ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION			
203.02	220	CY	UNCLASSIFIED EXCAVATION AND DISPOSAL	FOR:		
203.07 *	100	CY	SELECT GRANULAR FILL	FOR:		
206.0201*	25	CY	TRENCH AND CULVERT EXCAVATION	FOR:		
206.05	25	EA	TEST PIT EXCAVATION	FOR:		
209.11010024	220	EA	TEMPORARY CATCH BASIN INSERTS TRASH, SEDIMENT AND DEBRIS REMOVAL	FOR:		
304.00010018	57,814	SF	FINE GRADING OF EXISTING SUBBASE	FOR:		
304.10119917*	70	CY	SUBBASE COURSE, TYPE 1011-2	FOR:		
404.0001	240	QU	PLANT PRODUCTION QUALITY ADJUSTMENT TO ASPHALT ITEMS	FOR:		

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION			
404.0189	1,000	TN	TRUING & LEVELING F9, ASPHALT, 80 SERIES COMPACTION	FOR:		
404.0981	4,913	TN	9.5 F1 TOP COURSE ASPHALT, 80 SERIES COMPACTION	FOR:		
404.3789	457	TN	37.5 F9 BASE COURSE ASPHALT, 80 SERIES COMPACTION	FOR:		
407.0102	2,000	GAL	DILUTED TACK COAT	FOR:		
418.7603	29,030	LF	ASPHALT PAVEMENT JOINT ADHESIVE	FOR:		
490.10	36,009	SY	PRODUCTION COLD MILLING OF BITUMINOUS CONCRETE	FOR:		
490.30	2,853	SY	MISCELLANEOUS COLD MILLING OF BITUMINOUS CONCRETE	FOR:		
502.10010018	1	LS	PORTLAND CEMENT CONCRETE PAVEMENT REPAIR EVALUATION AND MARK-OUT	FOR:		

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION			
502.31010018	6,424	SY	FULL-DEPTH PORTLAND CEMENT CONCRETE (PCC) LIFT-OUT	FOR:		
502.32010010	9,229	EA	DRILL AND ANCHOR DOWELS FOR FULL-DEPTH PORTLAND CEMENT CONCRETE PAVEMENT REPAIRS	FOR:		
502.36130018	1,487	CY	PORTLAND CEMENT CONCRETE (PCC) PLACEMENT FOR FULL-DEPTH PAVEMENT REPAIRS	FOR:		
502.37010018	8,200	LF	TRANSVERSE JOINTS	FOR:		
502.38010018	6,952	LF	LONGITUDINAL JOINTS	FOR:		
502.44200018	4,500	SF	PCC PAVEMENT PARTIAL DEPTH REPAIRS USING RAPID SETTING CONCRETE REPAIR MATERIAL - SAW CUTTING METHOD	FOR:		
502.90010018	50,000	LF	CLEAN AND FILL CRACKS AND JOINTS IN PORTLAND CEMENT CONCRETE(PCC) PAVEMENT, ASTM D 6690 TYPE IV	FOR:		
502.9210*	17,700	LF	SEALING TRANSVERSE JOINTS - HIGHWAY JOINT SEALANT	FOR:		

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION			
502.9310*	20,500	LF	SEALING LONGITUDINAL JOINTS - HIGHWAY JOINT SEALER	FOR:		
505.0102	800	SY	BUMP GRINDING - PCC WITH SLURRY REMOVAL	FOR:		
505.0402	110,000	SY	PRODUCTION DIAMOND GRINDING - PAVEMENT PRESERVATION WITH SLURRY REMOVAL	FOR:		
520.05000010	1,096	LF	SAW CUTTING PORTLAND CEMENT CONCRETE AND COMPOSITE PAVEMENTS	FOR:		
520.09000010	1,009	LF	SAW CUTTING ASPHALT CONCRETE	FOR:		
604.071001	5	EA	ALTERING DRAINAGE STRUCTURES, LEACHING BASINS AND MANHOLES	FOR:		
604.07200110	150	EA	SETTING NEW DRAINAGE FRAMES ON EXISTING DRAINAGE STRUCTURES	FOR:		
604.07210110	14	EA	RESETTING EXISTING DRAINAGE FRAMES ON EXISTING DRAINAGE STRUCTURES	FOR:		

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION			
604.07290010	124	SF	REPAIR WALLS OF EXISTING DRAINAGE STRUCTURES	FOR:		
608.0101*	25	CY	CONCRETE SIDEWALKS AND DRIVEWAYS	FOR:		
608.01050010	90	CY	CONCRETE SIDEWALKS-UNREINFORCED (GRADING INCLUDED)	FOR:		
608.01050109	7	EA	CURB RAMP CONFIGURATION TYPE 1	FOR:		
608.01050209	7	EA	CURB RAMP CONFIGURATION TYPE 2	FOR:		
608.01050309	12	EA	CURB RAMP CONFIGURATION TYPE 3	FOR:		
608.01050409	38	EA	CURB RAMP CONFIGURATION TYPE 4	FOR:		
608.01050709	6	EA	CURB RAMP CONFIGURATION TYPE 7	FOR:		

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION			
608.01050809	4	EA	CURB RAMP CONFIGURATION TYPE 8	FOR:		
608.01050909	2	EA	CURB RAMP CONFIGURATION TYPE 9	FOR:		
608.01051009	14	EA	CURB RAMP CONFIGURATION TYPE 10	FOR:		
608.01051309	2	EA	CURB RAMP CONFIGURATION TYPE 13	FOR:		
608.01051409	1	EA	CURB RAMP CONFIGURATION TYPE 14	FOR:		
608.020102*	10	TON	ASPHALT SIDEWALKS, DRIVEWAYS AND BICYCLE PATHS,AND VEGETATION CONTROL STRIPS	FOR:		
608.03040008*	10	SY	REMOVE , STORE AND RESET CONCRETE BLOCK PAVERS	FOR:		
609.04*	2,025	LF	CAST-IN-PLACE CONCRETE CURB (AS DETAILED)	FOR:		

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION			
609.05*	485	LF	CAST-IN-PLACE CONCRETE CURB & GUTTER (AS DETAILED)	FOR:		
610.1403*	70	CY	TOPSOIL-LAWNS	FOR:		
611.0161	68	EA	PLANTING - MAJOR DECIDUOUS TREES - 2 1/2 INCH CAL., BALL & BURLAP, FIELD POTTED OR FIELD BOXED	FOR:		
614.060104	7	EA	TREE REMOVAL OVER 4 INCHES TO 6 INCHES DIAMETER BREAST HEIGHT - STUMPS GRUBBED	FOR:		
614.060204	3	EA	TREE REMOVAL OVER 6 INCHES TO 12 INCHES DIAMETER BREAST HEI GHT - STUMPS GRUBBED	FOR:		
614.060304	1	EA	TREE REMOVAL OVER 12 INCHES TO 18 INCHES DIAMETER BREAST HEIGHT - STUMPS GRUBBED	FOR:		
619.01	1	LS	BASIC WORK ZONE TRAFFIC CONTROL	FOR:		
619.0901	59,800	LF	TEMPORARY PAVEMENT MARKINGS STRIPES (TRAFFIC PAINT)	FOR:		

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION			
619.0904	640	LF	TEMPORARY PAVEMENT MARKINGS STRIPES (REMOVABLE WET REFLECTIVE TAPE)	FOR:		
619.110511	4	EA	(PVMS) STANDARD SIZE - FULL MATRIX (LED) NO OPTIONAL EQUIPMENT SPECIFIED, NO CELLULAR COMMUNICATIONS	FOR:		
621.03	22,500	LF	CLEANING CLOSED DRAINAGE SYSTEMS	FOR:		
621.04	282	EA	CLEANING DRAINAGE STRUCTURES	FOR:		
625.01	1	LS	SURVEY OPERATIONS	FOR:		
633.12	1	LS	CLEANING, SEALING AND/OR FILLING CRACKS	FOR:		
633.1401	100	SY	REMOVAL AND REPAIR OF DETERIORATED ASPHALT PAVEMENT LESS THAN OR EQUAL TO 4 SQUARE YARDS	FOR:		
633.05050208	1	LS	REMOVE TRANSVERSE AND LONGITUDINAL JOINT SEALERS, CLEAN AND FILL JOINTS AND CRACKS IN PORTLAND CEMENT CONCRETE PAVEMENT	FOR:		

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION			
635.0103	80,000	LF	CLEANING AND PREPARATION OF PAVEMENT SURFACES - LINES	FOR:		
635.0303	111	EA	CLEANING AND PREPARATION OF PAVEMENT SURFACES - SYMBOLS	FOR:		
637.13	21	MO	ENGINEER'S FIELD OFFICE - TYPE 3	FOR:		
639.210053	1	LS	CRITICAL PATH METHOD (CPM) PROGRESS SCHEDULE WITH MONTHLY UPDATES (MIN BID $30,000)	FOR:		
647.31	40	EA	RELOCATE SIGN PANEL, SIGN PANEL ASSEMBLY SIZE I (UNDER 30 SQUARE FEET)	FOR:		
655.05020010	80	EA	FRAMES AND COVERS FOR SANITARY SEWER MANHOLES	FOR:		
655.07030010	25	EA	CAST FRAME F3, WITHOUT CURB BOX AND WITH RETICULINE GRATE G3	FOR:		
655.0706	126	EA	CAST FRAME F3, UNMOUNTABLE CURB BOX CU3 & RETICULINE GRATE G3	FOR:		

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION			
655.1202	50	EA	MANHOLE FRAME AND COVER	FOR:		
655.15100010	5	EA	FURNISH AND REPLACE CAST IRON CURB BOXES	FOR:		
663.33*	5	EA	ADJUST EXISTING VALVE BOX ELEVATION	FOR:		
680.54	885	LF	INDUCTANCE LOOP INSTALLATION	FOR:		
680.72	2,086	LF	INDUCTANCE LOOP WIRE	FOR:		
685.03120018	35	EA	RAISED REFLECTORIZED SNOWPLOWABLE PAVEMENT MARKERS (TWO-WAY YELLOW)	FOR:		
685.072001NA	80,300	LF	HIGHLY REFLECTORIZED WHITE EPOXY PAVEMENT STRIPES - 20 MILS (TRIPLE DROP)	FOR:		
685.072002NA	21	EA	HIGHLY REFLECTORIZED WHITE EPOXY PAVEMENT LETTERS - 20 MILS (TRIPLE DROP)	FOR:		

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION			
685.072003NA	90	EA	HIGHLY REFLECTORIZED WHITE EPOXY PAVEMENT SYMBOLS - 20 MILS (TRIPLE DROP)	FOR:		
685.072004NA	1,350	LF	HIGHLY REFLECTORIZED WHITE EPOXY CROSS HATCHING - 20 MILS (TRIPLE DROP)	FOR:		
685.072005NA	9,000	LF	HIGHLY REFLECTORIZED WHITE EPOXY PAVEMENT STRIPES (SPECIAL MARKINGS) - 20 MILS (TRIPLE DROP)	FOR:		
685.072006NA	63,210	LF	HIGHLY REFLECTORIZED YELLOW EPOXY PAVEMENT STRIPES - 20 MILS (TRIPLE DROP)	FOR:		
685.072007NA	3	LF	HIGHLY REFLECTORIZED YELLOW EPOXY PAVEMENT STRIPES (CROSS HATCHING) - 20 MILS (TRIPLE DROP)	FOR:		
685.072009NA	3	EA	HIGHLY REFLECTORIZED WHITE EPOXY PAVEMENT YIELD LINE SYMBOLS -LARGE - 20 MILS (TRIPLE DROP)	FOR:		
697.03**	328,000	DC	FIELD CHANGE PAYMENT	FOR: ONE DOLLARS ZERO CENTS	$1.00	$328,000.00
698.04**	2,275	DC	ASPHALT PRICE ADJUSTMENT	FOR: ONE DOLLARS ZERO CENTS	$1.00	$2,275.00

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION			
698.05**	5,400	DC	FUEL PRICE ADJUSTMENT	FOR: ONE DOLLARS ZERO CENTS	$1.00	$5,400.00
698.06**	100	DC	STEEL/IRON PRICE ADJUSTMENT	FOR: ONE DOLLARS ZERO CENTS	$1.00	$100.00
699.040001	1	LS	MOBILIZATION	FOR:		

*CONTINGENCY
**FORCE BID

SPECIAL SPECIFICATIONS

209.11010024	TEMPORARY CATCH BASIN INSERTS TRASH, SEDIMENT AND DEBRIS REMOVAL	EA
304.00010018	FINE GRADING OF EXISTING SUBBASE	SF
304.10119917	SUBBASE COURSE, TYPE 1011-2	CY
502.10010018	PORTLAND CEMENT CONCRETE PAVEMENT REPAIR EVALUATION AND MARK-OUT	LS
502.31010018	FULL-DEPTH PORTLAND CEMENT CONCRETE (PCC) LIFT-OUT	EA
502.32010010	DRILL AND ANCHOR DOWELS FOR FULL-DEPTH PCC PAVEMENT REPAIRS	EA
502.36130018	PORTLAND CEMENT CONCRETE (PCC) PLACEMENT FOR FULL-DEPTH PAVEMENT REPAIR	CY
502.37010018	TRANSVERSE JOINTS	LF
502.38010018	LONGITUDINAL JOINTS	LF
502.44200018	PORTLAND CEMENT CONCRETE PAVEMENT PARTIAL-DEPTH REPAIRS	SF
502.90010018	CLEAN AND FILL CRACKS AND JOINTS IN PORTLAND CEMENT CONCRETE (PCC) PAVEMENT, ASTM D 6690 TYPE I	LF
520.05000010	SAW CUTTING PORTLAND CEMENT CONCRETE AND COMPOSITE PAVEMENTS	LF
520.09000010	SAW CUTTING ASPHALT CONCRETE	LF
604.07200110	SETTING NEW DRAINAGE FRAMES ON EXISTING DRAINAGE STRUCTURES	EA
604.07210110	RESETTING EXISTING DRAINAGE FRAMES ON EXISTING DRAINAGE STRUCTURES	EA
604.07290010	REPAIR WALLS OF EXISTING DRAINAGE STRUCTURES	SF
608.01050010*	CONCRETE SIDEWALKS-UNREINFORCED (GRADING INCLUDED)	CY
608.01050109	CURB RAMP CONFIGURATION TYPE 1	EA
608.01050309	CURB RAMP CONFIGURATION TYPE 2	EA
608.01050309	CURB RAMP CONFIGURATION TYPE 3	EA
608.01050409	CURB RAMP CONFIGURATION TYPE 4	EA
608.01050709	CURB RAMP CONFIGURATION TYPE 7	EA
608.01050809	CURB RAMP CONFIGURATION TYPE 8	EA
608.01050909	CURB RAMP CONFIGURATION TYPE 9	EA
608.01051009	CURB RAMP CONFIGURATION TYPE 10	EA
608.01051309	CURB RAMP CONFIGURATION TYPE 13	EA
608.01051409	CURB RAMP CONFIGURATION TYPE 14	EA
609.03040008	REMOVE, STORE AND RESET CONCRETE BLOCK PAVERS	
633.05050208	REMOVE TRANSVERSE AND LONGITUDINAL JOINT SEALERS, CLEAN AND FILL JOINTS AND CRACKS IN PORTLAND CEMENT CONCRETE PAVEMENT	LS
639.210053	CRITICAL PATH METHOD PROJECT SCHEDULE WITH MONTHLY UPDATES	LS
655.05020010	FRAMES AND COVERS FOR SANITARY SEWER MANHOLES	EA
655.07030010	CAST FRAME F3, WITHOUT CURB BOX AND WITH RETICULINE GRATE G3	EA
655.15100010	FURNISH AND REPLACE CAST IRON CURB BOXES	EA
685.03120018	RAISED REFLECTORIZED SNOWPLOWABLE PAVEMENT MARKERS (TWO-WAY YELLOW)	EA
685.072001NA	HIGHLY REFLECTORIZED WHITE EPOXY PAVEMENT STRIPES - 20 MILS (TRIPLE DROP)	LF
685.072002NA	HIGHLY REFLECTORIZED WHITE EPOXY PAVEMENT LETTERS - 20 MILS (TRIPLE DROP)	EA
685.072003NA	HIGHLY REFLECTORIZED WHITE EPOXY PAVEMENT SYMBOLS - 20 MILS (TRIPLE DROP)	EA
685.072004NA	HIGHLY REFLECTORIZED WHITE EPOXY CROSS HATCHING - 20 MILS (TRIPLE DROP)	LF
685.072005NA	HIGHLY REFLECTORIZED WHITE EPOXY PAVEMENT STRIPES (SPECIAL MARKINGS) - 20 MILS (TRIPLE DROP)	LF
685.072006NA	HIGHLY REFLECTORIZED YELLOW EPOXY PAVEMENT STRIPES - 20 MILS (TRIPLE DROP)	LF

685.072007NA	HIGHLY REFLECTORIZED YELLOW EPOXY PAVEMENT STRIPES (CROSS HATCHING) - 20 MILS (TRIPLE DROP)	LF
685.072009NA	HIGHLY REFLECTORIZED WHITE EPOXY PAVEMENT YIELD LINE SYMBOLS -LARGE - 20 MILS (TRIPLE DROP)	EA

ITEM 209.11XXNN24 – TEMPORARY CATCH BASIN INSERT (CBI)

DESCRIPTION:
The work shall consist of furnishing, installing, maintaining (removing, disposal of debris and resetting), replacing (if needed), and disposing (at end of contract) a temporary catch basin insert at the locations indicated in and according to the contract documents, and as directed by the Engineer.

The work shall also consist of removing and storing an existing temporary catch basin insert prior to a catastrophic storm event (e.g., flooding), and reinstalling it after the event at the locations indicated in and according to the contract documents, and as directed by the Engineer.

Acronyms
CBI – Temporary Catch Basin Insert

Temporary removal, storage and reinstallation of temporary catch basin inserts does not include the cost of a new temporary catch basin insert.

MATERIALS:
The following sections of the standard specification shall apply:

Temporary Catch Basin Insert	713-21

CONSTRUCTION DETAILS
The following section of the standard specifications shall apply:

Soil Erosion and Sediment Control	209-3.01

with the following exceptions:
- Torn or punctured geotextile must be replaced (see Maintenance below)
- Sediment deposition removed from the CBI shall be disposed of in accordance with §107-10 E.

Installation: Install the CBI according to manufacturer's instructions.

Inspection: Using the most restrictive inspection criteria listed below, the Contractor shall inspect each CBI:
- daily,
- after a rainfall event of 0.5" or more per twenty-four (24) hour period,
- as per manufacturer's instructions, and
- as per the conditions of the Stormwater Pollution Prevention Plan (SWPPP) (if the contract includes one).

Maintenance: Maintenance shall include the following:
- Removal of all accumulated sediment and debris from the vicinity of the CBI after each rainfall event of 0.5" or more per twenty-four (24) hour period and prior to removal of the insert for maintenance.
- Removal of CBI according to manufacturer's instructions.

ITEM 209.11XXNN24 – TEMPORARY CATCH BASIN INSERT (CBI)

- Emptying the CBI when the CBI's containment area is more than one third (1/3) full or before the sediment/trash/debris reaches the overflow openings. The Contractor shall ensure that the CBI is not so full that removing it causes the geotextile to rip, tear or become non-functioning. CBIs damaged during sediment removal shall be replaced at the Contractor's expense. The Engineer will determine if a damaged CBI warrants replacement. Sediment and/or debris that has been released into the drainage structure shall be removed by the Contractor and disposed of as below.
  - Refer to the manufacturer's instructions for emptying and re-installing the CBI. Removal of trash, sediment and debris from the CBI shall be done in a manner that ensures no trash, sediment or debris will enter an unprotected drainage structure.
- Disposal of the removed sediment shall occur at an upland location away from all stormwater conveyances.
  - Trash shall be disposed of according to §107-10 E. of the standard specifications.
- If a CBI's fabric or strap is torn,
  - dispose of the sediment and debris contained within the unit according to this specification, and
  - replace the entire CBI. A CBI shall be replaced at no additional cost to the state.
- When CBI servicing results in a non-functioning or poorly functioning CBI, the CBI shall be replaced at no additional cost to the state. The Engineer will determine if a CBI is non-functioning or poorly functioning.
- CBIs shall be removed prior to winter shut down. Re-installation of the CBIs shall occur prior to ground disturbance or first thaw in the following spring, whichever occurs first, and according to manufacturer's instructions.

Emergency Removal, Storage and Reinstallation: Emergency removal, storage and reinstallation shall be performed in association with catastrophic events (e.g. storms and flooding) as follows:

- As directed in consideration of forecasted events (e.g. moderate or major flood warnings) in impacted urban or residential locations where flooding is likely to result in hazardous public conditions.
- Removal, storage, and reinstallation as specified and applicable under Maintenance above. This includes replacing any damaged, poorly functioning, or non-functioning CBI.
- CBIs removed for emergency flooding events shall be reinstalled prior to resuming construction.

CBIs shall be removed according to §209-3.01 and disposed of according to §107-01 E. after all soil disturbance areas have been fully stabilized with an established, permanent, and approved vegetative cover at a uniform density of eighty percent (80%).

METHOD OF MEASUREMENT

Temporary Catch Basin Insert. The work will be measured as the number of each CBI furnished, installed, maintained, replaced, and disposed.

Temporary Catch Basin Insert Emergency Removal and Reinstallation. The work will be measured as the number of each CBI removed, stored, and reinstalled.

ITEM 209.11XXNN24 – TEMPORARY CATCH BASIN INSERT (CBI)

BASIS OF PAYMENT

Temporary Catch Basin Insert. The unit price bid for each CBI furnished, installed, maintained, replaced, and disposed shall include the cost of all labor, materials, and equipment necessary to satisfactorily complete the work.

Temporary Catch Basin Insert Emergency Removal and Reinstallation. The unit price bid for each CBI removed, stored, and reinstalled shall include the cost of all labor, materials, and equipment necessary to satisfactorily complete the work.

Progress payments will be made at fifty percent (50%) of the unit price bid upon installation of each CBI. The remaining fifty percent (50%) will be paid after soil disturbance areas have been fully stabilized with an established, permanent, and approved vegetative cover at a uniform density of eighty percent (80%) and the CBI has been removed. No progress payments are offered for the emergency removal and reinstallation of CBI.

Payment will be made under:

Item Number	Description	Unit
209.11010024	Temporary Catch Basin Insert – Trash, Sediment, and Debris Removal	EA
209.11020024	Temporary Catch Basin Insert –Trash, Sediment and Debris Removal, plus Oil and Hydrocarbon Removal	EA
209.11030024	Oil and Hydrocarbon Absorbent Pouches for Temporary Catch Basin Insert	EA
209.11040024	Temporary Removal, Storage and Reinstallation of a Temporary Catch Basin Insert	EA

ITEM 304.00010018 - FINE GRADING OF EXISTING SUBBASE

DESCRIPTION. Prepare a fine grade on the existing subbase course to receive new pavement and/or shoulders. Clean, regrade, shape, and compact the subbase surface to the line and grade in the contract documents.

MATERIALS.

Cushion Sand ..... §703-06

CONSTRUCTION DETAILS.

Remove and dispose of sod, permeable base, concrete, and/or other loose, unsuitable or excess material.

Grade the existing surface to a uniform cross slope such that, after compaction, the top surface is at true grade and surface at any location, ± ¼ inch. Remove excess material where the existing subbase is high or has insufficient slope. Build up the existing subbase with cushion sand where the existing subbase is low or has excessive cross slope.

Compact the subbase to the satisfaction of the Engineer using equipment meeting §203-3.03C, Compaction.

Do not allow traffic on the exposed subbase.

METHOD OF MEASUREMENT. The work will be measured for payment as the number of square feet of subbase satisfactorily fine graded, measured to the nearest square foot.

BASIS OF PAYMENT. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work in the unit price bid for Fine Grading of Existing Subbase. No additional payment will be made for extra work required to repair damage to the adjacent pavement or subbase that occurred during any operation. Additional payment will be made if the original repair area did not completely extend into sound pavement or stable subbase. Pavement and shoulder removal are paid for under separate pay items.

ITEM 304.10119917 - SUBBASE COURSE, TYPE 1011-2

All of the requirements of Section 304 *Subbase Course* shall apply except as herein modified:

MATERIALS

Material shall conform to the requirements of §733-04 *Subbase Course* with the addition of the following requirement:

Natural Material. Natural material obtained from sources located in Richmond, Kings, Queens, Nassau and Suffolk Counties shall conform to the following gradation:

Sieve Size Designation	Percentage Passing by Weight
2 in.	100
1 in.	80-100
¼ in.	50-85
No. 10	30-70
No. 40	15-40
No. 200	6-12

Natural material obtained from sources other than those listed above shall conform to the gradation requirements of Table 733-04A *Subbase Gradation* in §733-04B. *Gradation.*

BASIS OF PAYMENT

Payment will be made under:

Item No.	Item	Pay Unit
304.10119917	Subbase Course, Type 1011-2	Cubic Yard

ITEM 502.10010018 - PORTLAND CEMENT CONCRETE PAVEMENT REPAIR EVALUATION AND MARK-OUT

DESCRIPTION. Evaluate and tabulate pavement repair needs, develop a repair referencing system, and mark repair boundaries.

MATERIALS. None specified.

CONSTRUCTION DETAILS.

Reference Slabs. Develop a referencing system for the pavement slabs within the project limits and mark every 5th slab (maximum) with a unique designation visible from a shoulder. Maintain the referencing system throughout the project duration. Re-mark slabs with the same designations after diamond grinding, if necessary. In addition to marking slabs, mark and maintain plan stationing on or near the pavement to correlate repairs to the plans.

Pavement Evaluation and Mark-out. Coordinate evaluation and mark-out to ensure the Engineer's presence. Recommend a repair type and limits for each repair area identified in the contract documents. Use the repair items, quantities, and limits in the contract documents as a starting point for the repair recommendations. Modifying or grouping repairs is subject to the approval of the Engineer. Mark the repair type and limits on the pavement after approval by the Engineer. Ensure that the marked repair is not in conflict with the contract's maintenance and protection of traffic plan.

After repair types and limits are marked, develop a repair table for the Engineer's review and verification which includes station, slab designation, repair type, and quantity. If repair types are detailed in the contract plans, note additions, deletions, and changes from the plans. The Engineer will review the repair table within 2 work days of receipt. If necessary, modify the table until it meets the Engineer's approval and note any unresolved differences with the Engineer in repair type or quantity. Refer to the appropriate specifications for quantity determination.

Make no repairs until the Engineer approves the repair table and mark-outs. Do not alter the table or mark outs without the Engineer's approval. Any alteration, addition, or subtraction requires re-submission and approval of the Engineer.

Full-Depth Repair Joint Layout. Transverse joint layout for full-depth repairs is the Contractor's responsibility. Submit a proposed layout for multiple slab replacements and obtain the Engineer's approval before placing concrete.

METHOD OF MEASUREMENT. The work under PCC Pavement Repair Evaluation and Mark-out will be measured for payment on the lump sum basis.

BASIS OF PAYMENT. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work in the lump sum bid for PCC Pavement Repair Evaluation and Mark-out. No additional payment will be made for re-tabulating or re-marking concrete repair areas.

ITEM 502.31010018 - FULL-DEPTH PORTLAND CEMENT CONCRETE (PCC) LIFT-OUT

DESCRIPTION. Mark the area to be lifted, saw cut, lift, and dispose of:

- PCC.
- Permeable base.
- PCC patched with hot mix asphalt (HMA).
- Full-depth HMA within the marked area.

MATERIALS.

Anchoring Material and Dispensing Equipment. Use a pourable, 2 component, 100% solids structural epoxy meeting §701-07, Anchoring Materials - Chemically Curing, dispensed:

- From side-by-side cartridges by manual or pneumatically powered injection guns.
- Through a static nozzle that homogeneously mixes the material without any hand mixing.

CONSTRUCTION DETAILS. Schedule all full-depth repair operations (from lift-out to concrete placement) to minimize the total time to complete any individual repair. As the time frame from saw cutting to placement increases, the potential for damage to the surrounding pavement scheduled to remain in place also increases, particularly in hot weather or as the temperature rises. No time frame to completion is specified in this item due to contract variability.

Mark the boundaries of the area to be lifted out. Do not cut until the Engineer approves the marked boundaries. Saw cut full-depth around the removal area at the approved boundaries, including through the permeable base, if any. These cuts will become the transverse and longitudinal joints that define the repair. Use a diamond blade saw equipped with cutting guides, blade guards, water cooling systems, dust controls, and cut depth control. Set the cut depth to minimize subbase disturbance. Make straight saw cuts around the repair perimeter that result in smooth faces that are perpendicular to the pavement surface. Make transverse cuts perpendicular to the longitudinal joint.

Over cut the saw cut intersections a distance equal to the pavement thickness, including the permeable base, if any. After lift-out and before placing the full-depth repair material, fill the over cuts in concrete to remain in place with anchoring material. Place the anchoring material as deep as possible into the over cut, starting at the deepest portion of the over cut and proceeding to the shallowest portion. Block the deepest portion of the over cut such that the anchoring material does not enter into the lift-out area. Finish the anchoring material flush to the pavement surface. When using new cartridges of anchoring material, ensure that the initial material exiting the nozzle appears uniformly mixed. If it is not uniformly mixed, waste the material until uniformly mixed material extrudes.

Additional saw cuts within the repair boundaries to facilitate lift-out without damaging the repair boundaries are permitted. Use any saw for these cuts. Set the cut depth to minimize subbase disturbance. Do not over cut into adjacent concrete that is not scheduled for removal. (Be advised that the longer partial-width cuts remain in place without removal and replacement, the greater the potential for damaging the surrounding concrete scheduled to remain in place, particularly in hot weather or as temperatures are rising. No payment will be made for repairing damage to the surrounding pavement scheduled to remain in place.) Over cutting is allowed if the adjacent concrete is scheduled for removal.

If traffic is to be maintained on the pavement after cutting, remove all debris from the pavement before traffic is restored.

ITEM 502.31010018 - FULL-DEPTH PORTLAND CEMENT CONCRETE (PCC) LIFT-OUT

Drill holes and insert lift pins into the concrete to be removed. Lift and dispose of the concrete such that there is:

- No damage to the surrounding pavement to remain in place.
- Minimal disturbance to the subbase.
- No damage to any adjacent curb, drainage structure, or utility.

Pavement sections too deteriorated to lift-out as determined by the Engineer and full-depth HMA may be excavated rather than lifted. Excavate the pavement such that there is minimal disturbance to the subbase.

Dispose of all material in accordance with §203-3.02B, Disposal of Surplus Excavated Material.

METHOD OF MEASUREMENT. The work will be measured for payment as the number of square yards of pavement satisfactorily lift-out or excavated, measured to the nearest 0.1 yd^2 based on the Engineer-approved removal areas marked on the pavement prior to saw cutting.

BASIS OF PAYMENT. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work in the unit price bid for Full-Depth PCC Lift-Out. No additional payment will be made for:

- Extra work required to repair damage to the adjacent pavement that occurred during any operation.
- Additional saw cuts made inside the repair boundaries to facilitate lift-out.

Additional payment will be made if the original repair area did not completely extend into sound concrete.

Subbase removal and replacement or drainage enhancement identified before or after removal are paid under separate items.

ITEM 502.32010010 - DRILL AND ANCHOR DOWELS FOR FULL-DEPTH PORTLAND CEMENT CONCRETE PAVEMENT REPAIRS

DESCRIPTION

Drill holes and anchor dowels into full-depth saw cut concrete faces that will become transverse joints.

MATERIALS AND EQUIPMENT

Dowels. Obtain dowels from a supplier appearing on the Approved List for §705-15, Transverse Joint Supports. Use 18 inch long, 1-½ inch diameter, smooth, epoxy-coated, Grade 60 steel dowels coated with a bond breaker. Use an epoxy coating appearing on the Approved List for "Epoxy Coatings for Longitudinal Joint Ties" or "Epoxy Coatings for Steel Reinforcing Bars" that is applied by an applicator appearing on the Approved List for "Applicators for Steel Reinforcing Bars". At least 7 days prior to drilling, provide the Engineer:

- The name and address of the joint support assembly supplier.
- Material certification from the supplier that dowels meet the "Tests" and "Material Requirements " portions of §705-15, except Grade 60 steel is supplied.
- Material certification from the rolling mill as to the type and grade of steel used.
- The brand of epoxy coating and the name and address of the Manufacturer.
- The name and address of the epoxy coating applicator.
- The brand of bond breaker and the name and address of the Manufacturer.
- Material certification from the epoxy coating applicator that the bars have been coated, tested, and meet the requirements of §705-14, Longitudinal Joint Ties.

Epoxy coating field repairs are not permitted. The Department may perform supplementary sampling and testing of the dowels to ensure conformance with §705-14 and §705-15.

Anchoring Material and Dispensing Equipment. Use a pourable, 2 component, 100% solids structural epoxy meeting§ 701-07, Anchoring Materials - Chemically Curing, dispensed:

- From side-by-side cartridges by manual or pneumatically powered injection guns.
- Through a static nozzle that homogeneously mixes the material without any hand mixing.

Drills. Use hydraulic gang drills with a minimum of 2 independently powered and driven drills. Use tungsten carbide drill bits. Control the forward and reverse travel of the drills by mechanically applied pressure. Mount the drill on a suitable piece of equipment such that it is quickly transported and positioned. Rest and reference the drill rig frame on and to the pavement surface such that the drilled holes are cylindrical, perpendicular to the surface being drilled, and repeatable in terms of position and alignment on the surface being drilled. Hand-held drills are not permitted.

Grout Retention Disk. Use plastic grout retention disks, 1/8 inch thick, of sufficient diameter to prevent grout from entering the joint. The hole in the center of the disk must have the same diameter as the dowel.

CONSTRUCTION DETAILS

Drilling Holes. Drill holes 12 inch apart on center across the full width of the repair. Locate end holes 6 -12 inch from the longitudinal repair boundaries.

ITEM 502.32010010 - DRILL AND ANCHOR DOWELS FOR FULL-DEPTH PORTLAND CEMENT CONCRETE PAVEMENT REPAIRS

Determine the location and length of longitudinal joint ties in the concrete to remain in place outside the repair area. Use a pachometer or other device capable of locating steel embedded in concrete. If a longitudinal joint tie is within 12 inch of the surface being drilled, drill the outer holes 3 – 4 inch from the end of the tie.
Drill holes such that:

- The hole diameters are in accordance with the anchoring material Manufacturer's written recommendations. Provide those recommendations to the Engineer before drilling any holes.
- The hole depth is 9 inch (+3/8in- 0 in).
- When the dowels are anchored, the longitudinal axes of the protruding dowels are parallel to the pavement centerline, the pavement surface, and each other, ± 1/8 in, measured at the saw cut face and the dowel end.
- When the dowels are anchored, they protrude 8-21/32 inch – 9 inch from the saw cut face.

Extend the full depth repair boundaries as indicated in the contract documents if drilling cracks or damages pavement to remain in place. Replace worn bits when necessary to ensure the proper hole diameter is drilled.

Cleaning Holes. Follow the anchoring material Manufacturer's written recommendations for cleaning the holes. Provide those recommendations to the Engineer. As a minimum, clean the drilled holes with oil-free and moisture-free compressed air. The Engineer will check the compressed air stream purity with a clean white cloth. Use a compressor that delivers air at a minimum of 120 ft^3 per minute and develops a minimum nozzle pressure of 90psi. Insert the nozzle to the back of the hole to force out all dust and debris.

Dowel Installation. When using new cartridges of anchoring material, ensure that the initial material exiting the nozzle appears uniformly mixed. If it is not uniformly mixed, waste the material until uniformly mixed material extrudes. Place the anchoring material at the back of the hole using a nozzle of sufficient length. Push the dowel into the hole while twisting such that the air pocket within the hole is heard to burst and the anchoring material is evenly distributed around the dowel. Use sufficient amounts of anchoring material such that it slightly extrudes out the hole as the dowel is inserted. Place a grout retention disk over the dowel and tight against the exposed concrete face such that the anchoring material does not enter the joint.

METHOD OF MEASUREMENT

The work will be measured for payment as the number of dowels satisfactorily anchored.

BASIS OF PAYMENT

Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work in the unit price bid for Drill and Anchor Dowels for Full-Depth PCC Pavement Repairs. No additional payment will be made for extra work required to repair damage to the adjacent pavement that occurred during drilling.

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ITEM 502.37010018 - TRANSVERSE JOINTS
ITEM 502.38010018 - LONGITUDINAL JOINTS

DESCRIPTION. Place Class C, Class F, or High-Early-Strength (HES) PCC as indicated in the contract documents in a previously prepared full-depth repair area.

MATERIALS AND EQUIPMENT.

Portland Cement Concrete (Class C and Class F) 501
High-Early-Strength (HES) Concrete 502-2.02
Portland Cement Treated Permeable Base 502-2.03
Longitudinal Joint Ties 705-14
Transverse Joint Supports 705-15
Wire Fabric for Concrete Reinforcement 709-02
Epoxy-Coated Bar Reinforcement, Grade 60 709-04
Quilted Covers (for Curing) 711-02
Plastic Coated Fiber Blankets (for Curing) 711-03
Polyethylene Curing Covers (White Opaque) 711-04
Membrane Curing Compound 711-05
Form Insulating Materials for Winter Concreting 711-07
Water 712-01

HES concrete mix design and all details related to HES concrete production and discharge must be approved by the Regional Materials Engineer before placement.

Transit Mix HES Concrete. Accelerating admixtures may be batched into the concrete at the plant in accordance with §501-2.03F, Admixture Dispensing Systems, or added at the site depending on the amount of acceleration required and the haul time. When adding accelerating admixtures at the site, equip truck mixers with an air pressurized tank that:

- Contains the correct volume of admixture (for the volume of concrete in the truck) dispensed through the plant's Admixture Dispensing System.
- Discharges the required admixture quantity into the truck mixer drum in less than 1 minute.
- Has a clear plastic tank output hose that leads into the truck mixer drum.
- Has a properly working relief valve.

Twice daily, or more frequently if weather conditions change significantly as determined by the Engineer, determine the fine and coarse aggregate moisture contents. Compute the corresponding water added to the concrete in the truck from aggregate moisture. Subtract that quantity, as well as the water portion of the admixture in the tank and water added at the plant, from the design water for the truck. Submit these calculations to the NYSDOT plant inspector for approval. Upon approval, write the maximum volume of water to be added to the truck at the site on the delivery ticket. Upon arrival at the site, provide the delivery ticket to the Engineer.

Discharge the accelerating admixture into the truck mixer drum during or after any water additions at the site. Do not add more water than the maximum volume indicated on the delivery ticket. Add all of the

accelerating admixture in 1 uninterrupted operation in 1 minute or less. Apply a maximum of 200 total mixing revolutions before discharge.

Truck Mix HES Concrete. Add the accelerating admixture and water at the site. Equip trucks with an air pressurized tank for accelerating admixtures as described above in Transit Mix HES Concrete and an in-line water flow meter that:

- Resets easily to "0".
- Is mounted to allow easy reading.
- Withstands water temperatures up to 200°F.
- Is equipped with air strainers capable of removing entrapped air within the system.
- Has a batching delivery tolerance of 1% by weight or volume.
- Has a manufacturer's certified flow rate capacity of 70 gpm.
- Has a minimum actual flow rate of 50 gpm.

The Regional Materials Engineer will measure the actual flow rate and inspect the flow meter prior to use. Do not place any concrete without the Regional Materials Engineer's approval.

Twice daily, or more frequently if weather conditions change significantly as determined by the Engineer, determine the fine and coarse aggregate moisture contents. Compute the corresponding water added to the concrete in the truck from aggregate moisture. Subtract that quantity, as well as the water portion of the admixture in the tank, from the design water for the truck. Submit these calculations to the NYSDOT plant inspector for approval. Upon approval, write the exact volume of water to be added to the truck at the site on the delivery ticket. Upon arrival at the site, provide the delivery ticket to the Engineer.

Before adding water into the truck mixer, execute twenty dry revolutions at 12 to 18 rpm and reset the flow meter to 0. Add water in 1 uninterrupted operation. No water is to be removed from the truck mixer for any purpose while water is being added to the drum. After the required water designated on the delivery ticket has been added to the concrete in the truck, add all the accelerating admixture in 1 uninterrupted operation in 1 minute or less. Apply a maximum of 200 mixing revolutions before discharge.

Use equipment meeting:

Forms ..... §502-2.04B1
Paving Irregular Areas .. .. §502-2.04B3
Vibrators ..... §502-2.04C
Permeable Base Paving Equipment ..... §502-2.04D
Saw Cutting Equipment ..... §502-2.04E
Curing Compound Applicators .. .. §502-2.04F

CONSTRUCTION DETAILS. Apply the following from Section 502, Portland Cement Concrete Pavement, as modified herein:

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Weather Limitations..... §502-3.01
Portland Cement Treated Permeable Base..... §502-3.03

Use permeable base if the pavement being repaired was constructed with permeable base or if shown in the contract documents. Place permeable base 4 inches thick. Apply fixed form paving requirements.

Fixed Form Paving..... §502-3.05

Consider full-depth repairs to be irregular areas.

Joint Construction..... §502-3.06

Apply a bond breaker, such as form oil, to untied longitudinal joints immediately before placing concrete.

Finishing..... §502-3.09

Finish short repairs (those less than the length of the finishing equipment) transversely.

Texturing..... §502-3.10

Do not texture the plastic concrete if it will be diamond ground. The Engineer may require longitudinal astroturf drag if that was the original pavement texture.

Curing..... §502-3.11
Pavement Protection..... §502-3.13
Damaged or Defective Concrete..... §502-3.14
Hardened Surface Test..... §502-3.15

If the pavement is to be diamond ground, the maximum deviation is 3/8 inch in 10 feet. If the pavement will not be diamond ground, the maximum deviation is 1/8 inch in 10 feet.

Opening to Traffic..... §502-3.18

When determining concrete strength for opening to traffic, apply the following rather than §502-3.18C, Project Strength Determination:

Project Strength Determination. Provide an ACI Certified Concrete Field Testing Technician, Grade I, or higher, to cast all cylinders. Unless otherwise noted in the contract documents, use an agency accredited by the AASHTO Accreditation Program (AAP) in the field of construction materials testing of portland cement concrete to perform compressive strength testing. Cast and test in the presence of the Engineer, or the Engineer's representative. Provide acceptable proof of ACI Certification and AASHTO Accreditation to the Engineer before placing any concrete. The Engineer, or the Engineer's representative, will complete the Concrete Cylinder Report as cylinders are cast and tested.

Cast a minimum of 3 cylinder pairs (6 total) from each scheduled placement operation in accordance with Materials Method 9.2, Field Inspection of Portland Cement Concrete. Cast each pair from different delivery trucks with 1 of the 3 pairs cast from the last truck of the operation. Develop an Engineer-approved marking system that allows a cylinder to be readily associated with the corresponding placement location and placement time. Mark the cylinders and place them adjacent to the pavement under similar curing conditions. Determine the concrete compressive strength in accordance with ASTM C39, Standard Test Method for Compressive

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Strength of Cylindrical Concrete Specimens. Test all cylinder pairs at the same time relative to when they were cast. The testing time must be within the time frame needed to open the last concrete placed in the operation to traffic. The placement may be opened to traffic if all the following apply:

- Average compressive strength of all cylinder pairs exceed 2500 PSI.
- Average compressive strength of each cylinder pair exceeds 2000 PSI.
- Appropriate time frame has elapsed for the entire area to be opened.

If these conditions are not met, test 3 additional cylinder pairs at a later time, provided the appropriate number of additional cylinders were cast and the placement has not been opened to traffic. If the above conditions are not met after additional testing, or, if the required number of additional cylinders were not cast, open the placement to traffic after 5 days, or when directed by the Engineer, provided this time frame is not in conflict with the work zone closure time restrictions stipulated in the contract documents. If the placement is opened to traffic (in accordance with the work zone closure time restrictions stipulated in the contract documents) before it has achieved the required strength, the placement will be considered Damaged or Defective Concrete and will be replaced at no additional cost to the State.

Contract testing for 28 day compressive strength is not required. If subsequent trial batches are required, the Engineer may waive the 28 day compressive strength testing.

METHOD OF MEASUREMENT.

Portland Cement Treated Permeable Base. The work will be measured for payment as the number of cubic yards of permeable base satisfactorily placed, measured to the nearest 0.1 $yard^3$, based on the Engineer-approved repair area marked on the pavement prior to repair and the thickness of permeable base placed.

Portland Cement Concrete, Unreinforced, All Classes. The work will be measured for payment as the number of cubic yards of concrete satisfactorily placed, measured to nearest 0.1 $yard^3$, based on the Engineer-approved repair area marked on the pavement prior to repair and the thickness of concrete placed. Deductions, and separate payment, will be made for catch basins, manholes, or other similar pavement obstructions requiring either mesh reinforced or heavily reinforced placements.

Portland Cement Concrete, Mesh or Heavily Reinforced, All Classes. The work will be measured for payment as the number of cubic yards of concrete satisfactorily placed, measured to the nearest 0.1 $yard^3$, based on the Engineer-approved repair area marked on the pavement prior to repair and the thickness of concrete placed. No deductions will be made for drainage and utility structures or other similar pavement obstructions being isolated from the surrounding pavement.

Transverse Joints. The work will be measured for payment as the number of feet of transverse joints satisfactorily constructed within the repair boundary, measured to the nearest 0.1 foot. Separate

measurement will be made for transverse joints that define the repair boundary and drilling and anchoring dowels into those joints.

Constructing Longitudinal Joints. The work will be measured for payment as the number of feet of longitudinal joints satisfactorily constructed within the repair boundary, measured to the nearest 0.1 foot. Separate measurement will be made for longitudinal joints that define the repair boundary and drilling and anchoring longitudinal joint ties in those joints.

BASIS OF PAYMENT.

Portland Cement Treated Permeable Base. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work in the unit price bid for Portland Cement Treated Permeable Base. No additional payment will be made for extra work required to repair damage to the adjacent permeable base or pavement that occurred during any operation. Additional payment will be made if the original repair area did not completely extend into sound concrete.

Portland Cement Concrete, Unreinforced, All Classes. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work in the unit price bid for Portland Cement Concrete, Unreinforced, All Classes. No additional payment will be made for Contractor-requested HES concrete mixes or extra work required to repair damage to the adjacent pavement that occurred during any operation. Additional payment will be made if the original repair area did not completely extend into sound concrete.

Portland Cement Concrete, Mesh or Heavily Reinforced, All Classes. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work in the unit price bid for Portland Cement Concrete, Mesh or Heavily Reinforced, All Classes. No additional payment will be made for Contractor-requested HES concrete mixes or extra work required to repair damage to the adjacent pavement that occurred during any operation. Additional payment will be made if the original repair area did not completely extend into sound concrete.

Transverse Joints. Include the cost of all labor, material, equipment, and labor necessary to satisfactorily perform the work in the unit price bid for Transverse Joints. Separate payment will be made for constructing transverse joints that define the repair boundary and drilling and anchoring dowels into those joints. Separate payment will be made for joint sealing or joint filling.

Longitudinal Joints. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work in the unit price bid for Longitudinal Joints. Separate payment will be made for constructing longitudinal joints that define the repair boundary and drilling and anchoring ties into those joints. Separate payment will be made for joint sealing or joint filling.

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Payment Will Be Made Under:

Item No.	Item	Pay Unit
502.35010018	Portland Cement Treated Permeable Base	Cubic Yard
502.36RC0018	Portland Cement Concrete (PCC) Placement for Full-Depth Repair	Cubic Yard
	R - Reinforcement *0 - Unreinforced* *1 - Isolated, Mesh Reinforced* *2 - Isolated, Heavily Reinforced*	*C - Concrete Class* *1 - Class C* *2 - Class F* *3 - HES*
502.37010018	Transverse Joints	Foot
502.38010018	Longitudinal Joints	Foot

ITEM 502.4MR00018 - PORTLAND CEMENT CONCRETE PAVEMENT PARTIAL-DEPTH REPAIRS
ITEM 502.46010018 - PORTLAND CEMENT CONCRETE PAVEMENT PARTIAL-DEPTH REPAIRS USING EPOXY RESIN SYSTEMS

DESCRIPTION. Remove 2 – 4 inches of portland cement concrete (PCC) pavement, prepare the removal area, and repair it using Class D concrete, High-Early-Strength (HES) concrete, Concrete Repair Material, Rapid Hardening Concrete Repair Material, Rapid Hardening Polymer Concrete, or Epoxy Resin System as required by the contract documents.

MATERIALS AND EQUIPMENT.

Portland Cement Concrete, Class D..... 501
Concrete Repair Material..... 701-04
Rapid Hardening Concrete Repair Material..... 701-09
Coarse Aggregate..... 703-02
Premoulded Resilient Joint Filler..... 705-07
Portland Cement Mortar Bonding Grout 705-22
Membrane Curing Compound 711-05
Admixtures..... 711-08
Water 712-01
Epoxy Resin Systems.... 721-01
Rapid Hardening Polymer Concrete 721-20
Non-Chloride Accelerator Admixture .... Approved List

HES Concrete. Apply §502-2.02, High-Early-Strength (HES) Concrete, except:

- Design the HES mix to satisfy the opening to traffic time requirements of the contract and Table 1, High-Early-Strength Concrete Mix Requirements, rather than Table 502-1.
- Use coarse aggregate having a 1A gradation.
- Produce and place a 1.0 $yard^3$ (minimum) trial batch rather than a 4.0 $yard^3$ trial batch.

TABLE 1 - HIGH-EARLY-STRENGTH CONCRETE MIX REQUIREMENTS

Property	Minimum	Desired	Maximum
28 Day Compressive Strength (Trial Batch Only)	4,350 PSI	-	-
Opening Compressive Strength	3,000 PSI[1]	-	-
Plastic Air Content	5.0%	6.5%	8.0%
Slump	1½ inch	-	4 inch

[1] See Opening to Traffic below.

Determine the compressive strength of the trial batch concrete at the desired time as discussed below in Project Strength Determination. Mix design approval does not relieve the Contractor's responsibility of achieving the specified requirements during the contract.

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HES concrete mix design and all details related to HES concrete production and discharge must be approved by the Regional Materials Engineer before placement.

Transit Mix HES Concrete. Accelerating admixtures may be batched into the concrete at the plant in accordance with §501-2.03F, Admixture Dispensing Systems, or added at the site depending on the amount of acceleration required and the haul time. When adding accelerating admixtures at the site, equip truck mixers with an air pressurized tank that:

- Contains the correct volume of admixture (for the volume of concrete in the truck) dispensed through the plant's Admixture Dispensing System.
- Discharges the required admixture quantity into the truck mixer drum in less than 1 minute.
- Has a clear plastic tank output hose that leads into the truck mixer drum.
- Has a properly working relief valve.

Twice daily, or more frequently if weather conditions change significantly as determined by the Engineer, determine the fine and coarse aggregate moisture contents. Compute the corresponding water added to the concrete in the truck from aggregate moisture. Subtract that quantity, as well as the water portion of the admixture in the tank and water added at the plant, from the design water for the truck. Submit these calculations to the NYSDOT plant inspector for approval. Upon approval, write the maximum volume of water to be added to the truck at the site on the delivery ticket. Upon arrival at the site, provide the delivery ticket to the Engineer.

Discharge the accelerating admixture into the truck mixer drum during or after any water additions at the site. Do not add more water than the maximum volume indicated on the delivery ticket. Add all of the accelerating admixture in 1 uninterrupted operation in 1 minute or less. Apply a maximum of 200 total mixing revolutions before discharge.

Truck Mix HES Concrete. Add the accelerating admixture and water at the site. Equip trucks with an air pressurized tank for accelerating admixtures as described above in Transit Mix HES Concrete and an in-line water flow meter that:

- Resets easily to "0".
- Is mounted to allow easy reading.
- Withstands water temperatures up to 195°F.
- Is equipped with air strainers capable of removing entrapped air within the system.
- Has a batching delivery tolerance of 1% by weight or volume.
- Has a manufacturers certified flow rate capacity of 70 gpm.
- Has a minimum actual flow rate of 50 gpm.

The Regional Materials Engineer will measure the actual flow rate and inspect the flow meter prior to use. Do not place any concrete without the Regional Materials Engineer's approval.

Twice daily, or more frequently if weather conditions change significantly as determined by the Engineer, determine the fine and coarse aggregate moisture contents. Compute the corresponding water added to the concrete in the truck from aggregate moisture. Subtract that quantity, as well as the water portion of the

admixture in the tank, from the design water for the truck. Submit these calculations to the NYSDOT plant inspector for approval. Upon approval, write the exact volume of water to be added to the truck at the site on the delivery ticket. Upon arrival at the site, provide the delivery ticket to the Engineer.
Before adding water into the truck mixer, execute twenty dry revolutions at 12 to 18 rpm and reset the flow meter to 0. Add water in 1 uninterrupted operation. No water is to be removed from the truck mixer for any purpose while water is being added to the drum. After the required water designated on the delivery ticket has been added to the concrete in the truck, add all the accelerating admixture in 1 uninterrupted operation in 1 minute or less. Apply a maximum of 200 mixing revolutions before discharge.

Concrete Repair Material or Rapid Hardening Concrete Repair Material. Use only cementitious repair materials appearing on the Approved List. Provide the Engineer the Manufacturer's written instructions for mixing, bonding, placing, and curing the material. Follow the Manufacturer's instructions. Do not exceed the prescribed water amount. Extend concrete repair materials with coarse aggregate having a 1A gradation. Use a maximum aggregate extension rate of 60% of the dry, pre-packaged weight of repair material.

Rapid Hardening Polymer Concrete. Use rapid hardening polymer concrete appearing on the Approved List. Provide the Engineer the Manufacturer's written instructions for mixing, bonding, placing, and curing the material. Follow the Manufacturer's instructions, including all aspects of the Manufacturer's Safety Data Sheets when handling rapid hardening polymer concrete and their primers.

Extend rapid hardening polymer concrete with coarse aggregate having a 1A gradation. Use a maximum aggregate extension rate of 75% of the dry component weight of the repair material. Extension aggregates must contain no moisture at the time of mixing.

Epoxy Resin System. Use an epoxy resin system from a stock lot accepted by the Materials Bureau. Provide the Engineer the Manufacturer's written instructions for aggregate extension rates and type, substrate preparation, mixing, bonding, placing, and curing the material. Follow the Manufacturer's instructions, including all aspects of the Manufacturer's Safety Data Sheets when handling epoxy resin system. Extension aggregates must contain no moisture at the time of mixing.

Coring Equipment. Use trailer or truck mounted core rigs with diamond impregnated bits capable of coring 4 inches into the pavement. Use a core rig shaft capable of moving in multiple directions to readily position the bit over the removal area. Use a bit of sufficient diameter to remove the entire repair area to sound concrete. Maintain equipment and supplies to ensure uninterrupted operation. Supply a template equal in diameter to the bit outer diameter to mark removal areas prior to coring. Supply a steel sleeve having an outer diameter equal to the core bit outer diameter that is inserted into the core to protect the surrounding pavement during Concrete Removal described below.

Saw Cutting Equipment. Use diamond blade saws capable of making straight, 4 inch deep, saw cuts. Use saws equipped with cutting guides, blade guards, water cooling systems, dust control, and cut depth control. Maintain equipment and supplies to ensure uninterrupted operation.

Chipping Hammers. Use chipping hammers weighing no more than 30 pound (including bit and muffler) equipped with sharp spade bits. Provide the Engineer hammer specifications from the Manufacturer before sawing or coring. Use a maximum air pressure of 100 PSI (measured at the compressor) to power the

hammer. Supply an air pressure gauge at the compressor that allows the Engineer to easily monitor air pressure. Maintain equipment and supplies to ensure uninterrupted operation. The Engineer may halt operations if concrete to remain in place is damaged by the hammers.

Milling Machines. Use a milling machine with a 12 inch (minimum) wide milling head and equipped with a mechanism that maintains the milling operation at a preset depth.

Vibrators. Use hand-held vibrators having a maximum diameter of 1 inch and capable of operating through a frequency range of 6000 - 9000 vibrations per minute.

CONSTRUCTION DETAILS. Meet with the Engineer 7 to 14 days before the planned start of removal to coordinate all aspects of removal, preparation and material placement including mixing, transport, and discharge, material requirements and testing, and personnel requirements. Perform all operations within the allowable work zone closure time frame included in the contract documents, if any.

Epoxy resin systems typically do not require coring or sawing the repair boundary or removing concrete. This material is used at very small, shallow repairs with sound underlying concrete. An epoxy resin system is the only repair material that can be feathered to meet concrete to remain in place.

Determine Repair Boundary - Coring Method. Determine the repair boundary by placing the template described above in Coring Equipment over the repair area and marking the boundary. Position the template such that the repair boundary extends completely into sound concrete. If a joint or crack crosses the repair boundary, position the template such that the joint or crack crosses through the middle ⅓ of the repair boundary. If the template can not be positioned such that the repair boundary extends completely into sound concrete, or a joint or crack can not be accommodated in the middle ⅓, determine the repair area in accordance with Determine Repair Boundaries - Saw Cut Method.

Determine Repair Boundary - Saw Cut Method. Sound the area surrounding the repair with a 2 – 3 pound hammer to identify delaminated areas and include them within the repair boundary. Extend repair areas 3 – 6 inches beyond the visible deterioration or delaminations, whichever is larger. Combine repair areas within 6 inches of each other into one repair. Keep repair areas as square as possible. Avoid irregular repair shapes. Mark the repair boundary outlines.

Core Repair Boundary. Do not core until the Engineer approves the repair boundary. Core 2 – 4 inches into the pavement. Core sufficiently deep to ensure sound concrete is reached and new concrete faces are exposed.

Saw Cut Repair Boundary. Do not saw cut until the Engineer approves the repair boundary. Diamond blade saw cut the repair boundaries 2 – 4 inches deep. Cut at right angles to the pavement joints and the pavement surface. Over cut intersecting saw cuts such that the entire repair area is cut to the same depth.

Concrete Removal - Coring Method. Use the steel sleeve described above in Coring Equipment and a chipping hammer to remove concrete within the core. Remove concrete such that the repair bottom is at a uniform depth, ± 1 inch, and sound concrete is exposed along all faces. Discontinue removal if:

- Pavement joint hardware is encountered.
- The required repair depth exceeds 4 inches.
- The PCC surrounding or below the removal area is unsound.

In this instance the Engineer will determine the required repair, typically full-depth removal and replacement or partial-depth removal by the saw cutting method.

Concrete Removal - Saw Cuts. Use chipping hammers or a combination of chipping hammers and milling machines to remove concrete within the saw cuts. Remove concrete such that the repair bottom is at a uniform depth, ± 1 inch, and sound concrete is exposed along all faces. Do not operate milling machines within 25 mm of the saw cuts. Use chipping hammers in these locations to establish the proper repair depth. Discontinue removal if:

- Pavement joint hardware is encountered.
- The required repair depth exceeds 4 inches.
- The PCC surrounding or below the removal area is unsound.

In this instance the Engineer will determine the required repair, typically full-depth removal and replacement.

Clean the Repair Bottom and Vertical Faces. As close to repair material placement as possible, thoroughly abrasive blast all concrete surfaces that will be in contact with the repair material such that they are uniformly abraded and free of any dirt, laitance, oil, or other material that may prevent bond. Immediately before placement, air blast the repair to remove any remaining debris and moisture. The Engineer will check the:

- Air stream with a clean, white cloth to ensure no oil or contaminants are in the air blast.
- Repair surfaces for dust by wiping the repair faces with a dark cloth or glove.

Re-clean the repair if dust is found on the surfaces.

Some repair materials require a completely dry substrate to properly bond. Consult the Manufacturer's instructions and completely dry the substrate, if required, before placing the repair material.

Place Joint or Crack Insert. Fill joints or cracks that abut or cross the repair with a commercial caulk such that no repair material enters the joint or crack. Align premoulded resilient joint filler or commercial waxed corrugated cardboard with joints or cracks that abut or cross the repair area. Use an insert of the same thickness as the joint or crack width, ± 1/8 inch. Place inserts into the caulk before it sets such that no repair material enters the joint or crack. Leave the filler in place after the repair is complete.

Apply Bonding Agent. Use Portland Cement Mortar Bonding Grout if the repair material is Class D concrete or HES concrete. Mix the grout in small quantities to ensure freshly mixed grout is routinely placed. Mix the grout to a consistency that can be applied to the prepared surfaces without running or puddling. Evenly apply a thin coat of grout with a stiff bristle brush or broom to all surfaces receiving the repair material such that all cavities are coated. Slightly overlap the surrounding pavement surfaces. Do not apply bonding agent to the joint filler.

ITEM 502.4MR00018 - PORTLAND CEMENT CONCRETE PAVEMENT PARTIAL-DEPTH REPAIRS
ITEM 502.46010018 - PORTLAND CEMENT CONCRETE PAVEMENT PARTIAL-DEPTH REPAIRS USING EPOXY RESIN SYSTEMS

Follow the Manufacturer's instructions regarding the type and application of bonding agent, including water, for all other repair materials. If water is used, blow excess from the repair such that no standing water remains.

Placement. Small construction mixers or paddle mixers may be used, provided the proper slump and air is obtained and all Manufacturer's instructions are followed. Ready mix trucks may be used if quantities are sufficient. Use wheelbarrows, buggies, or other transporting vehicles to bring the repair material to the prepared area. Use shovels for very small patches. Place Class D concrete or HES concrete before the bonding grout dries. Consolidate cementitious material with a hand-held vibrator.

Finishing. Finish repairs flush with the surrounding pavement. Keep hand finishing to a minimum. Hand trowel from the center of the patch outward toward the edges. Force repair material into the intersecting over cuts. Do not add any additional water to the repair surface.

Curing. Immediately after finishing, thoroughly coat Class D and HES concrete with a double coat of curing compound meeting §711-05, Membrane Curing Compound at a minimum rate of 80 FT^2/Gal. Cure other materials in accordance with the Manufacturer's instructions.

Opening Class D or HES Concrete to Traffic. If no opening to traffic time frame is specified in the contract documents, open Class D concrete to traffic 5 days after placement. If an opening to traffic time frame is specified in the contract documents, open Class D or HES concrete to traffic after it has achieved a compressive strength of 3,000 PSI as discussed below in Project Strength Determination. The 5 day opening to traffic time frame may also be reduced if cylinders cast and tested as discussed below in Project Strength Determination indicate a compressive strength of 3,000 PSI has been achieved and the joints and cracks are sealed or filled in accordance with the contract documents.

Project Strength Determination. Provide an ACI Certified Concrete Field Testing Technician, Grade I, or higher, to cast all cylinders. Unless otherwise noted in the contract documents, use an agency accredited by the AASHTO Accreditation Program (AAP) in the field of construction materials testing of portland cement concrete to perform compressive strength testing. Cast and test in the presence of the Engineer, or the Engineer's representative. Provide acceptable proof of ACI Certification and AASHTO Accreditation to the Engineer before placing any concrete. The Engineer, or the Engineer's representative, will complete the Concrete Cylinder Report as cylinders are cast and tested.

Cast a minimum of 3 cylinder pairs (6 total) from each scheduled placement operation in accordance with Materials Method 9.2, Field Inspection of Portland Cement Concrete. Cast each pair from different delivery trucks with 1 of the 3 pairs cast from the last truck of the operation. Develop an Engineer-approved marking system that allows a cylinder to be readily associated with the corresponding placement location and placement time. Mark the cylinders and place them adjacent to the pavement under similar curing conditions. Determine the concrete compressive strength in accordance with ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens. Test all cylinder pairs at the same time relative to when they were cast. The testing time must be within the time frame needed to open the last concrete placed in the operation to traffic. The placement may be opened to traffic if all the following apply:

- Average compressive strength of all cylinder pairs exceed 2,500 PSI.

- Average compressive strength of each cylinder pair exceeds 2,000 PSI.
- Appropriate time frame has elapsed for the entire area to be opened.

If these conditions are not met, test 3 additional cylinder pairs at a later time, provided the appropriate number of additional cylinders were cast and the placement has not been opened to traffic. If the above conditions are not met after additional testing, or, if the required number of additional cylinders were not cast, open the placement to traffic after 5 days, or when directed by the Engineer, provided this time frame is not in conflict with the work zone closure time restrictions stipulated in the contract documents. If the placement is opened to traffic (in accordance with the work zone closure time restrictions stipulated in the contract documents) before it has achieved the required strength, the placement will be considered Damaged or Defective Concrete and will be replaced at no additional cost to the State.

Contract testing for 28 day compressive strength is not required. If subsequent trial batches are required, the Engineer may waive the 28 day compressive strength testing.

Opening Other Materials to Traffic. Open other repair materials as follows:

Material	Time to Opening
Concrete Repair Material (701-04)	24 hours after placement
Rapid Hardening Concrete Repair Material (701-09)	3 hours after placement
Rapid Hardening Polymer Concrete (721-20)	3 hours after placement
Epoxy Resin System (721-01)	See Manufacturer's Instructions

METHOD OF MEASUREMENT. The work will be measured for placement as the number of square feet of partial-depth repairs satisfactorily placed, measured to the nearest 0.1 feet^2, based on the Engineer-approved repair areas marked on the pavement prior to repair.

BASIS OF PAYMENT. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work in the unit price bid for Portland Cement Concrete Pavement Partial-Depth Repairs. 50% of the unit price bid will be paid if the Engineer changes the required repair after removal to a full-depth repair. No additional payment will be made for extra work required to repair damage to the adjacent pavement that occurred during any operation.

Payment will be made under:

Item No.	**Item**	**Pay Unit**
502.4MR00018	Portland Cement Concrete Pavement Partial-Depth Repairs	Square Feet

M - Material
1 - Class D Concrete
2 - HES Concrete

R - Repair Method
1 - Coring Method
2 - Saw Cutting Method

ITEM 502.4MR00018 - PORTLAND CEMENT CONCRETE PAVEMENT PARTIAL-DEPTH REPAIRS

ITEM 502.46010018 - PORTLAND CEMENT CONCRETE PAVEMENT PARTIAL-DEPTH REPAIRS USING EPOXY RESIN SYSTEMS

3 - Concrete Repair Material
4 - Rapid Hardening Concrete Repair Material
5 - Rapid Hardening Polymer Concrete

502.46010018	Portland Cement Concrete Pavement Partial-Depth Repairs Using Epoxy Resin Systems	Square Feet

ITEM 502.90010018 - CLEAN AND FILL CRACKS AND JOINTS IN PORTLAND CEMENT CONCRETE (PCC) PAVEMENT, ASTM D 6690 TYPE IV

DESCRIPTION. Clean and fill the following cracks and joints that are 1/4 - 1 inch wide at the locations indicated in the contract documents:

- New transverse contraction joints within full depth repairs.
- Existing transverse and longitudinal joints outside new full depth repairs.
- Existing cracks.

Do not clean and fill:

- Transverse and longitudinal joints that define new full depth repair boundaries.
- New longitudinal joints within full depth repairs.

MATERIALS.

Highway Joint Sealants (ASTM D 6690 Type IV) 705-02
Backer Rods ..... ASTM D5249 (Type 1)

In addition to meeting the requirement of ASTM D5249 (Type 1), backer rods must have a diameter at least 25% wider than the location of the crack it is placed into.

The Department may perform supplementary sampling and testing of the sealant. Deliver sealant in the Manufacturer's original sealed container legibly marked with the:

- Manufacturer's name.
- Trade name of the sealant.
- Manufacturer's batch or lot number.
- ASTM D 6690, Type IV.
- Minimum application temperature.
- Maximum (or Safe) heating temperature.

CONSTRUCTION DETAILS. If diamond grinding is included in the contract documents, prepare the joints and cracks, diamond grind the pavement, then clean and fill the joints and cracks.

Prepare New Transverse Contraction Joints Within Full Depth Repairs. Widen the joint to 1/4 – 3/8 inch for a depth of 1 inch if the first stage saw cut is less than ¼ inch wide. Use diamond blade saws equipped with cutting guides, blade guards, water cooling systems, dust controls, and cut depth control. Immediately wash the slurry from the pavement such that it does not re-enter the joint. Do not place backer rod in these joints.

Prepare Existing Transverse and Longitudinal Joints. Use a 1/8 – 1/4 inch wide, 1 5/8 inches deep saw cut to dislodge debris and existing sealant or filler from the joint without damaging the joint faces. Follow the saw cut with a compressed air blast to remove the dislodged debris to the bottom of the existing joint sealant reservoir or to a depth of 3 inches if there is no existing reservoir. Install a trap or other device on the compressed air equipment to prevent oil from contaminating the joint surfaces. Supplement the air blast with mechanical removal, such as a screwdriver, if it is not sufficient to remove the debris. Do not damage the joint faces. Immediately wash or sweep the dislodged debris from the pavement such that it does not re-enter the joint. Do not place backer rod in these joints.

Prepare Existing Cracks. Remove all debris from existing cracks as deep as possible using a compressed air blast supplemented with mechanical removal. Install a trap or other device on the compressed air

equipment to prevent oil from contaminating the crack surfaces. Immediately wash or sweep the dislodged debris from the pavement such that it does not re-enter the joint. Backer rod may be placed after cleaning provided it is at least 25 % wider than the crack everywhere along the crack and is placed 2 inches beneath the pavement surface.

Cleaning. Clean the joints and cracks by abrasive blasting before filling. Do not allow any traffic on the pavement between cleaning and filling. Reclean if it rains between cleaning and filling.

Sealant Melting. Provide the Engineer a copy of the sealant Manufacturer's recommendations for heating and application at least 24 business hours before filling. Follow those recommendations for heating and application. Unless stated otherwise, the recommended pouring temperature is 10ºF below the Manufacturer's designated safe heating temperature, with an allowable variation of ± 10ºF. Heat the sealant in a melter constructed either:

- As a double boiler with the space between inner and outer shells filled with a heat-transfer medium.
- With internal tubes or coils carrying the sealant through a heated oil bath and into a heated double wall hopper.

Do not use direct heating. Use a melter capable of maintaining the pouring temperature that is equipped with:

- Positive temperature controls.
- Mechanical agitation or a re-circulation pump capable of providing homogeneous sealant.
- Separate thermometers indicating the temperatures of the heat transfer medium and the sealant in the hopper. Do not place any sealant if the thermometers are defective or missing.

Prior to any sealing, measure the sealant temperature at discharge from the applicator wand. The temperature must be equal to or above the Manufacturer's recommended minimum pouring temperature and equal to or below the Manufacturer's recommended safe heating temperature. Discharge sealant into a vessel and measure the sealant temperature in the presence of the Engineer or the Engineer's representative. Provide 2 thermometers each having an 18 inches stem. Alternate methods to measure the sealant discharge temperature are subject to the Engineer's approval.

Use a discharge hose equipped with a thermostatically controlled heating apparatus or sufficiently insulated to maintain the proper sealant pouring temperature.

Do not use sealant heated beyond the safe heating temperature. Sealant may be reheated or heated in excess of six hours if allowed by the Manufacturer's heating and application recommendations. In these cases, recharge the melter with fresh sealant amounting to at least 20 % of the sealant volume remaining in the melter.

Filling. Fill within 8 hours of cleaning. Fill the joint or crack to within ¼ - ⅜ inch of the pavement surface. Fill when the:

- Air and surface temperatures are 40ºF or warmer.
- Air temperature is above the dew point.
- Pavement surface and vertical joint\crack surfaces are dry.

Open to traffic after the sealant has cured to prevent tracking. A water mist may be used to accelerate curing. Do not blot with fine aggregate.

ITEM 502.90010018 - CLEAN AND FILL CRACKS AND JOINTS IN PORTLAND CEMENT CONCRETE (PCC) PAVEMENT, ASTM D 6690 TYPE IV

METHOD OF MEASUREMENT. The work will be measured for payment as the number of feet of joints/cracks satisfactorily filled.

BASIS OF PAYMENT. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work in the unit price bid for Clean and Fill Cracks and Joints in Portland Cement Concrete (PCC) Pavement, ASTM D 6690, Type IV.

ITEM 520.05000010 - SAW CUTTING PORTLAND CEMENT CONCRETE AND COMPOSITE PAVEMENTS

DESCRIPTION. This work shall consist of saw cutting existing reinforced or unreinforced portland cement concrete, including portland cement concrete pavement and sidewalk, and composite pavement (asphalt concrete on reinforced or unreinforced portland cement concrete), at the locations indicated on the plans or where directed by the Engineer.

MATERIALS. All equipment proposed for this work shall be subject to approval by the Engineer prior to actual use. Rotary rock saws shall not be used for cuts under this item.

CONSTRUCTION DETAILS. Saw cutting shall be along a neat line as indicated on the plans or where directed by the Engineer. The cuts shall be neat and true with no shatter. Saw cuts shall be made to the depth (s) indicated on the plans and as stated below.

When removing composite pavement the Contractor shall saw cut the existing pavement for the full depth of the concrete pavement. The total saw cut depth will be more, depending on the thickness of the asphalt. At the Contractor's option, the asphalt concrete may first be saw cut and removed before making a second cut through the portland cement concrete.

Any damage to material not indicated for removal, caused by the Contractor's operations, shall be repaired by the Contractor. All repair shall be done in a manner satisfactory to the Engineer.

METHOD OF MEASUREMENT. This work will be measured by the number of linear feet of saw cutting done. No allowance will be made for saw cuts of different depths.

Saw cutting which is done for the Contractor's convenience will not be measured for payment under this item.

BASIS OF PAYMENT. The unit price bid per linear foot of saw cutting shall include the cost of all labor, materials, and equipment necessary to complete the work.

Only one payment will be made for saw cutting when removing composite pavement regardless of the method chosen. The cost of saw cutting the asphalt concrete in the composite pavement is included in this item. No payment will be made for this saw cutting under the item for saw cutting asphalt concrete.

Any repairs made necessary by the Contractor's operations shall be done to the satisfaction of the Engineer at no additional cost to the State

ITEM 520.09000010 - SAW CUTTING ASPHALT CONCRETE

DESCRIPTION. This work shall consist of saw cutting existing asphalt concrete pavement or sidewalk at the locations indicated on the plans or where directed by the Engineer.

MATERIALS. All equipment proposed for this work shall be approved by the Engineer prior to actual use.

CONSTRUCTION DETAILS. Saw cutting shall be along a neat line as indicated on the plans or where directed by the Engineer. Saw cuts shall be made to the depth(s) indicated on the plans.

Any damage to material not indicated for removal, caused by the Contractor's operations shall be repaired by the Contractor. All repair shall be done in a manner satisfactory to the Engineer.

METHOD OF MEASUREMENT. This work will be measured by the number of linear feet of saw cutting done. No allowances will be made for saw cuts of different depths.

No saw cutting will be measured for payment under this item which the Contractor may choose to do for his own convenience.

BASIS OF PAYMENT. The unit price bid per linear foot of saw cutting shall include the cost of all labor, materials, and equipment necessary to complete the work.

Any repairs made necessary by the Contractor's operations shall be done to the satisfaction of the Engineer at no additional cost to the State.

ITEM 604.07200110 - SETTING NEW DRAINAGE FRAMES ON EXISTING DRAINAGE STRUCTURES

DESCRIPTION

This work shall consist of setting new drainage frames, complete with grates or covers, to grade on existing drainage structures and shall include removing, storing, and/or disposing of the existing frames, grates, covers, and appurtenances.

This item shall also include the setting of new drainage frames on existing drainage structures modified under the item, "Rebuilding Top of Existing Drainage Structures."

MATERIALS

The new drainage frames, grates, and covers will be furnished under separate items.

Materials shall meet the requirements of the following subsections of Section 700:

Concrete Repair Material	701-04
Concrete Grouting Material	701-05
Precast Concrete Pavers	704-13

Concrete shall be Class A meeting the requirements of Section 501.

CONSTRUCTION DETAILS.

The existing frames, grates, covers, and appurtenances shall be removed and, as indicated in the plans or directed by the Engineer, stored for pick up by others, used elsewhere on the contract, or disposed of off the work site.

The existing masonry adjustment collar, or a portion of it, shall be removed where necessary for setting of the new frame. The new frames shall be set to the line and grade as indicated in the plans or as directed by the Engineer, using precast concrete pavers and concrete grouting material and/or Class A concrete. The frames shall be set in a concrete grouting bed on the existing structure.

Any asphalt pavement and shoulder courses, subcourses, curbs, sidewalks, lawns and other top surfaces removed or damaged during the work of removing the existing frames and setting the new frames, shall be replaced in kind, unless otherwise directed by the Engineer. This shall include all sawcutting necessary for this removal.

Existing concrete/composite pavement shall be removed and restored as per the details given in the plans.

METHOD OF MEASUREMENT

ITEM 604.07200110 - SETTING NEW DRAINAGE FRAMES ON EXISTING DRAINAGE STRUCTURES

This work will be measured by the number of new drainage frames complete with grates or covers, set to grade on existing drainage structures or on existing drainage structures modified under the item, "Rebuilding Top of Existing Drainage Structures."

BASIS OF PAYMENT

The unit price bid for setting each drainage frame shall include the cost of all labor, materials, and equipment necessary to complete the work including any necessary sawcutting, removal and replacement of pavement and shoulder courses, subcourses, curbs, sidewalks, lawns and other top surfaces, unless otherwise indicated in the plans or proposal. Removal and restoration of concrete/composite pavement will be paid for separately.

New drainage frames, grates, and covers will be paid for under the appropriate items. Any frames, grates, covers or appurtenances broken thru carelessness on the part of the Contractor shall be replaced at the Contractor's expense.

ITEM 604.07210110 - RESETTING EXISTING DRAINAGE FRAMES ON EXISTING DRAINAGE STRUCTURES

DESCRIPTION

This work shall consist of removing, storing, and resetting existing drainage frames, complete with grates, covers, and appurtenances, to grade on existing structures or on existing drainage structures modified under the item, "Rebuilding Top of Existing Drainage Structures."

MATERIALS

Materials shall meet the requirements of the following subsections of Section 700:

Concrete Repair Material	701-04
Concrete Grouting Material	701-05
Precast Concrete Pavers	704-13

Concrete shall be Class A meeting the requirements of Section 501.

CONSTRUCTION DETAILS

The existing frames, grates, covers and appurtenances shall be removed, stored if necessary, cleaned and reset to the line and grade indicated in the Plans or as directed by the Engineer.

The existing masonry adjustment collar, or a portion of it, shall be removed where necessary for resetting of the existing frame. The existing frames shall be set to grade using precast concrete pavers and concrete grouting material and/or Class A concrete. The frames shall be set in a concrete grouting bed on the existing structure. If an adjustment frame or ring was removed from the structure, the collar shall be set at such grade that no adjustment frame or ring is needed.

Any asphalt pavement and shoulder courses, subcourses, curbs, sidewalks, lawns and other top surfaces removed or damaged during the work of removing the existing frames and setting the new frames, shall be replaced in kind, unless otherwise directed by the Engineer. This shall include all sawcutting necessary for this removal.

Existing concrete/composite pavement shall be removed and restored as per the details given in the plans.

METHOD OF MEASUREMENT

This work shall be measured by the number of existing drainage frames, complete with grates or covers, reset to grade on existing drainage structures or on existing drainage structures modified under the item, "Rebuilding Top of Existing Drainage Structures."

BASIS OF PAYMENT

The unit price bid for resetting each drainage frame shall include the cost of all labor, materials and equipment necessary to complete the work including any necessary sawcutting, removal and replacement of pavement and shoulder courses, subcourses, curbs, sidewalks, lawns and other top surfaces, unless otherwise indicated in the plans or proposal. Removal and restoration of concrete/composite pavement will be paid for separately.

Any frames, grates and covers broken through carelessness on the part of the Contractor shall be replaced at the Contractor's expense.

ITEM 604.07290010 - REPAIR WALLS OF EXISTING DRAINAGE STRUCTURES

DESCRIPTION. The work to be performed under this item shall consist of removal of deteriorated concrete block or brick walls and mortar joints on existing leaching basins, catch basins, drop inlets, and manholes; and replacement with mortared precast concrete pavers as shown on the contract plans or as ordered by the Engineer.

MATERIALS. Materials shall meet the requirements specified in the following subsections of Section 700:

Precast Concrete Pavers	704-13
Mortar for Concrete Masonry	705-21
Steps for Manholes	725-02

CONSTRUCTION DETAILS. The work to be performed under this item shall consist of removing deteriorated concrete block or brick walls and mortar joints and making the required repairs utilizing precast concrete pavers with mortared joints. All work shall be performed from inside the structure. When necessary, to insure safety of the workers, the Contractor shall provide temporary support of the structure walls while the repair work is being done.

The Contractor shall exercise care in the removal work so as not to damage remaining portions of the drainage structure walls. Any block that is not scheduled for removal under this item that is loosened by the removal operation shall be reset by the Contractor at his own expense to the satisfaction of the Engineer.

All damaged materials removed under this item, including debris, will become the property of the Contractor and shall be removed from the site of the work.

METHOD OF MEASUREMENT. This work will be measured by the actual number of square feet of wall area repaired at each structure measured on the plane of the interior walls of the structures so repaired.

BASIS OF PAYMENT. The unit price bid per square feet for this item shall include the cost of all labor, materials, and equipment required to complete the work, including the cost of removal of grate; removal and repair of structure walls to the required limits; replacement of steps if needed; resetting of grate; and temporary support of walls while the repair work is being performed.

Any damage to existing facilities caused by the Contractor's operations shall be repaired at the Contractor's expense.

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ITEM 608.01050010 - CONCRETE SIDEWALKS - UNREINFORCED (GRADING INCLUDED)

DESCRIPTION.
The work shall consist of the construction of portland cement concrete sidewalks and necessary grading as shown on the plans.

MATERIALS.
The following requirements of Sections 203 and 608 shall apply: 203-2.02A, 608-2, and 608-2.01.

CONSTRUCTION DETAILS.
The requirements of Subsection 203-3.12 shall apply to the placement of embankment.

The requirements of Subsection 608-3.01 shall apply except that all references to driveways and wire fabric for reinforcement shall be disregarded. The sidewalk shall be constructed without wire fabric for concrete reinforcement.

The location of the sidewalks shall be properly graded to conform with the sidewalk cross-section and line and grade. The graded area shall be firm and dry before placing the concrete and all organic or unsuitable materials, existing curbs, sidewalks, and driveways shall be removed.

METHOD OF MEASUREMENT.
Concrete sidewalks will be measured by the number of cubic yards of cement concrete computed from payment lines shown on the plans.

BASIS OF PAYMENT.
The unit price bid per cubic yard will include all excavation, embankment, preparation of subgrade, and all other materials, equipment, and labor necessary to complete the work as called for on the plans and to the satisfaction of the Engineer.

No separate payment will be made for excavation or embankment above, below, or within the volume of sidewalk placed.

Payment at the unit bid price will be made after the concrete sidewalks and curing application have been properly placed.

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ITEM 608.0105NN09 –CURB RAMP

DESCRIPTION
The work shall consist of constructing curb ramps, turning spaces, and associated curbing in accordance with the applicable Standard Sheets and Specifications, and in accordance with the Contract Documents.

The fifth and sixth number to the right of the decimal place (NN), in the item number, is a serialized number to match the different types of curb ramp configurations depicted in the US Customary Standard Sheets 608-01.

The work shall include demolition, saw cutting, disposal, fill, compaction, construction of the new curb ramps, turning spaces and associated curbing. Also included are detectable warning units (supplied and installed where required), repairs to affected asphalt and concrete (as necessary), topsoil, establishing turf (on disturbed areas), and finish work. All material and labor required to perform these tasks is included. Any required adjustments to utilities shall be performed under the specifications for that work.

MATERIAL
Materials required for this work shall comply with, but are not limited to, the following Sections: 402-2, 502-2, 503-2, 608-2, 609-2, and 610-2.

CONSTRUCTION DETAILS
The work shall be in conformance with the US Customary Standard Sheets 608-01 and 608-03. The work performed shall comply with, but is not limited to, the following Sections of the Standard Specifications: 401-3, 402-3, 502-3, 503-3, 608-3, 609-3, and 610-3.

Any existing utility facilities not indicated to be removed that are damaged by the Contractor's operations performing this work, shall be repaired by the Contractor, to the satisfaction of the Engineer, at no additional cost.

Survey Requirements
The contractor shall be responsible for field verifying all elevations, slopes, and dimensions to ensure that the final layout of sidewalks and curb ramps meet ADA requirements prior to pouring concrete or placing asphalt or pavers. A Contract Control Plan is not necessary for work limited to sidewalks and curb ramps.

METHOD OF MEASUREMENT
Payment will be made at the unit price bid for each type of curb ramp (as shown in the US Customary Standard Sheets 608-01), satisfactorily installed, in accordance with the Contract Documents.

BASIS OF PAYMENT
The unit price bid shall include the cost of furnishing all labor, material, and equipment necessary to satisfactorily complete the work, to the satisfaction of the Engineer. Excavation and disposal under curb ramps and subbase course under curb ramps will be paid for separately. Sidewalk

beyond the upper grade break or turning space, as shown in the US Customary Standard Sheets 608-01, will be paid for separately. Any required Survey shall be paid for separately under the lump sum price bid for survey operations. Any incidental asphalt and concrete materials shall be included in work and not paid separately.

Payment will be made under:

Item Number	***Description***	***Pay unit***
608.01050009	Curb Ramp as shown in project details	Each
608.01050109	Curb Ramp Configuration Type 1	Each
608.01050209	Curb Ramp Configuration Type 2	Each
608.01050309	Curb Ramp Configuration Type 3	Each
608.01050409	Curb Ramp Configuration Type 4	Each
608.01050509	Curb Ramp Configuration Type 5	Each
608.01050609	Curb Ramp Configuration Type 6	Each
608.01050709	Curb Ramp Configuration Type 7	Each
608.01050809	Curb Ramp Configuration Type 8	Each
608.01050909	Curb Ramp Configuration Type 9	Each
608.01051009	Curb Ramp Configuration Type 10	Each
608.01051109	Curb Ramp Configuration Type 11	Each
608.01051209	Curb Ramp Configuration Type 12	Each
608.01051309	Curb Ramp Configuration Type 13	Each
608.01051409	Curb Ramp Configuration Type 14	Each

ITEM 608.03040008 - REMOVE, STORE AND RESET CONCRETE BLOCK PAVERS

DESCRIPTION:
Under this item the contractor shall carefully remove, store and reset concrete block pavers in the locations shown on the plans, or as directed by the Engineer.

MATERIALS:
Pavers shall be the units salvaged in a usable condition as determined by the Engineer.

Damaged pavers shall be replaced with new pavers of the same size, shape and color as the existing pavers as determined by the Engineer. Materials shall meet the requirements of Section 704-13, Precast Concrete Driveway and Sidewalk Pavers.

Setting bed material for the reset concrete block pavers shall conform to the requirements of Subsection 608-2.05.

CONSTRUCTION DETAILS:
All pavers shall be laid in the same pattern as existed or as directed by the Engineer to provide a uniformly even surface. Pavers shall be laid on a granular material setting bed not to exceed 2 inches of uniformly compacted material placed over the specified subbase.

After the pavers are in place, joint filler shall be swept over the pavers until the joints are completely filled.

METHOD OF MEASUREMENT:
Concrete block pavers shall be measured by the number of square yards of reset pavers. Damaged pavers shall be replaced by the contractor at his own expense. Unused concrete pavers shall be removed and disposed of under Item 203.02.

BASIS OF PAYMENT:
The unit price bid per square yard shall include the cost of all labor, materials and equipment necessary to complete the work. Excavation and subbase course necessary to reset the pavers, and removed unused pavers will be paid for under their appropriate items.

ITEM 633.05050208 - REMOVE TRANSVERSE AND LONGITUDINAL JOINT SEALERS, CLEAN AND FILL JOINTS AND CRACKS IN PORTLAND CEMENT CONCRETE PAVEMENT

DESCRIPTION

This work shall consist of removing existing transverse and longitudinal joint sealers, cleaning and filling joints and cracks and spalls in the existing PCC pavement prior to the application of a new course.

MATERIALS

Materials will conform to the following subsections of the Standard Specifications:

Plant Production	401
Bituminous Materials	702
Fine Aggregate	703-01
Mineral Filler	703-08

CONSTRUCTION DETAILS

Remove all transverse and longitudinal joint sealers; clean all packed dirt, vegetation and extraneous materials from all joints and cracks greater than ¼-inch in width to a depth equal to a minimum of twice the width of the joint or crack. This shall include any loose concrete or asphalt material at the joints and cracks.

Keep joints and cracks clean until the filling and paving operations are completed.

Complete all stress relieving pavement repairs prior to beginning this work.

Fill all cleaned joints and cracks with asphalt concrete meeting the requirements of Shim Course F9, Warm Mix Asphalt.

METHOD OF MEASUREMENT

This work will be measured on a lump sum basis for work satisfactorily completed in a manner approved by the Engineer.

BASIS OF PAYMENT

Payment includes the cost of all labor, materials, and equipment necessary to complete the work

DESCRIPTION

This work shall consist of preparing, maintaining and submitting a Progress Schedule using the Critical Path Method on Oracle-Primavera P6 software which demonstrates complete fulfillment of all work shown in the contract documents. All work to prepare and maintain the CPM Progress Schedule shall be performed using the scheduling software application. The Contractor shall regularly revise and update the Progress Schedule, and use it in planning, coordinating and performing all work. Schedule activities shall accurately depict the entire scope of work to be performed to complete the project including, but not limited to, all work to be performed by the Contractor, subcontractors, fabricators, suppliers, consultants, the Department, and others, contributing to the project. In preparing and maintaining the Progress Schedule, the Contractor shall take into account submittal requirements and proper submittal review times, coordination of submittals by subcontractors for fabricating and delivering materials and equipment, availability and abilities of workers, availability of construction equipment, weather conditions and site specific restrictions in operations.

DEFINITIONS

Activity - A discrete, identifiable task or event that usually has an expected duration, has a definable Start Date and/or Finish Date, and can be used to plan, schedule, and monitor a project.

Activity, Controlling - The first incomplete activity on the critical path.

Activity, Critical - An activity on the critical path.

Actual Start date- At the activity level, the Actual Start date represents the point in time that meaningful work actually started on an activity.

Actual Finish date - At the activity level, the Actual Finish date represents the point in time that work actually ended on an activity (Note: in some applications areas, the activity is considered "finished" when work is "substantially complete.")

Backward Pass – Calculation of the late start and late finish dates for each activity, based on the start or finish dates of successor activities as well as the duration of the activity itself. It is also known as the second pass.

Baseline Progress Schedule - The Progress Schedule submitted by the Contractor and accepted by the Department that shows the plan to complete the construction contract work. The Baseline Progress Schedule represents the Contractor's plan at the time of Contract Award or Notice to Proceed for completing the project.

Bid Date – The date the contract is let and there is an announcement by the Department of an apparent low bidder.

Completion Date, Contract - The date specified in the Notice To Proceed (NTP) letter for completion of the project or a revised date resulting from properly executed time extensions.

Anticipated Completion Date - The date forecasted by the Progress Schedule for the completion of the contract work.

Constraint - A schedule restriction imposed on the Start or Finish date(s) of an activity that modifies or overrides an activity's relationships.

Contemporaneous Period Analysis Method – A technique for evaluating schedule delays or time savings. The analysis period for the purpose of these provisions shall be the period covered in each regular progress update to the schedule, as they coincide with contract payments to the Contractor.

Contractor's First Day of Work - The day of the Contractor's first day of work which is Notice To Proceed (NTP)

Contractor's Last Day of Work - The Contractor's last day of work which is Contract Completion date.

Contractor Work Day - A calendar day scheduled for active prosecution of the work.

County Work days – Monday through Friday, with the exception of Holidays listed below. Days scheduled for the active prosecution of work activities by NC staff or NC's representatives.

Critical Path – In the Progress Schedule the critical activities shall be those activities being on the longest path. In a project network diagram, it is the series of activities which determines the earliest completion of the project.

Critical Delay - An event, action, or other factor that delays the critical path of the Progress Schedule and extends the time needed for completion of the construction project.

Critical Path Method (CPM) – A network analysis technique used to predict project duration by analyzing which sequence of activities (which path) has the least amount of scheduling flexibility (the least amount of float). A scheduling technique utilizing activities, durations, and interrelationships/dependencies (logic), such that all activities are interrelated with logic ties from the beginning of the project to the completion of the project. Early dates are calculated by means of a forward pass using a specified start date. Late dates are calculated by means of a backward pass starting from a specified completion date (usually the forward pass's calculated project early finish date).

Data Date – The date entered in the Project Details, in the Dates tab, which is used as the starting point to calculate the schedule. Everything occurring earlier than the data date is "as-built" and everything on or after the data date is "planned."

Deliverable – Any measurable, tangible, verifiable outcome, result, or item that must be produced to complete a project or part of a project. Often used more narrowly in reference to an external deliverable, which is a deliverable that is subject to approval by the Department.

Draft Baseline Progress Schedule – An optional schedule submission that reflects an outline of the schedule format and content proposed by the Contractor's Project Scheduler to comply with the schedule provisions in the contract to solicit early comments by the Engineer, prior to the submittal of complete Baseline Progress Schedule.

Duration, Original - The original estimated number of working days (not including holidays or other nonworking periods) in which the work task associated with the activity is expected to be performed. (The

number of calendar days may be different based on the calendar assigned to the activity.) For certain activities such as concrete curing, or others approved by the Engineer, the calendar shall reflect no non-working days.

Duration, Remaining - The estimated time, expressed in working days (not including holidays or other nonworking periods), needed to complete an activity that has started but has not finished.

Early Completion Schedule - A progress schedule will be considered an early completion schedule when the schedule submitted by the Contractor indicates a completion date that is earlier than the specified contract completion date, or the Finish date of any interim Milestone work activity is earlier than the date specified in the contract. This includes, but is not limited to, B-Clock activities, activities subject to Incentive/Disincentive provisions, and/or specific Liquidated Damages provisions, and Lane Rental activities.

Final Baseline Progress Schedule - The original plan against which the Contractor's progress is measured. The Final Baseline Progress Schedule represents the original plan at the award of the contract, of what is expected to happen. Once the Final Baseline Progress Schedule is accepted by the Engineer it is saved and used as a basis to compare against Progress Schedules Updates.

Float Suppression - Utilization of zero free float constraints which allows an activity to start as late as possible by using all of its' available free float. This technique allows activities to appear more critical than if the activity's total float was based on early dates. Assigning zero free float prevents true sharing of total float between Department and the Contractor. Utilization of overly generous activity durations and overly restrictive calendar non-working periods are also considered to cause float suppression.

Float, Free - The amount an activity can slip without delaying the immediate successor activities. Free Float is the property of an activity and not the network path.

Float, Total - The amount of time an activity (or chain of activities) can be delayed from its early start without delaying the contract completion date. Float is a mathematical calculation and can change as the project progresses and changes are made to the project plan. Total Float is calculated and reported for each activity in a network, however, Total Float is an attribute of a network path and not associated with any one specific activity along that path.

Fragnet – A subdivision of a project network diagram usually representing some portion of the project.

Global data – Data classified by Oracle-Primavera software as Global, including Project Codes, Global Activity Codes, Global Calendars, Resource Calendars, Global Filters, Resources, Global Reports, User Defined Fields and Unit of Measure.

Key Plans - Key Plans are graphic representations made by the Contractor's Project Scheduler on paper copies of the appropriate contract plan sheets that reflect the Contractor's planned breakdown of the project for scheduling purposes to efficiently communicate the Contractor's activity coding scheme to County scheduling staff. The key plans prepared by the Contractor shall clearly define the boundaries of the work for each designated Area, the operations contained in various Stages of work, and work in the Work Zone Traffic Control (WZTC) Phases. The alphanumeric codes on the key plans shall match the code values for the activity code "Area", "Stage", and "WZTC Phase" in the Progress Schedule.

Longest Path - The sequence of activities through the Progress Schedule network that establishes the Scheduled Completion Date

Look-Ahead Schedule – A three week time segment generated from the accepted Progress Schedule that shows the actual work progressed during the previous one week and forecasts the work planned for next two week

period following the Data Date, and includes any major materials to be delivered and any lane closings or anticipated shifts in WZTC.

Milestone – An activity with zero duration that typically represents a significant event, usually the beginning and end of the project, milestones set forth in the contract proposal, construction stages, a major work package, or the contract interim time-related clauses.

Monthly Status Report – The report generated monthly from the updated Progress Schedule in an electronic Adobe Acrobat PDF format that reflects a Data Date for that Progress Schedule Update period. The report shall be formatted to fit ANSI Size D paper (610 mm x 914 mm) (24 inch x 36 inch), listing all work activities from the data date to contract completion, using the NYSDOT Status Report Layout or as ordered by the Engineer, sorted by Early Start Date, Total Float in increasing order, showing the Activity ID, Activity Description, Original Duration, Remaining Duration, Total Float, Early Start date, Early Finish date, Start date, Finish date and Calendar ID.

Narrative Report - A descriptive report submitted with each Progress Schedule. The required contents of this report are set forth in this specification.

Open End - The condition that exists when an activity has either no predecessor or no successor, or when an activity's only predecessor relationship is a finish-to-finish relationship or only successor relationship is a start-to-start relationship.

Predecessor - An activity that is defined by Schedule logic to precede another activity. A predecessor may control the Start Date or Finish Date of its successor.

Progress Schedule – A general Oracle-Primavera P6 Schedule as defined by this Specification.

Progress Schedule Update – Changes to the Progress Schedule that reflect the status of activities that have commenced or have been completed, including the following items: (a) Actual Start date and or Actual Finish date as appropriate; (b) Remaining Duration for activities commenced and not complete; and (c) Suspend or Resume dates for activities commenced and not complete.

Progress Schedule Revision – Revisions to the Progress Schedule ensure it accurately reflects the current means and methods of how the project is anticipated to progress, including modifications made to any of the following items: (a) changes in logic connections between activities; (b) changes in constraints; (c) changes to activity descriptions; (d) activity additions or deletions; (e) changes in activity code assignments; (f) changes in activity Productivity Rates; and (g) changes in calendar assignments.

Project Scheduler – The person that is responsible for developing and maintaining the Progress Schedule.

Projects Planned Start Date – The date entered in the Project Details, in the Dates tab, that reflects the Contractor's planned start of work (based on contract requirements, and reasonable expectation for a Notice to Proceed) at the time the bid was submitted to the Department.

Projects Must Finish By Date – A date constraint entered in the Project Details, in the Dates tab, that reflects the Contract Completion Date set in the Contract Documents or through a formal contract extension of time.

Recovery Schedule – A schedule depicting the plan for recovery of significant time lost on the project. This separate CPM schedule submission shall provide the resolution and include appropriate changes in network logic, calendar adjustments, or resource assignments.

Relationships - The interdependence among activities. Relationships link an activity to its predecessors and successors. Relationships are defined as:

Finish to Start - The successor activity can start only when the current activity finishes.

Finish to Finish – The finish of the successor activity depends on the finish of the current activity.
Start to Start – The start of the successor activity depends on the start of the current activity.

Start to Finish – The successor activity cannot finish until the current activity starts.

Resources, Contract Pay Item – Contract Pay Item resources shall be identified as a Material resource type. When required, Contract Pay Item resources are developed for each Pay Item in the contract, with the Resource ID matching the contract Pay Item and the Resource Name matching the description of the contract Pay Item.

Resources, Equipment – Equipment resources shall be identified as a Nonlabor resource type. A unique identifier shall be used in the Resource Name or Resource Notes to distinguish this piece of equipment from a similar make and model of equipment used on the project.

Resources, Labor – Labor resources shall be identified as a Labor resource type. Labor Resources shall identify resources that encompass direct labor at the Crew level.

Scheduling/Leveling Report – The report generated by the software application when a user "Schedules" the project. It documents the settings used when scheduling the project, along with project statistics, errors/warnings, scheduling/leveling results, exceptions, etc.

Substantial Completion - the day, determined by the Engineer, when all of the following have occurred:

1. The public (including vehicles and pedestrians) has full and unrestricted use and benefit of the facilities both from the operational and safety standpoint, and
2. All safety features are installed and fully functional, including, but not limited to, illumination, signing, striping, barrier, guard rail, impact attenuators, delineators, and all other safety appurtenances, and
3. Only minor incidental work, replacement of temporary substitute facilities or correction or repair remains for the Physical Completion of the Contract, and
4. The Contractor and Engineer mutually agree that all work remaining will be performed with short term lane closures to minimize delays, disruption, or impediment to the traveling public. No overnight lanes closures will be allowed.

Successor - An activity that is defined by Schedule logic to succeed another activity. The Start Date or Finish Date of a successor may be controlled by its predecessor.

Time Impact Analysis - A technique to demonstrate the comparison of a time impact of a Progress Schedule revision prior to a change in the Contract work, against the current accepted Progress Schedule. It is also known as a "What-If" analysis.

Work Breakdown Structure (WBS) - A deliverable-oriented grouping of project elements, which organizes and defines the total scope of the project. Each descending level represents an increasingly detailed definition of project components or work packages.

Work Days – A calendar day (Monday through Friday) on which NC offices are open to the public for business NC recognized public holidays are not workdays**.** Days scheduled for the active prosecution of work activities by NC staff or the NC's representatives. (NC Workday calendar)

Nassau County Holidays	
New Year's Day	**January 1**
Martin Luther King Day	**3rd Monday in January**
Lincoln's Birthday	**February 12th**
President's Day	**3rd Monday in February**
Memorial Day	**Last Monday in May**

Independence Day	**July 4th**
Labor Day	**1st Monday in September**
Columbus Day	**2nd Monday in October**
Election Day	**1st Tuesday in November**
Veteran's Day	**November 11th**
Thanksgiving Day	**4th Thursday in November & Following Friday**
Christmas Day	**December 25th**

If the holiday occurs on a Saturday, it may be observed the Friday before. If the holiday occurs on a Sunday, it may be observed the Monday after.

Work Package - A deliverable at the lowest level of the work breakdown structure. A work package contains activities.

MATERIALS

Oracle-Primavera P6 software (as accepted by the Engineer)

CONSTRUCTION DETAILS

A. General. In addition to the attributes of the Progress Schedule provisions as set forth in NYSDOT Specification §108-01, the Contractor shall prepare, furnish, and maintain a computer-generated Progress Schedule using the Critical Path Method (CPM) utilizing Oracle-Primavera scheduling software. The CPM Progress Schedule shall be prepared based on the principles defined by the latest issue of the Construction Planning & Scheduling Manual published by the Associated General Contractors of America, except where superseded by the contract documents such as the CPM Special Notes and this specification.

The Contractor and the Department shall use the Progress Schedule to manage the work, including but not limited to the activities of subcontractors, fabricators, the Department, other involved agencies and authorities, other entities such as utilities and municipalities, and all other relevant parties involved with the project.

No work other than installation of the Engineer's Field Office, mobilization, procurement and administrative activities, installation of construction signs, installation of erosion and pollution protection, clearing and grubbing, field measurements, and survey and stakeout will be permitted to start until the Baseline Progress Schedule has been submitted to the Engineer, and the Engineer determines there are no deficiencies consistent with those identified in paragraph I.1 *Immediate Rejection of Progress Schedule Submissions.* .

The purpose of the Progress Schedule, and scheduling provisions in the contract, shall be to:

a) Ensure that the Contractor and the Department have a detailed plan and resources to complete the project in accordance with contract time requirements;
b) Provide a means of monitoring the progress of work;
c) Aid in communication and coordination of activities among all affected parties;
d) Analyze the effect of changed conditions on any milestone dates or on the contract completion date;
e) Analyze the effect of change orders for extra work or deductions, and unanticipated delays, on the contract completion date;
f) Establish a standard methodology for time adjustment analysis based on the principles of the Critical Path Method of scheduling, to analyze delays and resolve construction disputes concerning time;
g) Determine appropriate extensions or reductions of Contract Time.

In scheduling and executing the work, the Contractor shall:

a) Sequence the work commensurate with the Contractor's abilities, resources and the contract documents. The scheduling of activities is the responsibility of the Contractor.

b) Ensure that Progress Schedules prepared by the Project Scheduler for submission to the Department are in compliance with the Contract. The intent should be that Schedule submissions and accompanying Narratives are timely, complete, accurate, and in compliance with the Contract.

c) Communicate all Contract changes, and decisions or actions taken by the Contractor and all subcontractors, fabricators, etc., that effect the Progress Schedule to the Project Scheduler in a timely manner to allow appropriate development, maintenance, and update of the Progress Schedule.

d) Include all work contained in the Contract and all work directed in writing by the Engineer. Work activities directed by the Engineer to be added to the Contract shall be included in the next Monthly Progress Schedule submission.

e) Assure that Progress Schedule Updates reflect the actual dates that work activities started and completed in the field.

f) Break a schedule activity into multiple activities to reflect a discontinuity in the work if a work activity is suspended in the field and restarted at a later date, and the break between when the work was suspended to when it was resumed is significant compared to the original activity duration.

g) Ensure the Progress Schedule contains all work constraints and Milestones defined in the Contract.

h) Schedule the work using such procedures and staging or phasing as required by the Contract. Work designated as part of separate stages may be performed concurrently with other stages where allowed by the Contract or where approved by the Department.

Failure by the Contractor to include any element of work required by the Contract in the accepted progress schedule does not relieve the Contractor from its responsibility to perform such work.

Should the Contractor choose to show activities in the schedule that reflects their plan of work prior to the contract award, the Department does not incur any liability and such work being performed between the letting date and the contract award date shall be considered at risk work.

Errors or omissions on schedules shall not relieve the Contractor from finishing all work within the time limit specified for completion of the contract.

B. Project Scheduler. The Contractor shall designate an individual, entitled the Project Scheduler, who will develop and maintain the construction progress schedule. The Project Scheduler shall be present at the Preconstruction Schedule Meeting, prepared to discuss, in detail, the proposed sequence of work and methods of operation, and how that information will be communicated through the Progress Schedule. The Project Scheduler shall attend all meetings, keep notes which may affect the CPM schedule, including but not limited to those between the Contractor and their Subcontractors and between the Contractor and the Department. The Project Scheduler shall be knowledgeable of the status of all aspects of the work throughout the length of the Contract, including but not limited to original contract work, additional work, new work, and changed conditions of work.

C. Scheduling Software. Oracle-Primavera P6 software and computer system shall be used by the Contractor. The Contractor shall develop, update, and revise the Progress Schedules using Oracle-Primavera P6 software application.

In general, schedules are developed from the Contractor's knowledge of the project, and the means and methods represented in those schedules are based on the Contractor's understanding of the contract documents, and the Contractor's past experience, which are unique to the Contractor. Schedule activity data are therefore the intellectual property of the Contractor and will not be made available to other Contractors. However, all project schedule data are the sole property of the Department.

D. Meetings.

D.1. Preconstruction Schedule Meeting. The Contractor shall contact the Construction Engineer after notification they are the apparent low bidder, but no later than two (2) Work Days following Notification to Proceed (NTP) to schedule a Preconstruction Schedule Meeting. The purpose of this meeting will be to discuss essential matters pertaining to the satisfactory scheduling of project activities, and to resolve any known questions regarding interpretation of the contract requirements for this work.

The Project Scheduler shall be prepared to discuss the following:

a) The proposed hierarchal Work Breakdown Structure (WBS) for the Progress Schedules. The Project Scheduler shall provide a paper copy at the meeting.
b) The proposed project calendars.
c) The proposed project activity codes and various code values for each activity code. The Project Scheduler shall provide a paper copy at the meeting.
d) The specifics of any contract Time-Related Clauses (A+B Bidding, Incentive/Disincentive, Liquidated Damages, Lane Rental, etc.);
e) The Contractor's schedule methodology to be employed, proposed work sequence and any proposed deviations from the contract plans with respect to Staging or Work Zone Traffic Control phasing.
f) The Key Plans shall be provided at the meeting.
g) The factors that the Contractor determines to control the completion of the project and any milestone activity completion dates contained therein.
h) The Project Scheduler shall provide an outline for the content of the Narrative report for future Progress Schedule submissions.
i) Schedule submission protocol for Progress Schedule submissions.

The Contractor shall submit to the Resident Engineer (RE) for review, a minimum of five (5) Work Days prior to the Preconstruction Schedule Meeting, the following: a copy of the Key Plans, a print out of the proposed Work Breakdown Structure, a print out of each of the proposed project Calendars showing the Work Days versus non-work days and hours per day, and a list of the Code Values for each Project Activity Code proposed to be used in the schedules.

The Resident Engineer (RE) will be available to answer questions regarding scheduling, including: the availability of Department supplied electronic file(s) containing sample project schedule information, sample progress schedule narratives, Special Notes for CPM Scheduling, and required standard format for CPM Progress Schedules for contract work.

The Contractor shall schedule meetings as necessary with the Engineer to discuss schedule development and resolve schedule issues, until the Final Baseline Progress Schedule is accepted by the Engineer.

D.2. Progress Meetings. One topic of the regular progress meetings held by the Engineer and attended by the Contractor shall be a review of the monthly Status Report generated from the Progress Schedule. The Contractor shall be represented by the Field Superintendent and Project Scheduler. The Project Scheduler shall bring a copy of the printed plot of the current Status Report to the progress meeting, the report shall show the current anticipated schedule for all remaining work with the critical path activities highlighted.

a) The review of the Status Report serves as the forum to discuss project progress and delays, suggested remedies, necessary Progress Schedule revisions, coordination requirements, change orders, potential Contractor time extension requests, and other relevant issues. If contract work is falling behind the Progress Schedule, the responsible party (i.e. Contractor) shall be ready to discuss what measures it will take in the next thirty (30) days to put the work back on schedule so as to meet the contract Completion Date specified in the contract.
b) Items of discussion will include, but are not limited to: project progress; schedule progress; near term and long-term schedule issues, including RFIs, Shop Drawing submittals, permit

work, utility relocations, mitigation work; project issues and risks; proposed solutions; and any relevant technical issues that are schedule related.

c) At the meeting the Project Scheduler shall compile an action item list that describes who is responsible for existing or pending issues and the date by which the issue needs to be resolved to avoid delays. The Contractor shall forward a copy of the action item list to the Engineer within 2 business days following the meeting.

E. Progress Schedule Submissions:

E.1. Draft Baseline Schedule. The Contractor is encouraged, but not required, to submit a Draft Baseline Progress Schedule that demonstrates a sample of how the Project Scheduler's proposed alphanumeric coding structure and the activity identification system for labeling work activities in the CPM progress schedule will conform to the detailed requirements of this specification.

This submittal may be made anytime following notice to the Contractor that they are the apparent low bidder on the contract.

Critical items for this review should include but are not limited to: the proposed WBS for subsequent progress schedules; the proposed project Calendars; project Planned Start date; project Must Finish By date; major milestone activities (e.g. - Award, Notice to Proceed, Contractor's First Day of Work, Contractor's Last day of Work, Anticipated Completion Date); and between fifty to one hundred summary activities for the major work deliverables of the contract (e.g. - pave EB from STA x to STA y, construct roundabout 1, construct bridge xyz, etc.) that have assigned Activity Ids, Activity Descriptions, Activity Durations, Predecessors, Successors, and Activity Relationships. These summary activities will be broken down into, or supplemented with, individual work activities for the baseline submission.

If any Crew resources are included, the composition of the staffing (the number and titles of the various staff) shall be listed in the Notes tab of the Crew resource, and the composition of the crews shall be included in the narrative. To the extent practicable, the Draft Baseline Progress Schedule should include administrative and procurement activities to be accomplished during the contract; planned submittal, review, and approval dates for shop drawings, working drawings, fabrication drawings, and contractor supplied plans, procedures, and specifications.

Any submission of a Draft Baseline Progress Schedule should be accompanied by a written Narrative that provides details of the Calendar assignments of Working Days versus non-work days, outlines the sequence of planned operations to complete the project work, and provides the proposed Activity Codes and Code values to be assigned to activities in future submissions of project progress schedules.

The review and comment by the Engineer of the sample schedule should assist the Project Scheduler in assuring the first submittal of the Baseline Progress Schedule will be in general conformance with the requirements of the specification and other contract requirements, and that major rework of the Baseline Progress Schedule will not be required. The Engineer will review the logic diagram, coding structure, activity identification system, and Narrative; and provide comments for required changes by the Project Scheduler for implementation in the submission of the Baseline Progress Schedule. The Engineer will provide written comments on major deficiencies within five (5) Workdays of receipt. The Department reviews Draft Baseline Progress Schedules solely for format and will not consider any submission of a Draft Baseline Progress Schedule for approval as an Early Completion Schedule.

E.2. Baseline Progress Schedule– Within ten (10) Work Days of receipt of the contract NTP, the Contractor shall prepare and submit a Baseline Progress Schedule that meets the following requirements:

a) The schedule shall accurately reflect the proposed approach to accomplish the work outlined in the Contract documents and conforms to all requirements of this specification.

b) The schedule shall define a complete logical plan that can realistically be accomplished, to execute the work defined in the Contract.

c) The schedule shall comply with the work constraints and milestones defined in the Contract as well as all other contractual terms and conditions. The schedule shall be consistent in all respects with the

specific interim Time-Related Contract Provisions, and any order of work requirements of the contract documents. The schedule shall meet all interim milestone dates and the contractor's Anticipated Completion Date shall not extend beyond the contract completion date. This submission shall reflect the Contractor's plan at the time of contract award, and prior to the start of any work.

d) **Float.** No negative float is allowed in the Baseline Progress Schedule submission.

e) **Data Date.** The contract Award Date shall be entered as the Data Date. If the Contractor submits a Baseline Progress Schedule @ Bid submission, the Data date shall be the date of the schedule submission to the Engineer and not prior to the bid date. Time shall be the end of the work day.

f) **Activity Codes.** The Progress Schedule shall have assigned, to the maximum extent practicable, the Global Activity Codes Including, but not limited to Responsible Party, Stage and Type of Work. The Contractor shall also use a Project Level activity code named "Subcontractor" with code values identifying each of the approved subcontractors working on relevant activities.

g) **Project Level Layouts & Filters.** Any "Layouts", "Filters" and "Report" formats that the Contractor develops for the various Progress Schedules submissions to the Engineer shall be saved and made available to all other users of the project schedule with a name that includes the contract D#.
The Contractor shall assign appropriate Activity Codes and provide custom Layouts, Filters, and/or report formats necessary to allow the Engineer to generate a report from the each Progress Schedule submission of all submittals required under the contract (i.e., shop drawings, required permits, erection/demolition plans, etc.). The list shall show scheduled submission date, review date, and acceptance date for each submittal and identify the earliest activity affected by each of these submittals. This list shall be generated from each Progress Schedule submission until all such activities are completed.

h) **Schedule Submission**

i) Within the timeframe indicated in Table 1 column 1, the Contractor shall send an email to the Engineer and Construction Supervisor, notifying them the schedule is ready for review. **In the following table, the Construction supervisor may change the time.**

TABLE 1 (in Work Days)		
Timeframe from receipt of Notice to Proceed to Submission of complete Baseline Schedule. (Column 1)	**Timeframe for Engineer's Review (Column 2)**	**Timeframe from Notice to Proceed to acceptance by the Engineer not to exceed (Column 3)**
10	10	40

ii) The Engineer will review the schedule and return it, accept it with comments, or reject it within the timeframes indicated in Table 1 column 2, following the date of receipt of the Contractor's submission.

iii) If the schedule is returned with comments, the Contractor shall address all comments and revise the schedule as necessary. The Contractor shall complete the Final Baseline Progress Schedule and obtain the acceptance of the Engineer within the timeframe required in Table 1 column 3.

iv) If the schedule is accepted without any comments by the Engineer, the Contractor shall copy the schedule and rename it for submission as the Final Baseline Progress Schedule

v) **In no way does the Baseline Progress Schedule modify the contract documents**.

E.3. Final Baseline Progress Schedule

a) If the Baseline Progress Schedule is returned to the Contractor with comments, the Contractor shall make a copy of the schedule and rename it as the Final Baseline Progress Schedule with comments addressed and revisions made as necessary. The Contractor shall complete the Final Baseline Progress Schedule and obtain acceptance of the Engineer within the timeframe required in column 3 of Table1,

or within one week of the Contractor's receipt of the final comments by the Engineer, whichever is sooner.

b) The Engineer shall review the schedule and return it, accepted or with comments, within 5 Work Days following the date of receipt of the Contractor's submission.

c) The Final Baseline Progress Schedule must be "accepted" or "accepted as noted" by the Engineer prior to the Department evaluating any Contractor disputes associated with time impacts. This does not preclude the Contractor from submitting a dispute while the schedule is being reviewed for acceptance.

E.4. Progress Schedule Updates and Monthly Status Reports:

a) The Contractor shall perform a Progress Schedule Update, on a minimum, at the end of each month.

b) The Contractor shall generate a Monthly Status Report at the end each month after performing the Progress Schedule Update and Scheduling the project with a Data Date of day the schedule was updated and submit it to the Engineer by the beginning of business each Monday. The Status Report shall be generated using the activity Layout named Monthly Status Report, with activities grouped by the WBS, sorted by Finish Date. The Gantt Chart shall clearly indicate the project critical (longest) path. Graphical representations shall be shown at a suitable scale to be legible and readable.

c) **During any time periods within the contract that special time-related contract provisions are in effect, including Incentive/Disincentive Periods, the Engineer may require more frequent Progress Schedule Updates and/or Progress Schedule Status Reports.**

E.5. Monthly Progress Schedule Submissions.

a) **First Progress Schedule Submission** – Within three Work Days following acceptance of the Final Baseline Progress Schedule the Contractor shall perform a Progress Schedule Update to reflect the status of all activities where work was performed in the time period between the start of work and acceptance of the Final Baseline Progress Schedule. This shall include actual dates entered in the Actual Start and Actual Finish columns, and percentage of work complete for uncompleted activities, in addition the Contractor shall incorporate any Progress Schedule Revisions that reflect any changes in how future work activities are to be completed.

b) **Subsequent Progress Schedule Submissions** – The Contractor shall prepare and submit subsequent Progress Schedule submissions on a regular basis based on the **Monthly Progress** Schedules.

Schedule Updates and Revisions

The Contractor shall submit a copy of the current Progress Schedule that includes all Progress Schedule Revisions and Progress Schedule Updates to reflect the actual and planned prosecution and progress of the contract work. Progress Schedule Updates shall reflect the status of activities that have commenced or have been completed, including the following items: (a) actual dates in activity Actual Start and Actual Finish columns as appropriate; (b) actual Remaining Duration for activities commenced and not complete; and (c) actual activity Suspend or Resume dates for activities commenced and not complete. Progress Schedule Revisions reflect modifications made to activities in the current project baseline schedule in any of the following items: (a) activity Original Duration; (b) changes in logic connections between activities; (c) changes in Constraints; (d) changes to Activity Descriptions; (e) activity additions or deletions; (f) changes in Activity Code assignments; (g) changes in Calendar assignments, and Work Days; (h) Productivity Rates; (i) a list of Notebook Topic additions and changes . All "Out of Sequence" activities noted in the scheduling log shall be corrected to reflect the current construction operations.

c) As ordered by the Engineer, for any contract time extension requests the Contractor shall include: a Time Impact Analysis (TIA) for any changes to the schedule for future work for such issues as Added Work, VECP, or Changed Conditions; and a Delay Analysis that documents all delays from the Contract Award to the current date that is based on critical path delays that occurred when comparing

subsequent Monthly Progress Schedule submissions and the supporting delay documentation in the Progress Schedule Narratives.

E.6. As-Built Progress Schedule. As ordered by the Engineer, the Contractor shall submit the As-Built Progress Schedule with Actual Start and Actual Finish dates for all activities, within ten (10) Work Days following final acceptance of work by the Commissioner.

E.7. Look-Ahead Schedule. Except during winter shutdown periods the Contractor shall prepare a Look-ahead Schedule as either a plotted report from the current progress schedule, or as a narrative report, and provide it to the EIC on a weekly basis, or if approved by the Engineer on a mutually agreed upon interval The Look-ahead schedule shall include all work activities planned for the next two week period, and include all work activities progressed in the previous one week period, and should also show: anticipated lane closures, road closures and detours, environmental issues, and utility issues. The Engineer will provide the Project Scheduler with guidelines for determining the begin dates and end dates for the one or two week reporting periods, along with the how the plotted schedule report or narrative report shall be formatted.

The Department generally uses this Look-ahead schedule to facilitate communication with other Federal or State agencies, local municipalities, utility companies, railroads, emergency service providers, public news media and other affected parties.

F. Detailed Progress Schedule Requirements.

F.1. Baseline Progress Schedule. As a minimum, the Contractor shall address the following:

a) Defining Project details and defaults – Within the Dates tab, the "Planned Start" shall be the Letting Date, the "Data Date" shall be the date of Contract Award, the "Must Finish By" date shall be the contract Completion Date. Within the Settings tab, define the Critical Activities as the "Longest Path".

b) Sufficient activities shall be included to assure that there is adequate planning for the entire project. The appropriate number of activities will be largely dependent upon the nature, size, and complexity of the project. In addition to all site construction activities, network activities shall include: activities necessary to depict the procurement/submittal process including shop drawings and sample submittals; the fabrication and delivery of key and long-lead procurement elements; testing of materials, plants, and equipment; settlement or surcharge periods activities; sampling and testing period activities; cure periods; activities related to temporary structures or systems; activities assigned to subcontractors, fabricators, or suppliers; erection and removal of falsework and shoring; major traffic stage switches; activities assigned to the Department and other involved State agencies and authorities, including final inspection; activities to perform punch list work; and activities assigned to other entities such as utilities, municipalities, County government/agencies, and other adjacent contractors. The schedule shall indicate intended submittal dates and depict the review and approval periods as defined in the Contract Documents for Department review.

c) The following Activity ID's and Activity Descriptions as shown in Table 2, **subject to changes as <u>approved</u> by the Engineer**, shall be incorporated into all Progress Schedules:

TABLE 2

Activity ID	Activity Description	Duration (Min)	Predecessor	Logic Tie	Responsible Party
C00005	Preconstruction Schedule Meeting	1 Work Day	M00001	SS	NC
C00011	Prepare & Submit DMWBE Goals	Minimum 1 Contractor Work Day	M00001	SS	Contractor

C00015	DMWBE Utilization Approved	15 Work Days	C000011	FS	NYSDOT/NC
C00030	Submit Proof of Insurance	1 Contractor Work Day	M00001	SS	Contractor
M00025	Contract Award Date	0 - Finish Milestone	00020, C00015	FF	NYSDOT/NC
C00010	Preconstruction Meeting	1 Work Day	M00001	SS	NYSDOT/NC
C00035	Notification to Proceed	5 Work Days	M00025, C00030	FS	NYSDOT/NC
C00040	Prepare/Submit Safety & Health Plan	Minimum 1 Work Day	M00001	SS	Contractor
C00045	Approve Safety & Health Plan	20 Work Days	C00040	FS	NYSDOT/NC
M00050	Contractor's First Day of Work	0 - Start Milestone	C00035, C00045	FS	Contractor
C00055	Set Up Engineer's Field Office	20 Contractor Work Days	C00035	FS	Contractor
C00060	Prepare & Submit Baseline Progress Schedule	10 Work Days from NTP	C00005	FS	Contractor
C00065	Review Baseline Progress Schedule	10 Work Days	C00060, M00025	FS	NYSDOT/NC
C00070	Accept Baseline Progress Schedule	1 County Business Days	C00065	FS	NYSDOT/NC
C00075	Mobilization	20 Contractor Work Days	M00050	SS	Contractor

TABLE 2

Activity ID	**Activity Description**	**Duration (Min)**	**Predecessor**	**Logic Tie**	**Responsible Party**
M00100	Field Work Begins	0 - Start Milestone	M00050, C00055, C00060		Contractor
M00900	Substantial Completion	0 - Finish Milestone	See definition	FF	Contractor
C09010	Other Agency Inspection	20 Work Days	M00900	FS	Others
C09020	NYSDOT Final Inspection	20 Work Days	M00900	FS	NYSDOT/NC
C09030	Punchlist Work	20 Contractor Work Days	C09020	FS	Contractor
M00950	Contractor's Last Day of Work	0 - Finish Milestone	C09030	FF	Contractor
M00999	Anticipated Completion Date	0 - Finish Milestone	M00950	FF	Contractor
C09040	Demobilization	10 Contractor Work Days	C09020	FS	Contractor

M00925	Recommendation for Final Acceptance	0 - Finish Milestone	C09040	FF	NYSDOT/NC
M09999	Final Acceptance	0 - Finish Milestone	M00925	FF	NYSDOT/NC

The Logic Tie shown shall be used as a relationship to the predecessor activities contained in the column named Follows.

d) **Work Breakdown Structure (WBS)** - A multilevel hierarchal WBS shall be incorporated that provides a deliverable-oriented grouping of activities and defines the total scope of the project. The Contractor shall develop a detailed project specific WBS for the Engineer's review and approval. The Engineer shall make the final determination on the number of levels of the WBS, and how the activities shall be grouped to represent the deliverables of the project.

For all projects the first two levels (nodes) of the WBS shall be labeled as follows:

Level 1 - is the project level; and shall have the project name.

Level 2 - shall have three nodes; "PRECONSTRUCTION", "CONSTRUCTION", and "POST CONSTRUCTION";

Level 3- under "PRE-CONSTRUCTION", shall include at least three nodes "GENERAL SUBMITTALS", "SHOP DRAWINGS"; and "PROCUREMENT/FABRICATION/DELIVERY".

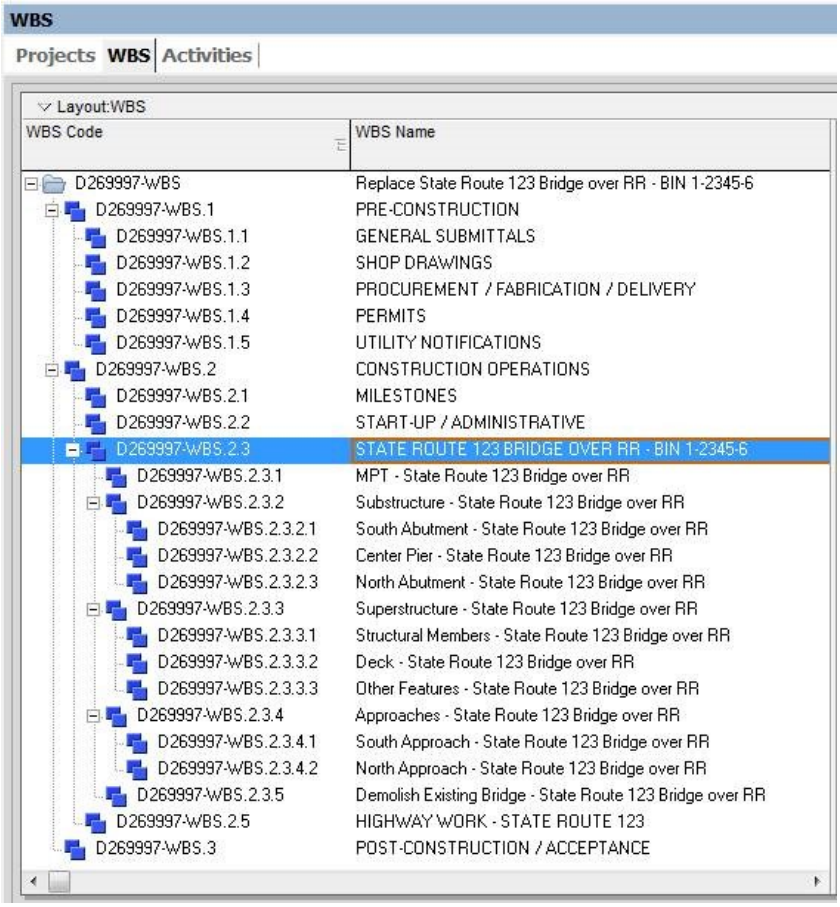
Level 3- under "CONSTRUCTION"; shall have three nodes "PRE-CONSTRUCTION", "CONSTRUCTION OPERATIONS", and "POST CONSTRUCTION/CLOSEOUT";

Under the "CONSTRUCTION OPERATIONS" node, the grouping of activities may vary depending on the scope and nature of the project work. The Contractor shall coordinate with the Engineer to determine the best way to represent (group activities) the project deliverables (i.e. Bridge, Roundabout, Highway segment, Interchange, Intersection, etc.) and the various Stages or Phases of work. The Engineer may require sub nodes for AREA (geographic area within the project limits), STAGE, or for a bridge project SUBSTRUCTURE, SUPERSTRUCTURE, and DECK .

Generally Level 4 would be by geographic area within the project limits, Level 5 would be by highway feature (bridge, highway segment, intersection), Level 6 the highway features should be broken into their components (a bridge into components such as Piles, Substructure, Superstructure), and a highway segment into components such as pavement, drainage, earthwork, lighting, traffic signals, etc.

An example Work Breakdown Structure is shown below in Figure 1

FIGURE 1



e) **Activity ID** - Include a unique identification number for each activity. Activity ID numbers shall not be changed, or reassigned for the duration of the contract. Task type Activity IDs shall be prefixed by a "C". Milestone type activities shall be prefixed by an "M". .

f) **Activity Name** - Clearly and uniquely define each activity name with a description of the work that is readily identifiable to inspection staff and the progress of each activity can be measured. Each Activity shall have a narrative description consisting at a minimum of a verb or work function (i.e. form, pour, excavate, etc.), an object (i.e. slab, footing, wall, etc.), and a location (i.e. STA, bridge or retaining wall number, street, etc.). The work related to each Activity shall be limited to one Area of the contract, one Stage of the contract, one WZTC Phase of the contract, and one Responsible Party of the contract. The Activity Name shall not be changed for the duration of the contract without approval of the Engineer.

g) **Milestone Activities** - Include activities for all contract milestones that define significant contractual events such as Contract Award, Notice to Proceed, Contractor Start Work, Substantial Completion, Physical Completion, Contract Completion, and coordination points with outside entities such as utilities, State agencies, Authorities, municipalities, Time-Related Contract Provisions, etc.

- The Contract Completion milestone shall have a primary constraint of "Finish on or before" and the contract Completion Date.
- The Contractor Start Work" Start milestone activity, that will eventually reflect the actual date the Contractor started work authorized under the contract.

h) **Activity Durations** – Define the Original Duration of each activity in units of whole work days, except for activities of less than one day duration which should be shown in units of tenths of a day. Except submittal/procurement activities, durations shall not exceed 15 work days unless approved by the Engineer. Durations for Department submittal reviews shall meet the requirements set forth in the contract documents. If requested by the Engineer, the Contractor shall justify the reasonableness of planned activity time durations. Task Dependent activities shall not have a zero duration.

i) **Activity Relationships** - Clearly assign predecessors and successors relationships to each activity, and assign appropriate logic ties between activities (Finish to Start, Start to Start, Finish to Finish, etc.). Do not have any open ended activities, with the exception of the first activity and last activity in the schedule. An activity may only appear once as a predecessor or successor to another specific activity, but may be assigned as a predecessor or successor to many different activities. Do not include inappropriate logic ties with Milestone activities (For a finish milestone activity: a predecessor shall only be assigned a Finish to Finish logic tie, a successor shall only be assigned a Finish to Start or Finish to Finish logic tie. For a start milestone: a predecessor shall only be assigned a Finish to Start or Start to Start logic tie, a successor shall only be assigned with a Start to Start logic tie). Lag time may not exceed 10 days. The Contractor shall not use negative Lag times.

j) The Contractor shall assign the 'Submittal' activity as a predecessor to all Review and Approval type activities to be performed by Department staff.

k) **Activity Constraint Dates** – The Contractor shall not have any constrained activities, with the exception of contractual dates, unless the Engineer accepts such constraints in writing. Milestone activities shall be included for the Contract Award which shall have a primary constraint of "Finish On" and the date of contract signature by the State Comptroller, and for the Anticipated Contract Completion which shall have a primary constraint of "Finish on or before" and the contract completion date indicated in the contract documents. Only contractual/owner-designated constraints are allowed unless specifically authorized by this specification or the Engineer. . If used, only Constraints of type, "Finish on or Before", 'Start on or After", or when deemed appropriate by the Engineer "As-Late-As-Possible" are acceptable

l) **Activity Dates** – With the exception of contract Milestone dates, "Actual Start" and "Actual Finish" dates and "Planned Start" and "Planned Finish" dates, activity dates shall be calculated by the project scheduler tool within the Oracle-Primavera software. No Actual Start or Actual Finish dates shall be entered in the Baseline Progress Schedule, with the exception of activities that were completed prior to the Contract Award.

m) **Calendars** - Use clearly defined calendars that account for expected seasonal weather conditions (including winter shutdown periods) and environmental permit requirements, for the planning and scheduling of activities. Do not incorporate an activity with a description of "Winter Shutdown" that requires constraints. Provide the working days per week, non-working holidays. Also provide the number of shifts per day, and the number of hours per shift by using the Calendar feature, called "Time Periods" in the P6 software. Incorporate any seasonal restrictions to the work within calendars assigned to activities.

- Global calendars used in the progress schedule shall be those established by the Department. There are only two Global Calendars developed and maintained by the Department for use by Contractor's, they are the following:
    - NYSDOT/NC Milestone/Curing 365 Day / 8 hour
    - NC Work Days, 5 Day Work Week w/ Holidays (see table on page 5)

  All milestone activities in the schedule shall be assigned the standard Global calendar named 'NYSDOT/NC Milestone/Curing 365 Day / 8 hour", this calendar should also be assigned to any activities for concrete curing. Activities for shop drawing reviews and other approvals by

Department personnel shall be assigned the Department's standard Global – "NC Work Day, 5 Day Work Week w/Holidays, Field" Calendar that reflects all holidays as listed above.

- Changes desired for these calendars shall require prior approval of the Engineer. Calendars related to specific resources (i.e., Crane, Bidwell, Asphalt Paver) shall be established as Project level Calendars (not Resource calendars), with the Calendar name clearly identifying the resource.
- All other calendars developed by a Contractor shall be established as Project Calendars, with the calendar name including the contract ~~D~~# and describing the function All work activities of the Contractor shall be assigned to Project Calendars.
- **The Baseline Progress Schedule cannot include a calendar that reflects any workers working more than 8 hours in any one calendar day or more than 5 days in any one week**. (§102-10 LABOR AND EMPLOYMENT) Following the contract award the Contractor can add additional calendars in their next Monthly Progress Schedule submission based on an approved overtime dispensation.

n) Clearly define significant interaction points between the Contractor, the Department, and other entities including but not limited to: Federal, State and local agencies/authorities; and utilities. All activities of the Department, utility companies, adjacent contracts, and other entities that affect progress and influence any contract required dates including durations shall be shown in the schedule. This includes dates related to all Permits or Agreements. The schedule shall give special consideration to sensitive areas such as road closures and parklands and shall indicate any time frames when work is restricted in these sensitive areas as outlined in the permits issued by the regulatory agencies, and provided in the contract documents.

o) **Activity Resources** – It shall be the Contractor's responsibility to assure the activity logic in the schedule properly reflects their resource limitations. An activity shall not involve multiple crews comprised of the Contractor and a subcontractor, or multiple subcontractors. The level of resource loading of the schedule shall be dependent on the schedule.

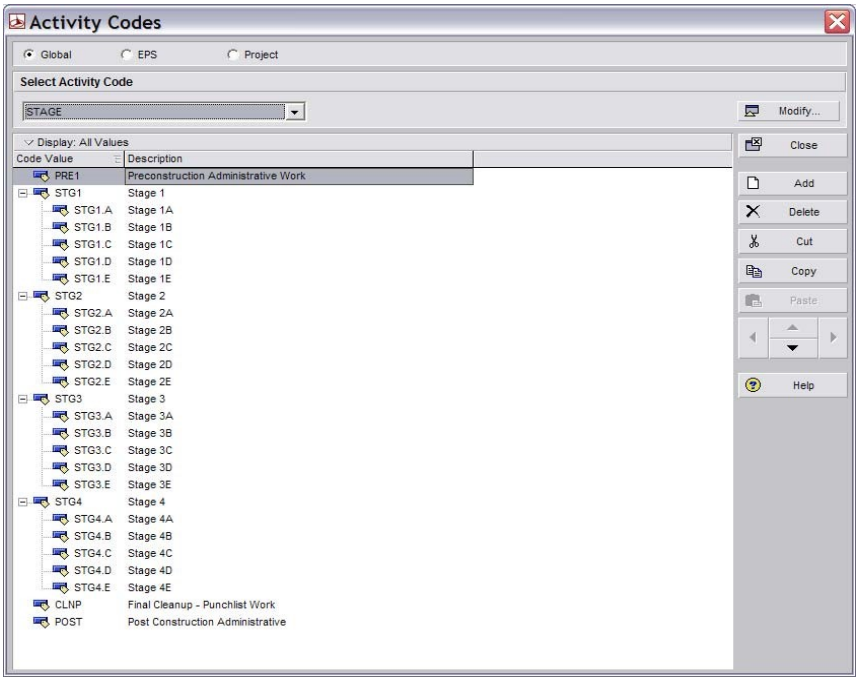
p) **Production Rates** – The Contractor shall enter the quantity of the major item of work for each non administrative activity in the schedule into the field labeled "PR Quantity", the Unit of Measure for that major item in the field labeled "PR Unit", the anticipated production rate of the equipment and labor resources for that activity of work in the field labeled "Production Rate / Day", and the associated duration for that work in the field labeled "PR Duration". These are all Activity level UDF fields, and can be found in the activity Layout named Contractor Production Rates.

q) **Activity Codes** – The Contractor shall include a well-defined activity coding structure that allows project activities to be sorted and filtered. Activity Codes shall include, but not be limited to: Responsible Party; Stage; Area of Work; Type of Work; Subcontractor; and additionally as required by the Engineer to meet the needs of the specific contract work to facilitate the use and analysis of the schedule.

    1) Additional Activity Codes developed for specific projects shall be established as Project Activity Codes. As a minimum this shall include the SUBCONTRACTORS.

r) **Activity Code Values** – Each Activity Code shall be broken down into various Activity Code Values that are then assigned to activities, as shown below in the example of Figure 2

FIGURE 2



s) Activity Code Assignments - For each activity, within the activity details the Contractor shall assign Activity Code values to identify the "Responsible Party" (i.e. – Contractor, NYSDOT, Utility Co, Municipality) for the work to be performed (one and only one responsible party shall be assigned to each activity), the "Stage" of the contract for the work that will be performed, the "Area" where the work is to be performed, the "WZTC Phase", and the Type of Work (i.e. - Procurement, Paving, Embankment, Excavation, Electrical, Signing, etc.). For activities included in work governed by time related contract provisions, the appropriate "Time Related" activity code shall be utilized. For activities included in work added and/or changed within an Order-On-Contract, the appropriate "Added/Changed Work" code shall be utilized. For all work activities performed by the Contractor or subcontractors/fabricators/suppliers, "Contactor" shall be designated as the Responsible Party

t) Interim Milestone Dates with Liquidated Damages and Special Time-Related Contract Provisions (i.e. – A+B Bidding, Incentive/Disincentive provisions, Lane Rental) – Each time-related contract provision in the contract shall be represented in the progress schedule by having a start and finish milestone, with appropriate predecessors and successors assigned to all schedule activities considered part of that time-related contract provision work including the start and finish milestone activities. In addition, the Start milestone for the time-related contract work shall have predecessors and/or date constraints assigned that include those defined in the contract documents, and the Finish milestone for the time-related contract work shall have successors and/or date constraints assigned that include those defined in the contract documents. All schedule activities associated with each specific time-related contract provision shall be assigned to a separate node within the project WBS and the WBS node description shall be labeled accordingly, in addition these activities shall be assigned the appropriate Time-Related Clauses activity code value. A Level Of Effort activity shall be used for each time related contract provision (i.e. - "Incentive 1 Duration" or "B Clock 1 Duration"), this activity shall have the Start Milestone as a predecessor with a SS relationship and the Finish Milestone as a successor with a FF relationship and the duration of this activity shall be calculated when the project is scheduled.

u) List of Submittals – The Contractor shall submit with the Progress Schedule a list of all Submittals (i.e. - Shop Drawings, required permits, Erection/Demolition plans, Health and Safety Plan, etc.) generated from the Baseline Progress Schedule for review and approval by the Engineer. The Contractor shall use a Filter to limit the schedule activities shown in the report to only the prepare/submit, and review/approve activities related to submittals. The report shall be in Adobe PDF format and transmitted to the Engineer by email.

F.2. Monthly Progress Schedules. In addition to the detailed schedule requirements for the submission of the Baseline Progress Schedule, the Contractor shall complete the following additional requirements for these regular Progress Schedule submissions: a) Activity Status -

i) Durations – the Original Duration shall not be changed without prior written justification by the Contractor, and written approval by the EIC. The Contractor shall edit the Remaining Duration to reflect progress made on work activities and shall not use Duration percentage. If a proposed change to Original Duration is due to additional or changed work to the contract the Contractor shall instead add an activity to reflect this additional work and assign the appropriate Activity Code. The Contractor shall not use zero durations for Task Dependent activities.

ii) Started and Finished dates – for each activity where work was begun during the Weekly/Biweekly or Monthly reporting period, the Contractor shall check the box adjacent to Started and enter the date the work began. For each activity where work was completed during the Weekly/Bi-weekly or Monthly reporting period, the Contractor shall check the box adjacent to Finished and enter the date the work was completed.

iii) Suspended work – The first time that work has been suspended on a schedule activity, the Contractor shall enter the Suspend and Resume fields within the Project Details under the Status tab. For any subsequent suspensions of work to that activity the Contractor shall break that activity into two or more activities to accurately reflect the suspension and resumption of work dates in the field, and to more accurately reflect the relationship to other work activities.

b) Calendars – To change a project calendar for activities scheduled in the future, the Contractor shall copy the calendar and use a revised name that includes a reference to which Update the change was incorporated (i.e. - D260000 - Concrete Calendar should be revised to D260000 – 2 - Concrete Calendar to reflect the 2nd Monthly Update when the change was made to the calendar). The reason for the change in the calendar shall be documented in the Narrative.

c) Resources –

For each month of the contract the Contractor's Progress Schedule submission shall include labor, equipment and pay item resources for an additional year of anticipated contract work until all activities in the schedule have resources defined. Until such time that all activities are resource loaded, for any activity that resource limitations are affecting the prosecution of work, as determined by the Engineer, labor and equipment resources shall be entered in the schedule by the Contractor. When the resource assignments are complete for all schedule activities, the Engineer will compare pay item quantities in the schedule with pay item quantities in the Engineer's estimate to determine if all contract work is represented in the Contractor's schedule.

d) Notebook Tab –

i) Delays - For any activities on the critical path that are delayed during this monthly reporting period, the Contractor in agreement with the Engineer shall enter the dates the activity was delayed and the reason for such delay in the Notebook tab of that activity. The reviewing scheduler will perform the delay analysis and will inform the Contractor accordingly.

ii) Activity Changes – For any changes to activity logic, calendar assignments, suspended work, added or revised lag periods or constraints the Contractor shall document the change and reason in a

Notebook Topic for that activity by assigning the appropriate "Progress Submission # Revision" and describing the changes.

e) Production Rates – For all non-administrative that have shifted onto the critical path, or now have less than 20 days of Total Float, the Contractor shall enter the Production Rate information required in paragraph F.1.p. For any activities where the work to be performed is similar in nature to work already performed on the same project and that the Production Rate for the work to be performed is different than the actual Production Rate for work already performed the Engineer may require the Contractor to adjust the Duration for the work to be performed to reflect the more appropriate Production Rate.

f) Deleted work – If work has been deleted the corresponding work activities in the schedule shall be deleted. The Contractor shall not just zero the activity duration since the calendar assigned to the zero duration activity shall still affect the logic of future work activities.

g) The Project Scheduler can modify the project's Data Date through the Schedule tool.

h) The Contractor shall complete the following additional requirements:

i) Data Date - the "Data Date" shall be the date the Project Scheduler last edits the schedule prior to submission to the Engineer (generally the last working day of the month).

ii) Submission frequency. The Contractor shall submit the schedule file and Narrative Report to the Engineer **monthly**. The schedule submission to the Engineer shall be made within three (3) Work Days of the last day of the month, whether or not the Engineer has accepted the previous Progress Schedule submission.

G. Detailed Narrative Requirements:

G.1. For the Baseline Progress Schedule. The Contractor shall include a narrative in Microsoft Word and/or Adobe Acrobat format that includes the following topics and attachments:

a) **Contract Identification.** Include the contract D number, project name, project location, and name of Prime Contractor.

b) **Key milestone dates.** Include the actual contract Award Date, original and adjusted contract Completion Date, Substantial Completion Date, and anticipated completion of all project work. Also include any contract Interim Milestone dates (I/D, B-Clock, LD, etc.), and scheduled Start and Finish dates for those Milestone activities.

c) **General approach.** Describe the Contractor's general approach to construct the Work outlined in the baseline schedule. Address the reasons for the sequencing of work and describe any resource limitations, potential conflicts, and other salient items that may affect the schedule and how they may be resolved.

d) **Key Plan**s. If not provided in the contract plans, or if modified by the Contractor, provide copies of the appropriate contract plan sheets marked up to correlate values on the contract plans (for Area of Work, Stage of Work, and WZTC Phase) to the Contractor's planned breakdown of the project (i.e.- Activity Codes, Activity Descriptions) for scheduling purposes.

e) **Logic Justifications.** The justification(s) for each activity with a duration exceeding 15 working days. The justification(s) for Contractor imposed activity constraints proposed in the schedule. The reason for any lags assigned to any activities.

f) **Calendars.** Include a list of calendars which have been incorporated in the schedule, and for each calendar the general reason for it's use in the schedule.

g) **Critical Path issues.** A brief discussion of the critical path shown in Appendix 2, highlighting any potential challenges that are foreseen associated with the critical path work.

h) **Coordination issues.** Outline any anticipated coordination issues related to work activities by other entities that require additional information from, or action by, the Engineer.

i) **APPENDIX 1 – Scheduling/Leveling Report.** This appendix in Adobe Acrobat PDF file format, formatted to fit standard ANSI Size A (Letter) size paper (8.5 inch x 12 inch) (215 mm x 279 mm) paper, printed with portrait orientation, shall be included with the narrative as a separate file.

A complete Scheduling/Leveling Report file generated by Contractor's Oracle-Primavera scheduling software application) which includes the Schedule Settings, Statistics, Errors, Warnings, Scheduling/Leveling Results, Exceptions, Activities with unsatisfied constraints, Activities with unsatisfied relationships, and Activities with external dates. The statistics shall include, # of Activities, # of Activities Not Started, # of Activities In Progress, # of Activities Completed, # of Activity Relationships, and # of Activities with Constraints. Total number of activities on the critical path, percent complete, activities without predecessors, activities without successors, and activities out of sequence.

j) **APPENDIX 2 – Progress Schedule plot.** This appendix in Adobe Acrobat PDF file format, formatted to fit ANSI Size B (Ledger) paper (11 inch x 17 inch) (279 mm x 431 mm) paper, printed with Landscape orientation, shall be included with the narrative as a separate file.

Appendix 2 to the narrative shall be an electronic schedule plot (Adobe Acrobat format), with activities sorted by Start Date in ascending order, Grouping of activities by WBS, and only the "Longest Path" filter applied. This plot shall provide a clear critical path from the Data Date to the last activity in the schedule.

Graphical representations shall be shown at a suitable scale to be legible and readable.

G.2. Monthly Update Progress Schedule. For each Progress Schedule submission, the Contractor shall submit a revised narrative in Microsoft Word or Adobe Acrobat format that includes (but is not limited to) the information from paragraph G.1, and the following **additional** topics:

k) **Project Progress.** Discuss the progress that was made during the current reporting period, and document any Total Float gained or recovered during the period. For major work items describe the differences between the actual work performed and the work planned for the period as represented in the preceding Progress Schedule submission, including explanations for the deviations.

l) **Suspended Work.** For all suspended work activities that could otherwise logically be progressed, identify the responsible party prohibiting the progression of the work, as well as the detailed reasons why.

m) **Project Delays.** Discuss any delays experienced during the current reporting period. Quantify any relative change in Total Float for the project since the last Progress Schedule submission. For each activity on the critical path (include Activity ID's and Activity Descriptions) where work was delayed during the reporting period, provide the following detailed information including:

- the extent in days (negative float) of the delay, and events that caused the delay.
- the party(s) responsible for the delay event(s).
- the other activities in the construction schedule affected by the events.

- the reasonable steps needed to minimize the impact of the delay, and which party needs to take the action(s).

The Contractor is reminded of the requirements of Notice & Recordkeeping as found in NYSDOT §104-06 of the contract specifications and as they relate to Disputed Work. The Contractor shall include a copy of any notice provided to the Engineer for any time-related delay dispute as part of their narrative.

n) **Project Issues**. List any other problems experienced during this Progress Schedule submission period, the party responsible for the problems, and the Contractor's intentions to resolve the issue(s).

o) **Schedule changes.**

i) List of all added or deleted activities included in this Progress Schedule submission, and the reason(s) for and the impact(s) of such changes.

ii) List all changes in activity Original Durations, the justification for such change(s), and the impact(s) of such changes.

iii) List all changes in relationships between activities included in this Progress Schedule submission, and the reason(s) for and the impact(s) of such changes.

iv) List any addition or deletion of activity or project constraints, and the reason(s) for and the impact(s) of such changes.

v) List all changes to the project calendars, and the reason(s) for and the impact(s) of such changes.

p) List all activities for procurement of long lead time materials that are behind schedule and the reason(s) why.

q) Description of any changes to the critical path since the last Progress Schedule submission and the impacts of such changes.

r) The major work elements, as defined in the WBS, to be accomplished during the next monthly work period.

s) Any potential problems that are anticipated for the next monthly work period and the proposed solutions to such problems. Identify potential problems or risks that either the Department or Contractor may be potentially responsible for. Explain what action the responsible party (i.e. - Department or Contractor) needs to take and the date by which time the action needs to taken to avoid the problem.

t) Any planned acceleration of activities that the Contractor anticipates to undertake within the next monthly work period that either the Department directed, or that the Contractor believes is necessary.

u) The following appendix in Adobe Acrobat PDF file format, formatted to fit ANSI Size E paper (34 inch x 44 inch) (863 mm x 1117 mm) paper, printed with Landscape orientation, shall be included with the narrative as a separate file.

- APPENDIX 3 – A listing of all work activities as of the data date, using the Appendix 1 activity layout, sorted by Finish date, Total Float in increasing order, showing the Activity ID, Activity Name, Original Duration, Remaining Duration, Actual Duration, Total Float, Early Start date, Start date, Finish date, Late Finish date, and Calendar ID. The grouping of activities shall be by WBS. The Gantt Chart shall clearly indicate all activities in the schedule. Graphical representations shall be shown at a suitable scale to be legible and readable.
- APPENDIX 4 – A listing of work activities filtered by Notebook Topics assigned as of the data date, sorted by Finish date and Total Float in increasing order, showing the Activity ID, Activity Name, and Notebook Topic. The grouping of activities shall be by WBS.

H. Schedule Submission Methodology. Progress Schedule submissions will only be considered complete when all documents and data have been provided to the Engineer.

H.1. File Naming Convention. The schedule filename shall conform to the requirements of the Department and as defined by the Engineer.

I. Progress Schedule Review and Analysis:

I.1. Immediate Rejection of Progress Schedule Submissions. The following deficiencies in a

Contractor's progress schedule submission shall be grounds for the immediate rejection by the EIC, without further review, analysis and/or comments.

a) Failure of the Project Scheduler to submit "schedule" of the project, as of the data date.
b) Failure to attach a copy of the complete Scheduling/Leveling Report
c) Any activities without predecessors, or activities without successors, appearing in the Scheduling/Leveling Report with the exception of the first and last activity in the schedule.
d) Any activity constraints appearing in the Scheduling/Leveling Report that have not been approved in writing by the EIC, or that are not specifically allowed by this specification.
e) Any Activities with Actual Dates > Data Date appearing in the Scheduling/Leveling Report.
f) Any Milestone Activities with invalid relationships appearing in the Scheduling/Leveling Report.
g) Failure to have a clearly defined Critical Path from the Data Date to the last activity in the schedule, using the Longest Path method. This would reflect logic errors in the project schedule.
h) Failure to attach the schedule Narrative and required appendices.
i) Repeated failure to correct "Out-Of-Sequence" activities.

If any of these deficiencies are found, the Contractor's submission shall be considered deficient, and Engineer will notify the Contractor immediately by return E-mail of the rejection of the schedule submittal.

I.2. Schedule Analysis Method.

Events, actions, and progress that cause delays or gains to the Progress Schedule will be analyzed solely by the "Contemporaneous Period Analysis" method.

I.3. Department Review and Acceptance of Progress Schedules.

The Engineer will review the Monthly Progress Schedule submissions and will prepare a written response (Progress Schedule Review Report) to the Contractor's submission within five (5) Work Days following receipt of the Contractor's complete schedule submission. The Engineer will either "accept" the schedule, "accept as noted", or "reject" the schedule for re-submittal by the Contractor.

If the Progress Schedule submission is not in compliance with contract requirements, the Engineer may reject the submittal and shall forward any comments and requests for schedule revisions to the Project Scheduler by email, with a copy to the Contractor The Project Scheduler shall address all comments in writing and/or make the requested revisions, and resubmit the revised schedule within three (3) State Business days of the Engineer's reply. If the Engineer determines the revised submission still does not meet the contract requirements, any further revisions required thereafter shall also be submitted for acceptance within (3) Work Days of the request for revisions by the Engineer.

For schedules that are "accepted as noted" the Engineer shall forward any comments, or requests for revisions, to the Contractor by email,. The Project Scheduler shall address all comments in writing and/or make the requested revisions as part of the next scheduled Progress Schedule submission.

The Project Scheduler shall make adjustments to the Progress Schedule in accordance with the Engineer's comments and resubmit copies for review consistent with the requirements of this section.

The Engineer, by accepting the progress Schedule, does not agree that the Progress Schedule is reasonable or that by following the Progress Schedule the Contractor can complete the work in a timely manner. If, after a Progress Schedule has been accepted by the Engineer, either the Contractor or the

Engineer discover that any aspect of the Schedule is on error, or something significant has been omitted, the Contractor shall correct the Progress Schedule in the next Progress Schedule submission and describe this revision in the Narrative report.

Acceptance of progress schedules by the Engineer shall not be construed to imply approval of any particular construction methods or sequence of construction or to relieve the Contractor from its responsibility to provide sufficient materials, equipment and labor to guarantee the completion of the contract in accordance with the contract documents.

Acceptance of the progress schedule by the Engineer does not attest to the validity of assumptions, activities, relationships, sequences, resource allocations, or any other aspect of the progress schedule. Within the contractual constraints, the Contractor is solely responsible for the planning and execution of the work.

Acceptance of the progress schedule by the Engineer shall not be construed to modify or amend the contract agreement or the date of completion therein. Completion dates can only be modified or amended by standard contractual means, Request For Extension of Completion Date.

If any resources are included in the Progress Schedule, it is not intended that the Engineer, by accepting the schedule should use the Contractor's resource data for anything other than determining the reasonableness of achieving the Contractor's production rates. Resources included with the accepted CPM schedule shall not be misconstrued as a cost benchmark for the performance of planned or actual work.

Once the progress schedule has been accepted, the Contractor shall not deviate from it without first notifying the Engineer in writing.

Upon receipt from the Contractor of the corrected schedule, a new review period by the Engineer of five (5) Work Days will begin.

J. Changes to Progress Schedule due to Added/Deleted/Changed Work:

J.1. Changes to the contract. In the event a notice of a change to the contract is received, the appropriate changes to the progress schedule shall be made, as necessary, to incorporate the anticipated added/deleted/changed work and the Contractor shall notify the Engineer in writing within 10 (ten) calendar days if there is any effect of such change to the schedule. Change to the contract includes, but is not limited to, Extra Work, Change Orders, Suspensions of Work Directed by the Engineer, Changed Condition, and Value Engineering Change Proposals. Added, deleted and/or extra work associated with Change Orders shall be reflected in the next Monthly Progress Schedule Submission in anticipation of and prior to the date in which the work physically takes place without regard to the dates when the actual Change Order was approved. The effect of the change to the contract on the projects Critical Path shall be stated. Extra work or additional work that does not affect the controlling operation on the critical path will not be considered as the basis for a time extension. All schedule activities effected by added, deleted or changed work that is included in a signed Order-On-Contract, Field Change Order, or Authorization of Extra Work (with the exception of minor quantity changes that do not impact contract milestones), or work activities performed by the Contractor at risk in anticipation of such Department approval, shall be assigned the appropriate Activity Code (Added/Changed Work) and Code Value (sequentially numbered) to denote which "Changed Contract Work" order number correlates to those activities of work.

J.2. Time Impact Analysis.

For each request of an adjustment of contract time due to an anticipated change to future work in the Progress Schedule, when the Contractor or Engineer consider that an anticipated or approved change to the contract may impact the critical path and contract progress by more than a calendar month, the Contractor shall submit a Time Impact Analysis (TIA). The TIA shall be submitted as part of any Order on Contract (Change Order) and/or VECP if the critical path changes by more than a calendar month. The TIA shall be based on a revised Progress Schedule and shall be submitted as an electronic file (using Microsoft Word for the narrative) containing:

a) The TIA shall illustrate the impacts of each change or delay on the current scheduled completion date or internal milestone, as appropriate.
b) The analysis shall use the accepted Monthly Progress Schedule that has a data date closest to and prior to the event as the "Current Baseline", this shall then be compared against the "What-if Project Plan Baseline" for the purpose of the TIA.
c) If the Engineer determines that the accepted schedule used does not appropriately represent the conditions prior to the event, the accepted schedule shall be updated to the day before the event being analyzed.
d) The TIA shall include an impacted schedule ("What-if Project Plan Baseline") developed from incorporating the actual or anticipated event into the accepted schedule by adding or deleting activities, or by changing durations or logic of existing activities.
e) If the impact schedule shows that incorporating the event negatively modifies the critical path and scheduled completion date of the accepted schedule, and the Engineer accepts the impacted schedule, the difference between scheduled completion dates of the two schedules shall be equal to the proposed adjustment of contract time.
f) The Engineer may construct and utilize an appropriate project schedule or use another recognized method to determine adjustments in contract time until the Contractor provides the TIA.
g) The Contractor shall submit a TIA within fifteen (15) ~~State~~ Business Days of receiving a written request for a TIA from the Engineer.
h) The Contractor shall allow the Engineer ten (10) Work Days after receipt to accept or reject the submitted TIA. All accepted TIA schedule changes shall be included in the next Monthly Progress Schedule submission.
i) If a TIA submitted by the Contractor is rejected by the Engineer, the Contractor shall meet with the Engineer to discuss and resolve issues related to the TIA. If agreement is not reached, the Contractor will give notice in conformance with §104-06 Notice & Recordkeeping, and submit in accordance within the provisions in §105-14.E "Required Content of *Dispute Submissions*".
j) The Contractor shall only show actual as-built work, not unapproved changes related to the TIA, in subsequent Monthly Progress Schedules submissions. If agreement is reached at a later date, approved TIA schedule changes shall be included in the next Monthly Progress Schedule submission.
k) Request for a contract time extension will not be processed until the receipt and approval of a Time Impact Analysis. **However, all extension of time will only be considered at the end of the project completion date.**

K. Failure to Submit Progress Schedules and/or Recovery Schedules:

K.1. No progress payment for this item of work shall be made until the progress schedule is "accepted" or "accepted as noted" by the Engineer.

K.2. If the Contractor's Progress Schedule submission is rejected due to any deficiency noted in paragraph I.1(a) through (i), it shall be considered an incomplete submission and therefore substantially deficient.

K.3. If the Contractor's revised Progress Schedule submission does not address the written comments provided by the Engineer and does not include a written explanation with a reasonable rational for not addressing those comments, the submission shall be considered deficient.

K.4. If the Contractor fails to submit a CPM Progress Schedule conforming to the provisions required under this specification, to the degree that such failure is deemed by the Construction Supervisor to adversely affect the management of the project and/or the administration of the construction contract, liquidated damages will be assessed as determined under Basis of Payment.

L. Recovery Schedule

L.1 If the latest completion time for any work on the current Progress Schedule results in an activity being delayed ten percent or more of the time beyond the required Contract duration or any specified Milestone duration, as adjusted if appropriate, the Engineer may require the Contractor to submit a Recovery

Schedule and written description of the plan to recover all lost time and maintain the required Completion Date or specified Interim Milestone Date(s).

L.2. With the Recovery Schedule the Contractor shall submit a narrative that identifies where additional labor and/or equipment resources will be allocated. Alternately, the Contractor may elect to provide the makeup of their Crew resources in the narrative and assign those Crew resources to the appropriate activities in the Progress Schedule. The makeup of the Crew shall include the various Labor classes and equipment that comprise the Crew along with the quantity of each labor class and type of equipment. Equipment resources shall be shown for major or specialty equipment such as tower cranes, piledrivers, barges, asphalt pavers, concrete pavers, dozers, front end loaders, backhoes, rollers, excavators, graders, long line striping truck or other equipment that cannot be rented easily.

The Contractor shall provide a reasonable plan for accomplishing the work of the contract within the current completion date, or to the requested contract extension date. The Engineer will use the Recovery Schedule to evaluate time extensions, with or without charges.

M. Submission of progress schedules with projected Early Completion date(s):

The Contractor may indicate a projected early completion date on any progress schedule submission without compensation

N. Float

During the course of contract execution, Total Float generated due to the efficiencies of either party (Owner or Contractor) will be considered project Float that is not for the sole use of the party generating the float; rather it is a shared commodity to be reasonably used by either party. Any party assigned activity responsibility within the schedule has the full use of the project Float until it is depleted.

METHOD OF MEASUREMENT:

The quantity shall be measured for payment on a Lump Sum basis.

The minimum lump sum bid for this item shall be the unit price shown in the itemized proposal.

Failure of the Contractor to bid at least the minimum amount will result in the Department adjusting the Contractor's bid to include the minimum bid amount for this item.

BASIS OF PAYMENT:

The lump sum price bid for CPM Progress Schedules shall include all labor, material, and equipment necessary to satisfactorily complete the work.

Progress payments will be made at 25 percent of the lump sum price bid upon acceptance of the Final Baseline Progress Schedule and the List of Submittals. 70 percent will be paid in subsequent contract payments, in proportion to the number of months remaining in the original contract duration, less any non-payment for substantial deficiencies. The remaining 5 percent will be paid upon acceptance of the As-built Progress Schedule.

A. Non-Payment. No payment will be made for any Progress Schedule submitted more than twenty-one calendar days late. For each calendar day during which there are substantial deficiencies with the Progress Schedule no payment will be made. The amount of such non-payment will be 1/30th of the Monthly Payment Amount multiplied by the number of days there are substantial deficiencies.

B. Liquidated Damages. Liquidated damages will be assessed for each subsequent calendar day or part thereof that a cited deficiency resulting in non-payment is not corrected or is permitted to recur. **Liquidated damages will be assessed at the rate equal to 1/10th of the Monthly Payment Amount.**

If an extension of time with the assessment of engineering charges and/or liquidated damages is approved, no additional payment **will** be made for CPM Progress Schedules.

C. Payment will be made under

Item No.	Item	Pay Unit
639.210053	Critical Path Method (CPM) Progress Schedule with Monthly Update	LS

To make the item compatible with the existing Computerized Engineers Estimate System the letters will be replaced as per below.

X=1 (monthly)

N=5 (Nassau) C=3 (County)

Disclaimer: Adopted from NYSDOT Specification 639.21010011

ITEM 633.05050208 - REMOVE TRANSVERSE AND LONGITUDINAL JOINT SEALERS, CLEAN AND FILL JOINTS AND CRACKS IN PORTLAND CEMENT CONCRETE PAVEMENT

DESCRIPTION

This work shall consist of removing existing transverse and longitudinal joint sealers, cleaning and filling joints and cracks and spalls in the existing PCC pavement prior to the application of a new course.

MATERIALS

Materials will conform to the following subsections of the Standard Specifications:

Plant Production	401
Bituminous Materials	702
Fine Aggregate	703-01
Mineral Filler	703-08

CONSTRUCTION DETAILS

Remove all transverse and longitudinal joint sealers; clean all packed dirt, vegetation and extraneous materials from all joints and cracks greater than ¼-inch in width to a depth equal to a minimum of twice the width of the joint or crack. This shall include any loose concrete or asphalt material at the joints and cracks.

Keep joints and cracks clean until the filling and paving operations are completed.

Complete all stress relieving pavement repairs prior to beginning this work.

Fill all cleaned joints and cracks with asphalt concrete meeting the requirements of Shim Course F9, Warm Mix Asphalt.

METHOD OF MEASUREMENT

This work will be measured on a lump sum basis for work satisfactorily completed in a manner approved by the Engineer.

BASIS OF PAYMENT

Payment includes the cost of all labor, materials, and equipment necessary to complete the work

ITEM 655.05020010 – FRAMES AND COVERS FOR SANITARY SEWER MANHOLES

DESCRIPTION:
This work shall consist of furnishing and installing frames, covers and appurtenances for sanitary sewer manholes in accordance with these specifications and details shown on the contract plans.

MATERIALS:
Materials shall conform to the following:

Cast iron for manhole frames and covers, and all special cast iron fixture entering into the construction of the work shall be made of tough, close-grained, gray iron without the admixture of any cinder iron or metal of inferior quality. Iron shall conform to ASTM Designation A48, Class 30B.

Manhole frames and covers shall be coated with coal tar epoxy of approved quality applied by the hot-dip process.

The acceptance of the frames and covers for sanitary sewer manholes will be based on the manufacturer's certification of compliance.

All manhole frames, covers and appurtenances shall be similar in detail to those existing in the adjacent area, and all elements shall be interchangeable.

The Contractor shall submit to the Engineer, with such promptness as to cause no delay in the work, or in the work of any other contractor, seven (7) copies of all shop drawings and no work shall be fabricated until the Engineer's approval has been given. All shop drawings, cuts, catalogs or other data requiring approval must be submitted to the Engineer by the Contractor and must bear his stamp of approval evidencing that the data have been checked. Drawings, cuts, catalogs or other data submitted without this stamp of approval will not be considered by the Engineer and will be returned to the Contractor. Likewise, all questions concerning the plans and specifications which require clarification or interpretation shall be submitted in writing to the Engineer through the Contractors.

The Contractor shall make any corrections in the drawings required by the Engineer and shall file with the Engineer (7) corrected copies. Approval by the Engineer of such drawings shall not relieve the Contractor from responsibility for errors of any sort in shop drawings or deviations from plans and specifications unless the Contractor, at the time of submission of said drawings, has given notice to the Engineer of any such deviations.

CONSTRUCTION DETAILS:
Construction details shall conform with the details shown on the plan and shall conform to the requirements of Subsection 655-3 in addition to the following:

3/10/09ER 12/22/08E 5/28/99 M

ITEM 655.05020010 – FRAMES AND COVERS FOR SANITARY SEWER MANHOLES

All manholes will be provided with a Type "F" Manhole Frame and Cover (Adjustable Frame). The frame cover, without the use of any filler rings, shall be set to a top frame elevation 1-9/16 inch below finished grade. At the time of final paving, the frame and cover shall be raised to the correct grade by insertion of one 1 inch and one 19/32 inch filler rings. In the event the Engineer, at any time during the Contract Period, directs the removal of either or both filler rings, the Contractor shall remove them and deliver the same to the Engineer.

METHOD OF MEASUREMENT:

The quantity to be measured under this work will be the number of frames, covers and appurtenance materials furnished and placed in accordance with the plans and specifications. The measurement shall be made for the frame containing the cover and appurtenance.

BASIS OF PAYMENT:

The unit prices bid per frame and cover shall include the cost of furnishing all labor, materials an equipment necessary to satisfactorily complete the work, including the cost of any field repair work to render the frame and cover non-rocking.

ITEM 655.07010010 - CAST FRAME F1, WITHOUT CURB BOX AND WITH RETICULINE GRATE G1
ITEM 655.07020010 - CAST FRAME F2, WITHOUT CURB BOX AND WITH RETICULINE GRATE G2
ITEM 655.07030010 - CAST FRAME F3, WITHOUT CURB BOX AND WITH RETICULINE GRATE G3

All conditions and requirements of Items 655.0701, 655.0702, and 655.0703 of the Standard Specifications shall apply except for the following modifications:

These shall be cast frame without curb box and with reticuline grate as detailed on the plans.

ITEM 655.15100010 - FURNISH AND REPLACE CAST IRON CURB BOXES

DESCRIPTION

This work shall consist of furnishing and replacing cast iron curb boxes for drainage structures at the locations shown in the plans in accordance with the specifications and where directed by the Engineer.

MATERIALS

All cast iron curb boxes shall conform to the requirements of Subsection 655-2.01.

All steel appurtenant parts shall conform to the requirements of Subsection 655-2.02.

CONSTRUCTION DETAILS

The Contractor shall remove the existing curb box which shall become the property of the Contractor.

The Contractor shall verify in the field the type of curb box and all dimensions shown on the plans and report any discrepancies to the Engineer for correction before fabrication of the new curb piece.

Both mountable and non-mountable curb boxes shall be included in this item

The curb boxes shall be placed true to line and grade.

Any damaged or missing appurtenant parts, such as, nuts and bolts shall be replaced.

METHOD OF MEASUREMENT

This work shall be measured by the number of curb boxes furnished and installed.

BASIS OF PAYMENT

The unit price bid per each curb box shall include the cost of all labor, materials, and equipment necessary to complete the work, including the cost of removal and proper disposal of the curb box and replacement of damaged or missing appurtenant parts.

Any damage to existing facilities caused by the Contractor's operations shall be repaired at the Contractor's own expense.

12/22/08E 12/10/98 M

ITEM 685.03XX0018 - RAISED REFLECTORIZED SNOWPLOWABLE PAVEMENT MARKERS

DESCRIPTION

Under this work, the Contractor shall furnish and install new raised reflectorized snowplowable pavement markers and replacement retroreflectors in existing snowplowable pavement marker castings, at the locations and in accordance with the patterns indicated in the plans or as directed by the Engineer.

A raised reflectorized snowplowable pavement marker shall consist of a one-way or a two-way plastic prismatic retroreflector that is mounted in a durable iron casting. The raised reflectorized snowplowable pavement marker shall be designed to provide nighttime visibility in wet weather conditions and to resist damage from snowplowing operations.

Replacement retroreflectors for existing raised reflectorized snowplowable pavement markers shall meet the requirements of these specifications and shall be designed for use with the iron castings in which they will be installed.

MATERIALS

1. **Raised Reflectorized Snowplowable Pavement Marker.** Raised reflectorized snowplowable pavement markers shall be furnished by the manufacturer as complete units which shall consist of a one-way or two-way retroreflector that is firmly adhered to a snowplow resistant iron casting. The iron casting shall be designed to protect the retroreflector from damage by snowplowing operations. The raised reflectorized snowplowable pavement marker shall be designed so that the lower portion of the iron casting is installed below the pavement surface and adhered with an epoxy resin adhesive.

   Materials for raised reflectorized snowplowable pavement markers and for replacement retroreflectors shall meet the following requirements.

   a. **Retroreflector.** Retroreflectors shall be a prismatic type, molded of acrylic plastic, polycarbonate, or other suitable material designed to provide strength, abrasion resistance, impact resistance, resilience, and adhesion. The retroreflector shall be a transparent, ultraviolet stabilized grade material that provides resistance to color change over long periods of outdoor exposure.

      The retroreflector shall contain one or two prismatic reflective face(s) to reflect incident light from one or two directions. The surface of the reflective face(s) shall be protected by a permanently bonded glass face or other transparent, abrasion-resistant material.

      The minimum required reflective surface area of each reflective face shall be 1.43 in^2.

ITEM 685.03XX0018 - RAISED REFLECTORIZED SNOWPLOWABLE PAVEMENT

MARKERS

The initial minimum coefficient of luminous intensity (R_I) of each retroreflector shall be as shown in Table 1. Measurements shall be conducted in accordance with ASTM D 4383 or the following test procedure:

The retroreflector to be tested shall be located with the center of the reflective face at a distance of 5 ft from a uniformly bright light source having an effective diameter of 0.20 inches. The return of light shall be measured using an annular ring photocell having a 0.37 in I.D. x 0.47 in O.D. The photocell shall be shielded to eliminate stray light. The distance from the light source center to the center of the photo active area shall be 0.21 inches. If a test distance of other than 5 ft is used, the source and receiver dimensions and the distance between the source and receiver shall be modified in the same proportion as the test distance.

Table 1
Coefficient Of Luminous Intensity (R_I)
Minimum Values (cd/fc)

Entrance Angle	Observation Angle	White	Yellow	Red
0°	0.2°	3.0	1.8	0.75
20°	0.2°	1.2	0.72	0.30

When tested in accordance with ASTM D4383, the coefficient of luminous intensity (R_I) of the retroreflective face(s), after abrasion and when measured in accordance with this specification, shall not be less than the values in Table 1.

When tested in accordance with ASTM D4383 the lens impact strength of the prismatic retroreflector face(s) shall show no more than two radial cracks longer than ¼ in. There shall be no radial cracks extending to the edge of the abrasion resistant area. There shall be no delamination.

The finished retroreflector shall be laminated to an approximately 40 mils thick elastomeric pad which is designed to absorb impact and to permit attachment of the retroreflector to the raised reflectorized snowplowable pavement marker iron casting.

b. **Iron Casting.** The iron casting shall be ductile iron hardened to Rockwell Hardness 51-55

HRC. The iron casting shall be designed so that the final installation height of the top of the iron casting is a maximum ⅓ inches above the pavement surface, and the leading edges of the iron casting are installed below the pavement surface. Iron castings with ramps shall have a maximum 4½° ramp angle. The ramp angle shall be the angle formed by the pavement surface and a straight line drawn from the intersection of the ramp with the pavement surface to the top of the ramp.

c. **Epoxy Resin Adhesive**. Adhesive for bonding the iron casting to the pavement surface shall be a two-component epoxy resin which meets the requirements of AASHTO M 237, Type IV, or ASTM D 4383. Containers of epoxy resin adhesive in storage shall be protected from moisture and direct sunlight, and maintained at a temperature above 40 °F.

d. **Replacement Retroreflector Adhesive**. Adhesive for bonding the replacement retroreflector to the existing iron casting shall meet the requirements of ASTM D 3498, or the adhesive shall be as recommended by the manufacturer of the replacement retroreflector.

2. Basis of Acceptance.

a. **Raised Reflectorized Snowplowable Pavement Markers**. Raised reflectorized snowplowable pavement markers shall be considered for acceptance at the project site based on the appearance of the product on the Department's Approved List. The retroreflector and iron casting shall be identified with the manufacturer's name and product name.

The manufacturer shall certify that the raised reflectorized snowplowable pavement marker meets the requirements of these specifications.

Raised reflectorized snowplowable pavement markers shall be approved by the Materials Bureau based on laboratory and field testing. Detailed requirements and procedures for the approval of raised reflectorized snowplowable pavement markers are available from the Materials Bureau.

b. **Replacement Retroreflectors**. Replacement retroreflectors shall be considered for acceptance at the project site based on the appearance of the product on the Department's Approved List. Replacement retroreflectors shall be identified with the manufacturer's name and product name.

The manufacturer shall certify that the replacement retroreflector(s) meet the requirements of this specification.

Replacement retroreflectors shall be approved by the Materials Bureau based on laboratory and field testing. Detailed requirements and procedures for the approval of

replacement retroreflectors are available from the Materials Bureau.

Adhesive for bonding replacement retroreflectors to existing iron castings shall be accepted based on the manufacturer's certification that the product meets the requirements of these specifications.

c. **Epoxy Resin Adhesive**. Epoxy resin adhesives shall be considered for acceptance at the project site on the basis of the manufacturer's certification that the adhesive meets the requirements of AASHTO M 237, Type IV or ASTM D 4383. Containers of epoxy resin adhesive shall be labeled with the manufacturer's name, the product name, the date of manufacture, and the shelf life.

CONSTRUCTION DETAILS

1. General. Before work begins, the Contractor shall submit a schedule of operations for approval by the Engineer. In addition, the Contractor shall supply the Engineer with the manufacturer's written installation and usage instructions for all materials to be used on the project.

All raised reflectorized snowplowable pavement markers and replacement retroreflectors shall be installed and located as shown in the contract documents or as directed by the Engineer and in accordance with the Manual of Uniform Traffic Control Devices (MUTCD).

When raised reflectorized snowplowable pavement markers and replacement retroreflectors are installed under traffic, the Contractor shall provide all necessary traffic control devices including flaggers, signs, channelizing devices, mobile construction zone impact attenuators, shadow vehicles with flashing arrow boards, flashing arrow boards, etc. to maintain and protect traffic, to protect the work operation, and to protect raised reflectorized snowplowable pavement markers or retroreflectors until thoroughly serviceable. No additional payment will be made for this work.

The installation of raised reflectorized snowplowable pavement markers and replacement retroreflectors shall be performed in such a manner so as not to cause damage to the surrounding pavement. The Contractor shall be responsible for repairing damaged pavement surfaces that result from improper installation, or installation of raised reflectorized snowplowable pavement markers in unauthorized areas. Removal and repair work shall be done as directed by and to the satisfaction of the Engineer, at no cost to the State.

2. Installation of Raised Reflectorized Snowplowable Pavement Markers. All raised reflectorized snowplowable pavement markers shall be installed in accordance with the manufacturer's written instructions for installation, in accordance with these specifications, and as directed by the Engineer.

ITEM 685.03XX0018 - RAISED REFLECTORIZED SNOWPLOWABLE PAVEMENT MARKERS

Raised reflectorized snowplowable pavement markers installed in broken line patterns shall be placed in the gaps between the existing broken lines and in the same longitudinal alignment as the existing broken lines.

Raised reflectorized snowplowable pavement markers installed in full or partial barrier line patterns shall be installed between the two existing full or partial barrier lines except that raised reflectorized snowplowable pavement markers shall not be installed across longitudinal or transverse pavement joints. If a longitudinal pavement joint exists between full or partial barrier lines, two raised reflectorized snowplowable pavement markers shall be placed opposite each other, located on the outside of and 2 inches away from each of the double yellow lines. A pavement joint shall be defined as either a sawed or formed joint in a concrete pavement that separates two pavement slabs or lanes, or as a construction (paving) joint or sawed and sealed joint in an asphalt pavement.

When possible, the edges of the raised reflectorized snowplowable pavement marker shall be located 4 to 6 inches away from pavement joints and cracks.

Raised reflectorized snowplowable pavement markers shall not be installed at locations that show visible evidence of pavement deterioration such as cracking and spalling. If the typical longitudinal spacing of the raised reflectorized snowplowable pavement marker falls at a location of pavement deterioration the raised reflectorized snowplowable pavement marker shall be relocated to another location as directed by the Engineer. In general, the distance that the raised reflectorized snowplowable pavement marker may be relocated away from the original location should not exceed ± 10% of the specified longitudinal spacing. If the raised reflectorized snowplowable pavement marker cannot be relocated within the ± 10% tolerance, the raised reflectorized snowplowable pavement marker should not be installed.

Raised reflectorized snowplowable pavement markers shall be installed by the following operation:

a. **Pavement Cutting and Cleaning**. The pavement shall be cut to the dimensions and depth recommended by the manufacturer of the raised reflectorized snowplowable pavement marker. The Contractor shall conduct pavement cutting operations and pavement cleaning work in such a manner as to minimize airborne dust and similar debris so as to prevent a hazard to workers, motor vehicle operation, or nuisance to property. On new portland cement concrete pavements, pavement cutting operations shall not begin until a minimum of 30 days after placement of the concrete, unless otherwise allowed by the Engineer.

All debris resulting from the pavement cutting operation shall be collected by vacuuming the pavement cut and adjacent pavement surface. Collected debris shall be disposed of uncontaminated solid waste or construction and demolition debris. The Contractor shall ensure that all operations associated with the handling, transporting, and disposal of the construction and demolition debris are in compliance with the New York State Solid Waste Management Regulations 6 NYCRR, Part 360 as well as all applicable Federal,

State and local regulations.

b. **Installation of Raised Reflectorized Snowplowable Pavement Marker**. No raised reflectorized snowplowable pavement markers shall be installed when the ambient or pavement temperatures are below 50°F.

At the time of installation, the cut pavement shall be clean, dry, and free of loose material. The minimum surface temperature of the iron casting shall be 50°F and surfaces of the iron casting shall be substantially free of scale, dirt, rust, oil, grease, or any other contaminant which may reduce the bond between the iron casting and the epoxy adhesive. Iron castings that require removal of contaminants shall be cleaned as directed by and to the satisfaction of the Engineer.

If necessary, to facilitate installation of the epoxy resin adhesive the two components (Part A and Part B) may be heated, by indirect heat, in accordance with the manufacturer's written recommendations. The minimum temperature of the epoxy resin adhesive shall be 50 °F.

The epoxy resin adhesive shall be proportioned and mixed in accordance with the epoxy resin adhesive manufacturer's written recommendations. The mixed epoxy resin adhesive shall be dispensed into the pavement cut in such quantity that the cavity is filled with epoxy resin adhesive to within approximately ½ inch of the pavement surface.

The raised reflectorized snowplowable pavement marker shall be immediately placed into the filled pavement cut. Extreme care shall be taken to ensure that the tabs located on the sides of the iron casting are in direct contact with the pavement surface, and the leading edges of the iron casting are below the pavement surface.

That portion of the iron casting installed in the pavement cavity shall be completely encased in the epoxy resin adhesive. Additional epoxy adhesive shall be added as necessary so that the adhesive is approximately flush with the pavement surface. Excess epoxy shall not be allowed to remain in front of the retroreflector or on the face of the retroreflector.

The installed raised reflectorized snowplowable pavement marker shall be protected from traffic until the epoxy resin adhesive has hardened to a condition that will not allow the
iron casting to move.

3. Installation of Replacement Retroreflectors for Existing Raised Reflectorized Snowplowable Pavement Markers. No replacement retroreflectors shall be installed when the ambient temperature is less than 50 °F, when the surface temperature of the iron casting is less than 50 °F, when the iron casting is wet, or during periods of rain.

ITEM 685.03XX0018 - RAISED REFLECTORIZED SNOWPLOWABLE PAVEMENT MARKERS

Prior to installing replacement retroreflectors, the Contractor shall remove existing retroreflectors and clean the existing iron castings. Retroreflectors that are removed from existing iron castings shall be collected and disposed of in a manner approved by the Engineer. All visible adhesive residue, salt, dirt, rust, and other contaminants that are detrimental to the adhesion of the replacement retroreflector shall be removed from the existing iron casting by either abrasive blasting, hand and power wire brushing, or by other methods approved by the Engineer. Surfaces of the iron casting shall be clean and dry at the time of installation of the replacement retroreflector and adhesive.

If present, the release paper or protective liner shall be removed from the laminated elastomeric pad on the bottom of the new retroreflector. If recommended by the manufacturer of the replacement retroreflector, adhesive (approximate ½ inch diameter bead) shall be applied lengthwise to the center of the elastomeric pad or to the center of the iron casting surface that will receive the retroreflector. The replacement retroreflector shall be immediately installed into the iron casting and a minimum load of 100 lb shall be applied to the top of the retroreflector to seat and secure the replacement retroreflector.
Properly applied adhesive shall cover the entire contact area of the bottom of the retroreflector and a slight excess of adhesive will be evident around the edges of the retroreflector. The Contractor shall remove excess adhesive from the retroreflector face or excess build up of adhesive on the iron casting in front of the retroreflector face.

METHOD OF MEASUREMENT

Raised reflectorized snowplowable pavement markers will be measured as the number of complete raised reflectorized snowplowable pavement marker units satisfactorily furnished and installed.

Replacement retroreflectors will be measured as the number of retroreflector units satisfactorily furnished and installed.

BASIS OF PAYMENT

The accepted quantities of raised reflectorized snowplowable pavement markers and replacement retroreflectors will be paid for at the contract unit price, which shall include the cost of furnishing all labor, materials and equipment to satisfactorily complete the work. The cost for maintenance and protection of traffic, construction signs, mobile construction zone impact attenuators, shadow vehicles with flashing arrow boards, flashing arrow boards, etc. shall be included in the price bid under this item. The cost of collection and disposal of uncontaminated solid waste and existing retroreflectors shall be included in the price bid under this item.

ITEM 685.03XX0018 - RAISED REFLECTORIZED SNOWPLOWABLE PAVEMENT MARKERS

Payment will be made under:

Item No.	Item	Pay Unit
685.03100018	Raised Reflectorized Snowplowable Pavement Marker (One-way White)	Each
685.03110018	Raised Reflectorized Snowplowable Pavement Marker (One-way Yellow)	Each
685.03120018	Raised Reflectorized Snowplowable Pavement Marker (Two-way Yellow)	Each
685.03130018	Raised Reflectorized Snowplowable Pavement Marker (Two-way White/Red)	Each
685.03140018	Raised Reflectorized Snowplowable Pavement Marker (Two-way Yellow/Red)	Each
685.03150018	Replacement Retroreflector for Existing Raised Reflectorized Snowplowable Pavement Marker (One-way White)	Each
685.03160018	Replacement Retroreflector for Existing Raised Reflectorized Snowplowable Pavement Marker (One-way Yellow)	Each
685.03170018	Replacement Retroreflector for Existing Raised Reflectorized Snowplowable Pavement Marker (Two-way Yellow)	Each
685.03180018	Replacement Retroreflector for Existing Raised Reflectorized Snowplowable Pavement Marker (Two-way White/Red)	Each
685.03190018	Replacement Retroreflector for Existing Raised Reflectorized Snowplowable Pavement Marker (Two-way Yellow/Red)	Each

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ITEM 685.0720XXNA – HIGHLY REFLECTORIZED EPOXY PAVEMENT MARKINGS, 20 MILS (TRIPLE DROP)

DESCRIPTION:

Under this work the contractor shall furnish and apply highly reflectorized epoxy pavement markings in accordance with these specifications, the Contract Documents, the MUTCD with the NYS Supplement, or as ordered by the Engineer.

Items for Special Markings include stop bars and crosswalks.
Yield line symbols are isosceles triangles with height equaling 1.5 times the base dimension:

- A small yield line symbol shall have a base dimension of one foot.
- A large yield line symbol shall have a base dimension of two feet.
- Yield line symbols are to be installed with the Apex of the triangle oriented towards oncoming traffic.

The epoxy marking material shall be hot-applied by spray methods onto bituminous and portland cement concrete pavement surfaces at the thickness and width shown on the Contract Documents. The triple drop system shall consist of a combination of highly reflective composite optics, defined as a structural center core surrounded by high index microcrystalline ceramic beads, wet/night visibility beads, and standard glass beads. The cured epoxy marking shall be an adherent, highly reflectorized stripe that will provide wet night retro-reflectivity.

MATERIALS REQUIREMENTS:

White and Yellow Epoxy Reflectorized Pavement Markings	727-03
Glass Beads for Pavement Markings	727-05

Microcrystalline Ceramic Beads. The Microcrystalline Ceramic Beads must meet the following requirements:

- Composed of highly reflective particles having a structural center core surrounded by high refractive index microcrystalline ceramic beads and designed to be applied to epoxy pavement marking paint.
- Refractive index of 2.30 minimum when tested using the liquid oil immersion method.
- Either white or yellow tinted as required.
- Appearance in Table 1, below or approved equal.

TABLE 1

Product Name	Manufacturer Location
3M Series 70E-White 3M Series 71E-Yellow	3M Traffic Control Materials Division Brownwood, TX

Packaging and Shipment. Shipped and packaged in accordance with commercially accepted standards. Clearly display the name of the product, the name and address of the manufacturer, the quantity of material, the date of manufacture, and the date of expiration or the shelf life, on each container or on the shipping invoice.

ITEM 685.0720XXNA – HIGHLY REFLECTORIZED EPOXY PAVEMENT MARKINGS, 20 MILS (TRIPLE DROP)

Basis of Approval. Approvals will be based upon independent lab analysis and field testing in accordance to this specification and Department directives. The Contractor shall submit independent lab analysis to Director of Materials and arrange for field testing through the General Engineering Section of the Materials Bureau. If the product passes the requirements of this specification, it will be added to the Department's Approved List.

Basis of Acceptance. Epoxy Paint and Glass Beads for Pavement markings will be accepted on the basis of the appearance of the product on the Department's Approved List. Wet-Night Reflective Elements will be accepted based on manufacturer's certification that the product meets the requirements of this specification.

EPOXY PAINT APPLICATION EQUIPMENT

In general, a mobile applicator shall be a truck mounted, self-contained pavement marking machine, specifically designed to apply epoxy resin materials and reflective glass spheres in continuous line patterns. The applicating equipment shall be maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc. In addition, the truck mounted unit shall be provided with accessories to allow for the marking of cross hatching and other special patterns as directed by the Engineer.

At any time throughout the duration of the project, the Contractor shall provide free access to his epoxy applicating equipment for inspection by the Engineer or his authorized representative.

The Engineer may approve the use of a portable applicator in lieu of mobile truck mounted accessories for use in applying special markings only, provided such equipment can demonstrate satisfactory application of reflectorized epoxy markings in accordance with these specifications.

Mobile applicating equipment shall be capable of installing up to 19 miles of epoxy reflectorized pavement markings in an eight hour day and shall include the following features:

1. Individual tanks for the storage of Part A and Part B of the epoxy resin.

2. Individual tanks for the storage of Standard Glass beads, Wet-Night Visibility Spheres, and Microcrystalline Ceramic Beads. Each tank shall have a minimum capacity of 3000 lbs.

3. Heating equipment of sufficient capacity to maintain the individual epoxy resin components at the manufacturer's recommended temperature for spray application.

4. Individual dispensers for the simultaneous application of Standard Glass Beads, Wet-Night Visibility Spheres, and Microcrystalline Ceramic Beads.

5. Metering devices or pressure gauges on the proportioning pumps, positioned to be readily visible to the Engineer.

6. All necessary spray equipment, mixers, compressors, and other appurtenances for

the placement of epoxy reflectorized pavement markings in a simultaneous sequence of operations as described in the Construction Details of this specification.

CONSTRUCTION DETAILS

General

Before any pavement marking work is begun, contractor shall submit a schedule of operations for the approval of the Engineer.

At least five (5) days prior to the start or work, the Contractor shall provide the Engineer with the manufacturer's written instructions for:

- Applying epoxy paint with Microcrystalline Ceramic Beads including but not be limited to, material mixing ratios and application temperatures

The Contractor shall provide and retain an on site manufacturer's representative to provide guidance regarding construction methods, and oversight of Microcrystalline Ceramic Beads application. The services of the manufacturer's representative shall be retained by the Contractor until the release by the Engineer.

When pavement markings operations are carried out under traffic, the Contractor shall provide all necessary flags, markers, signs, etc. in accordance with the MUTCD to maintain and protect traffic, and to protect marking operations and the markings until thoroughly set as per manufacturer's procedures.

Epoxy Paint Application

Pavement markings shall be applied in the general direction of traffic. Applications against the direction of traffic flow shall not be allowed.

Atmospheric Conditions. Epoxy pavement markings shall only be applied during conditions of dry weather and on thoroughly dry pavement surfaces. At the time of installation, the pavement surface temperature shall be a minimum of 50^{o}F and the ambient temperature shall be a minimum of 50^{o}F and rising. The Engineer shall be the sole determiner as to when atmospheric conditions and pavement surface conditions are such to produce satisfactory results.

Surface Preparation. The Contractor shall clean all surfaces by air blasting to remove all loose residues. Include power brooming or manual brooming, if necessary, to remove all loose residue. Make sure all pavement surfaces are free of oil, dirt, dust, grease, salt, and similar foreign materials at the time of application. The cost of cleaning these contaminants shall be included in the bid price of this item. If water blasting is used, allow the surface to thoroughly dry to the satisfaction of the Engineer, before application of any epoxy paint.

Application of Epoxy Reflectorized Pavement Markings

ITEM 685.0720XXNA – HIGHLY REFLECTORIZED EPOXY PAVEMENT MARKINGS, 20 MILS (TRIPLE DROP)

Epoxy reflectorized pavement markings shall be applied at the width, thickness, and pattern designated in the Contract Documents.

New PCC Surfaces: Do not apply permanent epoxy pavement markings on new PCC surfaces until at least 30 days after placement, or such time as determined by the Engineer, to allow adequate cure of the PCC.

New Asphalt Surfaces: Do not apply permanent epoxy pavement markings on new asphalt pavement surfaces until at least 14 days after placement.

Marking operations shall not begin until applicable surface preparation work is completed and approved by the Engineer, and the atmospheric conditions are acceptable to the Engineer.

Pavement markings shall be applied by the following simultaneous operation:

1. The pavement surface is air-blasted to remove dirt and residues.

2. The epoxy resin, mixed and heated in accordance with the manufacturer's recommendations, is uniformly hot-sprayed onto the pavement surface at the minimum specified thickness. Epoxy paint shall be applied at the wet film thickness specified in the contract documents.

3. Standard Glass Beads, Wet-Night Visibility Spheres, and Microcrystalline Ceramic Beads are injected into or dropped onto the liquid epoxy marking. The first drop shall be Microcrystalline Ceramic Beads at a rate per manufacturer's recommendation; the second drop shall be Wet-Night Visibility Spheres at a rate of 5 pounds per gallon; and the third drop shall be Standard Glass Beads at a rate of 8 pounds per gallon.

4. The Contractor shall be responsible for removing, to the satisfaction of the Engineer, all tracking marks, spilled epoxy, and epoxy markings applied in unauthorized areas**.**

Defective Epoxy Pavement Markings

Repair defective markings, as determined by the Engineer and at no additional cost to the County, as follows:

1. Repair Method for insufficient film thickness; insufficient line width; and inadequate Standard Glass Bead, Wet-Night Visibility Sphere, and Microcrystalline Ceramic Bead coverage and/or retention:

   Prepare the surface of the defective epoxy marking by grinding or blast cleaning. No other cleaning methods will be allowed. Surface preparation shall be performed to the extent that a substantial amount of the reflective glass spheres are removed and a roughened epoxy marking surface remains as determined by the Engineer.

   Remove loose particles and foreign debris by brooming or blasting with compressed air

just prior to reapplication of markings in accordance with this specification.

2. Repair Method for uncured or discolored epoxy and/or insufficient bond to pavement surface or existing durable marking:

   Uncured epoxy shall be defined as applied material that fails to cure (dry) in accordance with the requirements of §727-03 Epoxy Paint or applied material that fails to cure (dry) within a reasonable time period under actual field conditions, as defined by the Engineer.

   Discoloration shall be defined as localized areas or patches of brown, grayish or black colored epoxy marking material. These areas often occur in a cyclic pattern and often are not visible until several days or weeks after markings are applied.

   The defective epoxy marking shall be completely removed and cleaned to the underlying pavement surface in accordance with the requirements of Section 635 - Cleaning and Preparation of Pavement Surfaces, at the Contractor's expense.

   The extent of removal shall be the defective area plus any adjacent epoxy pavement marking material extending one meter in any direction.

   After surface preparation work is complete, repair shall be made by reapplying epoxy over the cleaned pavement surface in accordance with the requirements of this specification.

   Other defects not noted above, but determined by the Engineer to need repair, shall be repaired or replaced as directed by and to the satisfaction of the Engineer. All work in conjunction with the repair or replacement of defective epoxy reflectorized pavement markings shall be performed by the Contractor at no additional cost to the County.

METHOD OF MEASUREMENT

Pavement striping (regular lines, cross hatching and special markings) will be measured in feet along the centerline of the pavement stripe and will be based on a 4 inch wide stripe. Measurement for striping with a width greater than the basic 4 inches, as shown on the plans or directed by the Engineer, will be made by the following method:

$$\frac{\text{Plan Width of Striping (inches)}}{\text{Feet}} \times 4 \text{ inches}$$

This includes stripes 6 inches and wider, such as hatch lines, crosswalk bars and stop bars.

Letters and symbols will be measured by each unit applied. A unit will consist of one letter or one symbol. Example: “SCHOOL” would be paid as six units. Double and triple headed arrows will be measured as a single unit, but the “X” in railroad grade crossing markings (M.U.T.C.D. figure 8B-7) will be measured by linear feet of 4-inch stripe.

BASIS OF PAYMENT

ITEM 685.0720XXNA – HIGHLY REFLECTORIZED EPOXY PAVEMENT MARKINGS, 20 MILS (TRIPLE DROP)

The unit bid price, shall include all labor, materials, and equipment to complete the work including the cost of cleaning and waste disposal associated with the preparation, installation and application of epoxy paint with standard glass beads and Microcrystalline Ceramic Beads. The cost for maintaining and protecting traffic during the marking operations shall be included in the price bid.

No payment will be made for the repair or replacement of defective epoxy reflectorized pavement markings.

PAY ITEM NO.	***DESCRIPTION***	***PAY UNIT***
685.072001NA	Highly Reflectorized White Epoxy Pavement Stripes – 20 mils (Triple Drop)	Foot
685.072002NA	Highly Reflectorized White Epoxy Pavement Letters – 20 mils (Triple Drop)	Each
685.072003NA	Highly Reflectorized White Epoxy Pavement Symbols – 20 mils (Triple Drop)	Each
685.072004NA	Highly Reflectorized White Epoxy Cross Hatching -20 mils (Triple Drop)	Foot
685.072005NA	Highly Reflectorized White Epoxy Pavement Stripes (Special Markings) 20 mils (Triple Drop)	Foot
685.072006NA	Highly Reflectorized Yellow Epoxy Pavement Stripes – 20 mils (Triple Drop)	Foot
685.072007NA	Highly Reflectorized Yellow Epoxy Pavement Stripes (Cross Hatching) 20 mils (Triple Drop)	Foot
685.072008NA	Highly Reflectorized White Epoxy Pavement Yield Line Symbols - Small - 20 mils (Triple Drop)	Each
685.072009NA	Highly Reflectorized White Epoxy Pavement Yield Line Symbols - Large - 20 mils (Triple Drop)	Each

(On Construction firms letterhead)

Date Issued: _____

Dear Resident:

We are sorry to inconvenience you, but in order to proceed with construction for _____ we must close and/or limit your access to your driveway. As work progresses, you will be notified on a daily basis when and how your particular residence will be affected. We assure you that every effort will be made to minimize the impact to you relative to this construction.

Our current schedule calls for the project related work to be performed in your area during the week of _____. A copy of this letter with specific dates and time for this work will be delivered at least twenty-four (24) hours in advance in order that you will have sufficient opportunity to plan for accessibility to your vehicles.

If additional information is necessary, you may contact any of the representatives listed below.

Thank you for your patience.

Contractor	_____	Phone:	_____
Inspector	_____	Phone:	_____
Project Manager	_____	Phone:	_____

_____

(On Construction firms letterhead)

Date Issued: _____

CONSTRUCTION NOTIFICATION
24 HOUR NOTICE

Date & Type of Construction: _____
How will residence be affected: _____
Approximate time of Construction: _____

Driveway access (will) (will not) be permitted.