Design Engineer shall explain the required shear strength of fill soil in the reinforced, retained and foundation zones of the retaining wall to the Inspection Engineer.
 - d. The Retaining Wall Design Engineer shall explain any measures required for coordination of the installation of utilities or other obstructions in the reinforced or retained fill zones of the retaining wall.
 - e. The Retaining Wall Installation Contractor shall explain all excavation needs, site access and material staging area requirements to the General Contractor and Grading Contractor.

1.05 SUBMITTALS

- A. Product Data. At least 14 days prior to construction, the General Contractor shall submit a minimum of six (6) copies of the retaining wall product submittal package to the Owner's Representative for review and approval. The submittal package shall include technical specifications and product data from the manufacturer for the following:
1. Precast Modular Block System brochure
 2. Precast Modular Block concrete test results specified in paragraph 2.01, subparagraph B of this section as follows:
 - a. 28-day compressive strength
 - b. Air content
 - c. Slump or Slump Flow (as applicable)
 3. Drainage Pipe
 4. Geotextile
 5. Geosynthetic Soil Reinforcement. The contractor shall provide certified manufacturer test reports for the geosynthetic soil reinforcement material in the manufactured roll width specified. The test report shall list the individual roll numbers for which the certified material properties are valid.
 6. Finish treatments for the exposed ends and top of wall.
- B. Installer Qualification Data. At least 14 days prior to construction, the General Contractor shall submit the qualifications of the business entity responsible for installation of the

retaining wall, the Retaining Wall Installation Contractor, per paragraph 1.07, subparagraph A of this section.

- C. Retaining Wall Design Calculations and Construction Shop Drawings. At least 14 days prior to construction, the General Contractor shall furnish six (6) sets of construction shop drawings and six (6) copies of the supporting structural calculations report to the Owner for review and approval. This submittal shall include the following:
 - 1. Signed, sealed and dated drawings and engineering calculations prepared in accordance with these specifications.
 - 2. Qualifications Statement of Experience of the Retaining Wall Design Engineer as specified in paragraph 1.07, subparagraph B of this section.
 - 3. Certificate of Insurance of the Retaining Wall Design Engineer as specified in paragraph 1.06, subparagraph B of this section.

1.06 CONSTRUCTION SHOP DRAWING PREPARATION

- A. The Retaining Wall Design Engineer shall coordinate the retaining wall construction shop drawing preparation with the project Civil Engineer, project Geotechnical Engineer and Owner's Representatives. The General Contractor shall furnish the Retaining Wall Design Engineer the following project information required to prepare the construction shop drawings. This information shall include, but is not limited to, the following:
 - 1. Current versions of the site, grading, drainage, utility, erosion control, landscape, and irrigation plans;
 - 2. electronic CAD file of the civil site plans listed in (1);
 - 3. report of geotechnical investigation and all addenda and supplemental reports;
 - 4. recommendations of the project Geotechnical Engineer regarding effective stress shear strength and total stress shear strength (when applicable) parameters for in-situ soils in the vicinity of the proposed retaining wall(s) and for any fill soil that may potentially be used as backfill in retained and/or foundation zones of the retaining wall.
- B. The Retaining Wall Design Engineer shall provide the Owner with a certificate of professional liability insurance verifying the minimum coverage limits of \$1 million per claim and \$1 million aggregate.
- C. Design of the precast modular block retaining wall shall satisfy the requirements of this section. Where local design or building code requirements exceed these specifications, the local requirements shall also be satisfied.
- D. The Retaining Wall Design Engineer shall note any exceptions to the requirements of this section by listing them at the bottom right corner of the first page of the construction shop drawings.
- E. Approval or rejection of the exceptions taken by the Retaining Wall Engineer will be made in writing as directed by the Owner.
- F. The precast modular block design, except as noted herein, shall be based upon AASHTO Load and Resistance Factor Design (LRFD) methodology as referenced in paragraph 1.03, subparagraph C.1.

- G. In the event that a conflict is discovered between these specifications and a reasonable interpretation of the design specifications and methods referenced in paragraph F above, these specifications shall prevail. If a reasonable interpretation is not possible, the conflict shall be resolved per the requirements in paragraph 1.03, subparagraph A of this section.
- H. Soil Shear Parameters. The Retaining Wall Design Engineer shall prepare the construction shop drawings based upon soil shear strength parameters from the available project data and the recommendations of the project Geotechnical Engineer. If insufficient data exists to develop the retaining wall design, the Retaining Wall Design Engineer shall communicate the specific deficiency of the project information or data to the Owner in writing.
- I. Allowable bearing pressure requirements for each retaining wall shall be clearly shown on the construction drawings.
- J. Global Stability. Overall (global) stability shall be evaluated in accordance with the principals of limit equilibrium analysis as set forth in FHWA-NHI-10-024 Volume I and FHWA-NHI-10-025 Volume II GEC 11 Design of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes as referenced in paragraph 1.03, subparagraph C.1. The minimum factors of safety shall be as follows:

Normal Service (Static)	1.4
Seismic	1.1
Rapid Drawdown (if applicable)	1.2
- K. Seismic Stability. Seismic loading shall be evaluated in accordance with AASHTO Load and Resistance Factor Design (LRFD) methodology as referenced in paragraph 1.03, subparagraph C.1.

1.07 QUALITY ASSURANCE

- A. Retaining Wall Installation Contractor Qualifications. In order to demonstrate basic competence in the construction of precast modular block walls, the Retaining Wall Installation Contractor shall document compliance with the following:
 - 1. Experience.
 - a. Construction experience with a minimum of 20,000 square feet of the proposed precast modular block retaining wall system.
 - b. Construction of at least ten (10) precast modular block (large block) retaining wall structures within the past three (3) years.
 - 2. Retaining Wall Installation Contractor experience documentation for each qualifying project shall include:
 - a. Project name and location
 - b. Date (month and year) of construction completion
 - c. Contact information of Owner or General Contractor
 - d. Type (trade name) of precast modular block system built
 - e. Maximum height of the wall constructed
 - f. Face area of the wall constructed

3. In lieu of the requirements set forth in items 1 and 2 above, the Retaining Wall Installation Contractor must be a certified Precast Modular Block Retaining Wall Installation Contractor as demonstrated by satisfactory completion of a certified precast modular block retaining wall installation training program administered by the precast modular block manufacturer.
- B. Retaining Wall Design Engineer Qualifications and Statement of Experience. The Retaining Wall Design Engineer shall submit a written statement affirming that he or she has the following minimum qualifications and experience.
1. The Retaining Wall Design Engineer shall be licensed to practice in the jurisdiction of the project location.
 2. The Retaining Wall Design Engineer shall be independently capable of performing all internal and external stability analyses, including those for seismic loading, compound stability, rapid draw-down and deep-seated, global modes of failure.
 3. The Retaining Wall Design Engineer shall affirm in writing that he or she has personally supervised the design of the retaining walls for the project, that the design considers all the requirements listed in paragraph 1.06 and that he or she accepts responsibility as the design engineer of record for the retaining walls constructed on the project.
 4. The Retaining Wall Design Engineer shall affirm in writing that he or she has personally designed in excess of 100,000 face square feet (9,000 face square meters) of modular block earth retaining walls within the previous three (3) years.
 5. In lieu of these specific requirements, the engineer may submit alternate documentation demonstrating competency in Precast Modular Block retaining wall design.
- C. The Owner reserves the right to reject the design services of any engineer or engineering firm who, in the sole opinion of the Owner, does not possess the requisite experience or qualifications.

1.08 QUALITY CONTROL

- A. The Owner's Representative shall review all submittals for materials, design, Retaining Wall Design Engineer qualifications and the Retaining Wall Installation Contractor qualifications.
- B. The General Contractor shall retain the services of an Inspection Engineer who is experienced with the construction of precast modular block retaining wall structures to perform inspection and testing. The cost of inspection shall be the responsibility of the General Contractor. Inspection shall be continuous throughout the construction of the retaining walls.
- C. The Inspection Engineer shall perform the following duties:
1. Inspect the construction of the precast modular block structure for conformance with construction shop drawings and the requirements of this specification.
 2. Verify that soil or aggregate fill placed and compacted in the reinforced, retained and foundation zones of the retaining wall conforms with paragraphs 2.04 and 2.05 of this section and exhibits the shear strength parameters specified by the Retaining Wall Design Engineer.
 3. Verify that the shear strength of the in-situ soil assumed by the Retaining Wall Design Engineer is appropriate.

4. Inspect and document soil compaction in accordance with these specifications:
 - a. Required dry unit weight
 - b. Actual dry unit weight
 - c. Allowable moisture content
 - d. Actual moisture content
 - e. Pass/fail assessment
 - f. Test location – wall station number
 - g. Test elevation
 - h. Distance of test location behind the wall face
 5. Verify that all excavated slopes in the vicinity of the retaining wall are bench-cut as directed by the project Geotechnical Engineer.
 6. Notify the Retaining Wall Installation Contractor of any deficiencies in the retaining wall construction and provide the Retaining Wall Installation Contractor a reasonable opportunity to correct the deficiency.
 7. Notify the General Contractor, Owner and Retaining Wall Design Engineer of any construction deficiencies that have not been corrected timely.
 8. Document all inspection results.
 9. Test compacted density and moisture content of the retained backfill with the following frequency:
 - a. At least once every 1,000 square feet (90 square meters) (in plan) per 9-inch (230 mm) vertical lift, and
 - b. At least once per every 18 inches (460 mm) of vertical wall construction.
- D. The General Contractor’s engagement of the Inspection Engineer does not relieve the Retaining Wall Installation Contractor of responsibility to construct the proposed retaining wall in accordance with the approved construction shop drawings and these specifications.
- E. The Retaining Wall Installation Contractor shall inspect the on-site grades and excavations prior to construction and notify the Retaining Wall Design Engineer and General Contractor if on-site conditions differ from the elevations and grading conditions depicted in the retaining wall construction shop drawings.

1.09 DELIVERY, STORAGE AND HANDLING

- A. The Retaining Wall Installation Contractor shall inspect the materials upon delivery to ensure that the proper type, grade and color of materials have been delivered.
- B. The Retaining Wall Installation Contractor shall store and handle all materials in accordance with the manufacturer’s recommendations as specified herein and in a manner that prevents deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, UV exposure or other causes. Damaged materials shall not be incorporated into the work.

- C. Geosynthetics
 - 1. All geosynthetic materials shall be handled in accordance with ASTM D4873. The materials should be stored off the ground and protected from precipitation, sunlight, dirt and physical damage.

- D. Precast Modular Blocks
 - 1. Precast modular blocks shall be stored in an area with positive drainage away from the blocks. Be careful to protect the block from mud and excessive chipping and breakage. Precast modular blocks shall not be stacked more than three (3) units high in the storage area.

- E. Drainage Aggregate and Backfill Stockpiles
 - 1. Drainage aggregate or backfill material shall not be piled over unstable slopes or areas of the project site with buried utilities.
 - 2. Drainage aggregate and/or reinforced fill material shall not be staged where it may become mixed with or contaminated by poor draining fine-grained soils such as clay or silt.

PART 2 – MATERIALS

2.01 PRECAST MODULAR BLOCK RETAINING WALL UNITS

- A. All units shall be wet-cast precast modular retaining wall units conforming to ASTM C1776.

- B. All units for the project shall be obtained from the same manufacturer. The manufacturer shall be licensed and authorized to produce the retaining wall units by the precast modular block system patent holder/licensor and shall document compliance with the published quality control standards of the proprietary precast modular block system licensor for the previous three (3) years or the total time the manufacturer has been licensed, whichever is less.

- C. Concrete used in the production of the precast modular block units shall be first-purpose, fresh concrete. It shall not consist of returned, reconstituted, surplus or waste concrete. It shall be an original production mix meeting the requirements of ASTM C94 and exhibit the properties as shown in the following table:

Concrete Mix Properties

Freeze Thaw Exposure Class⁽¹⁾	Minimum 28-Day Compressive Strength⁽²⁾	Maximum Water Cement Ratio	Nominal Maximum Aggregate Size	Aggregate Class Designation⁽³⁾	Air Content⁽⁴⁾
Moderate	4,000 psi (27.6 MPa)	0.45	1 inch (25 mm)	3M	4.5% +/- 1.5%
Severe	4,000 psi (27.6 MPa)	0.45	1 inch (25 mm)	3S	6.0% +/- 1.5%
Very Severe	4,500 psi (30.0 MPa)	0.40	1 inch (25 mm)	4S	6.0% +/- 1.5%
Maximum Water-Soluble Chloride Ion (Cl⁻) Content in Concrete, Percent by Weight of Cement^(5,6)					0.15
Maximum Chloride as Cl⁻ Concentration in Mixing Water, Parts Per Million					1000

Maximum Percentage of Total Cementitious Materials By Weight ^(7,9) (Very Severe Exposure Class Only):	
Fly Ash or Other Pozzolans Conforming to ASTM C618	25
Slag Conforming to ASTM C989	50
Silica Fume Conforming to ASTM C1240	10
Total of Fly Ash or Other Pozzolans, Slag, and Silica Fume ⁽⁸⁾	50
Total of Fly Ash or Other Pozzolans and Silica Fume ⁽⁸⁾	35
Alkali-Aggregate Reactivity Mitigation per ACI 201	
Slump (Conventional Concrete) per ASTM C143⁽¹⁰⁾	5 inches +/- 1½ inches (125 mm +/- 40 mm)
Slump Flow (Self-Consolidating Concrete) per ASTM C1611	18 inches – 32 inches (450 mm – 800 mm)

⁽¹⁾Exposure class is as described in ACI 318. “Moderate” describes concrete that is exposed to freezing and thawing cycles and occasional exposure to moisture. “Severe” describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture. “Very Severe” describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture and exposed to deicing chemicals. Exposure class should be specified by owner/purchaser prior to order placement.

⁽²⁾Test method ASTM C39.

⁽³⁾Defined in ASTM C33 Table 3 *Limits for Deleterious Substances and Physical Property Requirements of Coarse Aggregates for Concrete*.

⁽⁴⁾Test method ASTM C231.

⁽⁵⁾Test method ASTM C1218 at age between 28 and 42 days.

⁽⁶⁾Where used in high sulfate environments or where alkali-silica reactivity is an issue, water soluble chloride shall be limited to no more than trace amounts (from impurities in concrete-making components, not intended constituents.)

⁽⁷⁾The total cementitious material also includes ASTM C150, C595, C845, C1157 cement. The maximum percentages shall include:

(a) Fly ash or other pozzolans in type IP, blended cement, ASTM C595, or ASTM C1157.

(b) Slag used in the manufacture of an IS blended cement, ASTM C595, or ASTM C1157.

(c) Silica fume, ASTM C1240, present in a blended cement.

⁽⁸⁾Fly ash or other pozzolans and silica fume shall constitute no more than 25 and 10 percent, respectively, of the total weight of the cementitious materials.

⁽⁹⁾Prescriptive limits shown may be waived for concrete mixes that demonstrate excellent freeze/thaw durability in a detailed and current testing program.

⁽¹⁰⁾Slump may be increased by a high-range water-reducing admixture.

D. Each concrete block shall be cast in a single continuous pour without cold joints. With the exception of half-block units, corner units and other special application units, the precast modular block units shall conform to the nominal dimensions listed in the table below and be produced to the dimensional tolerances shown.

Block Type	Dimension	Nominal Value	Tolerance
28" (710 mm) Block	Height	18" (457 mm)	+/- 3/16" (5 mm)
	Length	46-1/8" (1172 mm)	+/- 1/2" (13 mm)
	Width*	28" (710 mm)	+/- 1/2" (13 mm)
41" (1030 mm) Block	Height	18" (457 mm)	+/- 3/16" (5 mm)
	Length	46-1/8" (1172 mm)	+/- 1/2" (13 mm)
	Width*	40-1/2" (1030 mm)	+/- 1/2" (13 mm)
60" (1520 mm) Block	Height	18" (457 mm)	+/- 3/16" (5 mm)

	Length	46-1/8" (1172 mm)	+/- 1/2" (13 mm)
	Width*	60" (1520 mm)	+/- 1/2" (13 mm)

* Block tolerance measurements shall exclude variable face texture

- E. Individual block units shall have a nominal height of 18 inches (457 mm).
- F. With the exception of half-block units, corner units and other special application units, the precast modular block units shall have the ability to transmit a shear load which, when measured in accordance with ASTM D6916, shall exceed 6,500 lb/ft (95 kN/m) at a minimum normal load of 500 lb/ft (7kN/m) as well as an ultimate peak interface shear ~~capaVillage~~ capacity in excess of 11,000 lb/ft (160 kN/m). The peak interlock shear between any two (2) vertically stacked precast modular block units measured in accordance with ASTM D6916 shall exceed 1,850 lb/ft (27 kN/m) at a minimum normal load of 500 lb/ft (7kN/m) as well as an ultimate peak interface shear ~~capaVillage~~ capacity in excess of 10,000 lb/ft (146 kN/m). Test specimen blocks tested under ASTM D6916 shall be actual, full-scale production blocks of known compressive strength. The interface shear ~~capaVillage~~ capacity reported shall be corrected for a 4,000 psi (27.6 MPa) concrete compressive strength. Regardless of precast modular block configuration, interface shear testing shall be completed without the inclusion of unit core infill aggregate.
- G. The 28" (710 mm) and 41" (1030 mm) precast modular block units shall be cast with a 13" (330 mm) wide, continuous vertical core slot that will permit the insertion of a 12" (305 mm) inch wide strip of geogrid reinforcement to pass completely through the block. When installed in this manner, the geogrid reinforcement shall form a non-normal load dependent, positive connection between the block unit and the reinforcement strip. The use of steel for the purposes of creating the geogrid to block connection is not acceptable.
- H. Without field cutting or special modification, the precast modular block units shall be capable of achieving a minimum radius of 14 ft 6 in (4.42 m).
- I. The precast modular block units shall be manufactured with an integrally cast shear knobs that establishes a standard horizontal set-back for subsequent block courses. The precast modular block system shall be available in the four (4) standard horizontal set-back facing batter options listed below:

Horizontal <u>Set-Back/Blk. Course</u>	Max. <u>Facing Batter</u>
3/8" (10 mm)	1.2°
1-5/8" (41 mm)	5.2°
9-3/8" (238 mm)	27.5°
16-5/8" (422 mm)	42.7°

The precast modular block units shall be furnished with the required shear knobs that provide the facing batter required in the construction shop drawings.

- J. The precast modular block unit face texture shall be selected by the owner from the available range of textures available from the precast modular block manufacturer. Each textured

block facing unit shall be a minimum of 5.76 square feet (0.54 square meters) with a unique texture pattern that repeats with a maximum frequency of once in any 15 square feet (1.4 square meters) of wall face.

- K. The block color shall be selected by the owner from the available range of colors available from the precast modular block manufacturer.
- L. All precast modular block units shall be sound and free of cracks or other defects that would interfere with the proper installation of the unit, impair the strength or performance of the constructed wall. PMB units to be used in exposed wall construction shall not exhibit chips or cracks in the exposed face or faces of the unit that are not otherwise permitted. Chips smaller than 1.5" (38 mm) in its largest dimension and cracks not wider than 0.012" (0.3 mm) and not longer than 25% of the nominal height of the PMB unit shall be permitted. PMB units with bug holes in the exposed architectural face smaller than 0.75" (19 mm) in its largest dimension shall be permitted. Bug holes, water marks, and color variation on non-architectural faces are acceptable. PMB units that exhibit cracks that are continuous through any solid element of the PMB unit shall not be incorporated in the work regardless of the width or length of the crack.
- M. **Preapproved Manufacturers.**
Manufacturers of Redi-Rock Retaining Wall Systems as licensed by Redi-Rock International, LLC, 05481 US 31 South, Charlevoix, MI 49720 USA; telephone (866) 222-8400; website www.redi-rock.com.
- N. **Substitutions.** Technical information demonstrating conformance with the requirements of this specification for an alternative precast modular block retaining wall system must be submitted for preapproval at least 7 calendar days prior to the bid date. Acceptable alternative PMB retaining wall systems, otherwise found to be in conformance with this specification, shall be approved in writing by the owner 3 days prior to the bid date. The Owner's Representative reserves the right to provide no response to submissions made out of the time requirements of this section or to submissions of block retaining wall systems that are determined to be unacceptable to the owner.
- O. **Value Engineering Alternatives.** The owner may evaluate and accept systems that meet the requirements of this specification after the bid date that provide a minimum cost savings of 20% to the Owner. Construction expediency will not be considered as a contributing portion of the cost savings total.

2.02 GEOGRID REINFORCEMENT

- A. Geogrid reinforcement shall be a woven or knitted PVC coated geogrid manufactured from high-tenaVillage ~~tenacity~~ PET polyester fiber with an average molecular weight greater than 25,000 ($M_n > 25,0000$) and a carboxyl end group less than 30 (CEG < 30). The geogrid shall be furnished in prefabricated roll widths of certified tensile strength by the manufacturer. The prefabricated roll width of the geogrid shall be 12" (300 mm) +/- 1/2" (13 mm). No cutting of geogrid reinforcement down to the 12" (300 mm) roll width from a larger commercial roll width will be allowed under any circumstances.

- B. The ultimate tensile strength (T_{ult}) of the geogrid reinforcement shall be measured in accordance with ASTM D6637.
- C. Geogrid – Soil Friction Properties
 - 1. Friction factor, F^* , shall be equal to $2/3 \tan \phi$, where ϕ is the effective angle of internal friction of the reinforced fill soil.
 - 2. Linear Scale Correction Factor, α , shall equal 0.8.
- D. Long-Term Tensile Strength (T_{al}) of the geogrid reinforcement shall be calculated in accordance with Section 3.5.2 of FHWA-NHI-10-024 and as provided in this specification.
 - 1. The creep reduction factor (RF_{CR}) shall be determined in accordance with Appendix D of FHWA-NHI-10-025 for a minimum 75 year design life.
 - 2. Minimum installation damage reduction factor (RF_{ID}) shall be 1.25. The value of RF_{ID} shall be based upon documented full-scale tests in a soil that is comparable to the material proposed for use as reinforced backfill in accordance with ASTM D5818.
 - 3. Minimum durability reduction factor (RF_D) shall be 1.3 for a soil pH range of 3 to 9.
- E. Connection between the PMB retaining wall unit and the geogrid reinforcement shall be determined from short-term testing per the requirements of FHWA NHI-10-025, Appendix B.4 for a minimum 75-year design life.
- F. The minimum value of T_{al} for geogrid used in design of a reinforced precast modular block retaining wall shall be 2,000 lb/ft (29 kN/m) or greater.
- G. The minimum length of geogrid reinforcement shall be the greater of the following:
 - 1. 0.7 times the wall design height, H.
 - 2. 6 feet (1.83 m).
 - 3. The length required by design to meet internal stability requirements, soil bearing pressure requirements and constructability requirements.
- H. Constructability Requirements. Geogrid design embedment length shall be measured from the back of the precast modular block facing unit and shall be consistent for the entire height of a given retaining wall section.
- I. Geogrid shall be positively connected to every precast modular block unit. Design coverage ratio, R_c , as calculated in accordance with AASHTO LRFD Bridge Design Specifications Figure 11.10.6.4.1-2 shall not exceed 0.50.
- J. Preapproved Geogrid Reinforcement Products.
 - 1. Miragrid XT Geogrids as manufactured by TenCate Geosynthetics of Pendergrass, Georgia USA and distributed by Manufacturers of the Redi-Rock Retaining Wall System.
- K. Substitutions. No substitutions of geogrid reinforcement products shall be allowed.

2.03 GEOTEXTILE

- A. Nonwoven geotextile fabric shall be placed as indicated on the retaining wall construction shop drawings. Additionally, the nonwoven geotextile fabric shall be placed in the v-shaped

joint between adjacent block units on the same course. The nonwoven geotextile fabric shall meet the requirements Class 3 construction survivability in accordance with AASHTO M 288.

B. Preapproved Nonwoven Geotextile Products

1. Mirafi 140N
2. Propex Geotex 451
3. Skaps GT-142
4. Thrace-Linq 140EX
5. Carthage Mills FX-40HS
6. Stratatex ST 142

2.04 DRAINAGE AGGREGATE AND WALL INFILL

- A. Drainage aggregate (and wall infill for retaining walls designed as modular gravity structures) shall be a durable crushed stone conforming to No. 57 size per ASTM C33 with the following particle-size distribution requirements per ASTM D422:

U.S. Standard	
<u>Sieve Size</u>	<u>% Passing</u>
1-½" (38 mm)	100
1" (25 mm)	95-100
½" (13 mm)	25-60
No. 4 (4.76 mm)	0-10
No. 8 (2.38 mm)	0-5

2.05 REINFORCED FILL

- A. Material used as reinforced backfill material in the reinforced zone (if applicable) shall be a granular fill material meeting the requirements of USCS soil type GW, GP, SW or SP per ASTM D2487 or alternatively by AASHTO Group Classification A-1-a or A-3 per AASHTO M 145. The backfill shall exhibit a minimum effective internal angle of friction, $\phi = 34$ degrees at a maximum 2% shear strain and meet the following particle-size distribution requirements per ASTM D422.

U.S. Standard	
<u>Sieve Size</u>	<u>% Passing</u>
¾" (19 mm)	100
No. 4 (4.76 mm)	0-100
No. 40 (0.42 mm)	0-60
No. 100 (0.15 mm)	0-10
No. 200 (0.07 mm)	0-15

- B. The reinforced backfill material shall be free of sod, peat, roots or other organic or deleterious matter including, but not limited to, ice, snow or frozen soils. Materials passing the No. 40 (0.42 mm) sieve shall have a liquid limit less than 25 and ~~plasticity index~~ plasticity index less than 6 per ASTM D4318. Organic content in the backfill material shall be less than 1% per AASHTO T-267 and the pH of the backfill material shall be between 5 and 8.

- C. Soundness. The reinforced backfill material shall exhibit a magnesium sulfate soundness loss of less than 30% after four (4) cycles, or sodium sulfate soundness loss of less than 15% after five (5) cycles as measured in accordance with AASHTO T-104.
- D. Reinforced backfill shall not be comprised of crushed or recycled concrete, recycled asphalt, bottom ash, shale or any other material that may degrade, creep or experience a loss in shear strength or a change in pH over time.

2.06 LEVELING PAD

- A. The precast modular block units shall be placed on a leveling pad constructed from crushed stone or unreinforced concrete. The leveling pad shall be constructed to the dimensions and limits shown on the retaining wall design drawings prepared by the Retaining Wall Design Engineer.
- B. Crushed stone used for construction of a granular leveling pad shall meet the requirements of the drainage aggregate and wall infill in section 2.04 or a preapproved alternate material.
- C. Concrete used for construction of an unreinforced concrete leveling pad shall satisfy the criteria for AASHTO Class B. The concrete should be cured a minimum of 12 hours prior to placement of the precast modular block wall retaining units and exhibit a minimum 28-day compressive strength of 2,500 psi (17.2 MPa).

2.07 DRAINAGE

- A. Drainage Pipe
 - 1. Drainage collection pipe shall be a 4" (100 mm) diameter, 3-hole perforated, HDPE pipe with a minimum pipe stiffness of 22 psi (152 kPa) per ASTM D2412.
 - 2. The drainage pipe shall be manufactured in accordance with ASTM D1248 for HDPE pipe and fittings.
- B. Preapproved Drainage Pipe Products
 - 1. ADS 3000 Triple Wall pipe as manufactured by Advanced Drainage Systems.

PART 3 – EXECUTION

3.01 GENERAL

- A. All work shall be performed in accordance with OSHA safety standards, state and local building codes and manufacturer's requirements.
- B. The General Contractor is responsible for the location and protection of all existing underground utilities. Any new utilities proposed for installation in the vicinity of the retaining wall, shall be installed concurrent with retaining wall construction. The General Contractor shall coordinate the work of subcontractors affected by this requirement.
- C. New utilities installed below the retaining wall shall be backfilled and compacted to a minimum of 98% maximum dry density per ASTM D698 standard proctor.

- D. The General Contractor is responsible to ensure that safe excavations and embankments are maintained throughout the course of the project.
- E. All work shall be inspected by the Inspection Engineer as directed by the Owner.

3.02 EXAMINATION

- A. Prior to construction, the General Contractor, Grading Contractor, Retaining Wall Installation Contractor and Inspection Engineer shall examine the areas in which the retaining wall will be constructed to evaluate compliance with the requirements for installation tolerances, worker safety and any site conditions affecting performance of the completed structure. Installation shall proceed only after unsatisfactory conditions have been corrected.

3.03 PREPARATION

- A. Fill Soil.
 - 1. The Inspection Engineer shall verify that reinforced backfill placed in the reinforced soil zone satisfies the criteria of this section.
 - 2. The Inspection Engineer shall verify that any fill soil installed in the foundation and retained soil zones of the retaining wall satisfies the specification of the Retaining Wall Design Engineer as shown on the construction drawings.
- B. Excavation.
 - 1. The Grading Contractor shall excavate to the lines and grades required for construction of the precast modular block retaining wall as shown on the construction drawings. The Grading Contractor shall minimize over-excavation. Excavation support, if required, shall be the responsibility of the Grading Contractor.
 - 2. Over-excavated soil shall be replaced with compacted fill in conformance with the specifications of the Retaining Wall Design Engineer and "Division 31, Section 31 20 00 – Earthmoving" of these project specifications.
 - 3. Embankment excavations shall be bench cut as directed by the project Geotechnical Engineer and inspected by the Inspection Engineer for compliance.
- C. Foundation Preparation.
 - 1. Prior to construction of the precast modular block retaining wall, the leveling pad area and undercut zone (if applicable) shall be cleared and grubbed. All topsoil, brush, frozen soil and organic material shall be removed. Additional foundation soils found to be unsatisfactory beyond the specified undercut limits shall be undercut and replaced with approved fill as directed by the project Geotechnical Engineer. The Inspection Engineer shall ensure that the undercut limits are consistent with the requirements of the project Geotechnical Engineer and that all soil fill material is properly compacted according project specifications. The Inspection Engineer shall document the volume of undercut and replacement.
 - 2. Following excavation for the leveling pad and undercut zone (if applicable), the Inspection Engineer shall evaluate the in-situ soil in the foundation and retained soil zones.
 - a. The Inspection Engineer shall verify that the shear strength of the in-situ soil assumed by the Retaining Wall Design Engineer is appropriate. The Inspection

Engineer shall immediately stop work and notify the Owner if the in-situ shear strength is found to be inconsistent with the retaining wall design assumptions.

- b. The Inspection Engineer shall verify that the foundation soil exhibits sufficient ultimate bearing capacity to satisfy the requirements indicated on the retaining wall construction shop drawings per paragraph 1.06 I of this section.

D. Leveling Pad.

1. The leveling pad shall be constructed to provide a level, hard surface on which to place the first course of precast modular block units. The leveling pad shall be placed in the dimensions shown on the retaining wall construction drawings and extend to the limits indicated.
2. Crushed Stone Leveling Pad. Crushed stone shall be placed in uniform maximum lifts of 6" (150 mm). The crushed stone shall be compacted by a minimum of 3 passes of a vibratory compactor capable of exerting 2,000 lb (8.9 kN) of centrifugal force and to the satisfaction of the Inspection Engineer.
3. Unreinforced Concrete Leveling Pad. The concrete shall be placed in the same dimensions as those required for the crushed stone leveling pad. The Retaining Wall Installation Contractor shall erect proper forms as required to ensure the accurate placement of the concrete leveling pad according to the retaining wall construction drawings.

3.04 PRECAST MODULAR BLOCK WALL SYSTEM INSTALLATION

- A. The precast modular block structure shall be constructed in accordance with the construction drawings, these specifications and the recommendations of the retaining wall system component manufacturers. Where conflicts exist between the manufacturer's recommendations and these specifications, these specifications shall prevail.

- B. Drainage components. Pipe, geotextile and drainage aggregate shall be installed as shown on the construction shop drawings.

C. Precast Modular Block Installation

1. The first course of block units shall be placed with the front face edges tightly abutted together on the prepared leveling pad at the locations and elevations shown on the construction drawings. The Retaining Wall Installation Contractor shall take special care to ensure that the bottom course of block units are in full contact with the leveling pad, are set level and true and are properly aligned according to the locations shown on the construction drawings.
2. Backfill shall be placed in front of the bottom course of blocks prior to placement of subsequent block courses. Nonwoven geotextile fabric shall be placed in the V-shaped joints between adjacent blocks. Drainage aggregate shall be placed in the V-shaped joints between adjacent blocks to a minimum distance of 12" (300 mm) behind the block unit.
3. Drainage aggregate shall be placed in 9 inch maximum lifts and compacted by a minimum of three (3) passes of a vibratory plate compactor capable exerting a minimum of 2,000 lb (8.9 kN) of centrifugal force.
4. Unit core fill shall be placed in the precast modular block unit vertical core slot. The core fill shall completely fill the slot to the level of the top of the block unit. The top of the block unit shall be broom-cleaned prior to placement of subsequent block courses. No additional courses of precast modular blocks may be stacked before the unit core fill is installed in the blocks on the course below.

5. Base course blocks for gravity wall designs (without geosynthetic soil reinforcement) may be furnished without vertical core slots. If so, disregard item 4 above, for the base course blocks in this application.
6. Nonwoven geotextile fabric shall be placed between the drainage aggregate and the retained soil (gravity wall design) or between the drainage aggregate and the reinforced fill (reinforced wall design) as required on the retaining wall construction drawings.
7. Subsequent courses of block units shall be installed with a running bond (half block horizontal course-to-course offset). With the exception of 90 degree corner units, the shear channel of the upper block shall be fully engaged with the shear knobs of the block course below. The upper block course shall be pushed forward to fully engage the interface shear key between the blocks and to ensure consistent face batter and wall alignment. Geogrid, drainage aggregate, unit core fill, geotextile and properly compacted backfill shall be complete and in-place for each course of block units before the next course of blocks is stacked.
8. The elevation of retained soil fill shall not be less than 1 block course (18" (457 mm)) below the elevation of the reinforced backfill throughout the construction of the retaining wall.
9. If included as part of the precast modular block wall design, cap units shall be secured with an adhesive in accordance with the precast modular block manufacturer's recommendation.

D. Geogrid Reinforcement Installation (if required)

1. Geogrid reinforcement shall be installed at the locations and elevations shown on the construction drawings on level fill compacted to the requirements of this specification.
2. Continuous 12" (300 mm) wide strips of geogrid reinforcement shall be passed completely through the vertical core slot of the precast modular block unit and extended to the embedment length shown on the construction plans. The strips shall be staked or anchored as necessary to maintain a taut condition.
3. Reinforcement length (L) of the geogrid reinforcement is measured from the back of the precast modular block unit. The cut length (L_c) is two times the reinforcement length plus additional length through the block facing unit. The cut length is calculated as follows:

$$L_c = 2*L + 3 \text{ ft } (2*L + 0.9 \text{ m}) \text{ (28" (710 mm) block unit)}$$

$$L_c = 2*L + 5 \text{ ft } (2*L + 1.5 \text{ m}) \text{ (41" (1030 mm) block unit)}$$

4. The geogrid strip shall be continuous throughout its entire length and may not be spliced. The geogrid shall be furnished in nominal, prefabricated roll widths of 12" (300 mm) +/- 1/2" (13 mm). No field modification of the geogrid roll width shall be permitted.
5. Neither rubber tire nor track vehicles may operate directly on the geogrid. Construction vehicle traffic in the reinforced zone shall be limited to speeds of less than 5 mph (8 km/hr) once a minimum of 9 inches (230 mm) of compacted fill has been placed over the geogrid reinforcement. Sudden braking and turning of construction vehicles in the reinforced zone shall be avoided.

E. Construction Tolerance. Allowable construction tolerance of the retaining wall shall be as follows:

1. Deviation from the design batter and horizontal alignment, when measured along a 10' (3 m) straight wall section, shall not exceed 3/4" (19 mm).

2. Deviation from the overall design batter shall not exceed 1/2" (13 mm) per 10' (3 m) of wall height.
3. The maximum allowable offset (horizontal bulge) of the face in any precast modular block joint shall be 1/2" (13 mm).
4. The base of the precast modular block wall excavation shall be within 2" (50 mm) of the staked elevations, unless otherwise approved by the Inspection Engineer.
5. Differential vertical settlement of the face shall not exceed 1' (300 mm) along any 200' (61 m) of wall length.
6. The maximum allowable vertical displacement of the face in any precast modular block joint shall be 1/2" (13 mm).
7. The wall face shall be placed within 2" (50 mm) of the horizontal location staked.

3.05 WALL INFILL AND REINFORCED BACKFILL PLACEMENT

- A. Backfill material placed immediately behind the drainage aggregate shall be compacted as follows:
 1. 98% of maximum dry density at $\pm 2\%$ optimum moisture content per ASTM D698 standard proctor or 85% relative density per ASTM D4254.
- B. Compactive effort within 3' (0.9 m) of the back of the precast modular blocks should be accomplished with walk-behind compactors. Compaction in this zone shall be within 95% of maximum dry density as measured in accordance with ASTM D698 standard proctor or 80% relative density per ASTM D 4254. Heavy equipment should not be operated within 3' (0.9 m) of the back of the precast modular blocks.
- C. Backfill material shall be installed in lifts that do not exceed a compacted thickness of 9" (230 mm).
- D. At the end of each work day, the Retaining Wall Installation Contractor shall grade the surface of the last lift of the granular wall infill to a $3\% \pm 1\%$ slope away from the precast modular block wall face and compact it.
- E. The General Contractor shall direct the Grading Contractor to protect the precast modular block wall structure against surface water runoff at all times through the use of berms, diversion ditches, silt fence, temporary drains and/or any other necessary measures to prevent soil staining of the wall face, scour of the retaining wall foundation or erosion of the reinforced backfill or wall infill.

3.06 OBSTRUCTIONS IN THE INFILL AND REINFORCED FILL ZONE

- A. The Retaining Wall Installation Contractor shall make all required allowances for obstructions behind and through the wall face in accordance with the approved construction shop drawings.
- B. Should unplanned obstructions become apparent for which the approved construction shop drawings do not account, the affected portion of the wall shall not be constructed until the Retaining Wall Design Engineer can appropriately address the required procedures for construction of the wall section in question.

3.07 COMPLETION

- A. For walls supporting unpaved areas, a minimum of 12" (300 mm) of compacted, low-permeability fill shall be placed over the granular wall infill zone of the precast modular block retaining wall structure. The adjacent retained soil shall be graded to prevent ponding of water behind the completed retaining wall.
- B. For retaining walls with crest slopes of 5H:1V or steeper, silt fence shall be installed along the wall crest immediately following construction. The silt fence shall be located 3' to 4' (0.9 m to 1.2 m) behind the uppermost precast modular block unit. The crest slope above the wall shall be immediately seeded to establish vegetation. The General Contractor shall ensure that the seeded slope receives adequate irrigation and erosion protection to support germination and growth.
- C. The General Contractor shall confirm that the as-built precast modular block wall geometries conform to the requirements of this section. The General Contractor shall notify the Owner of any deviations.