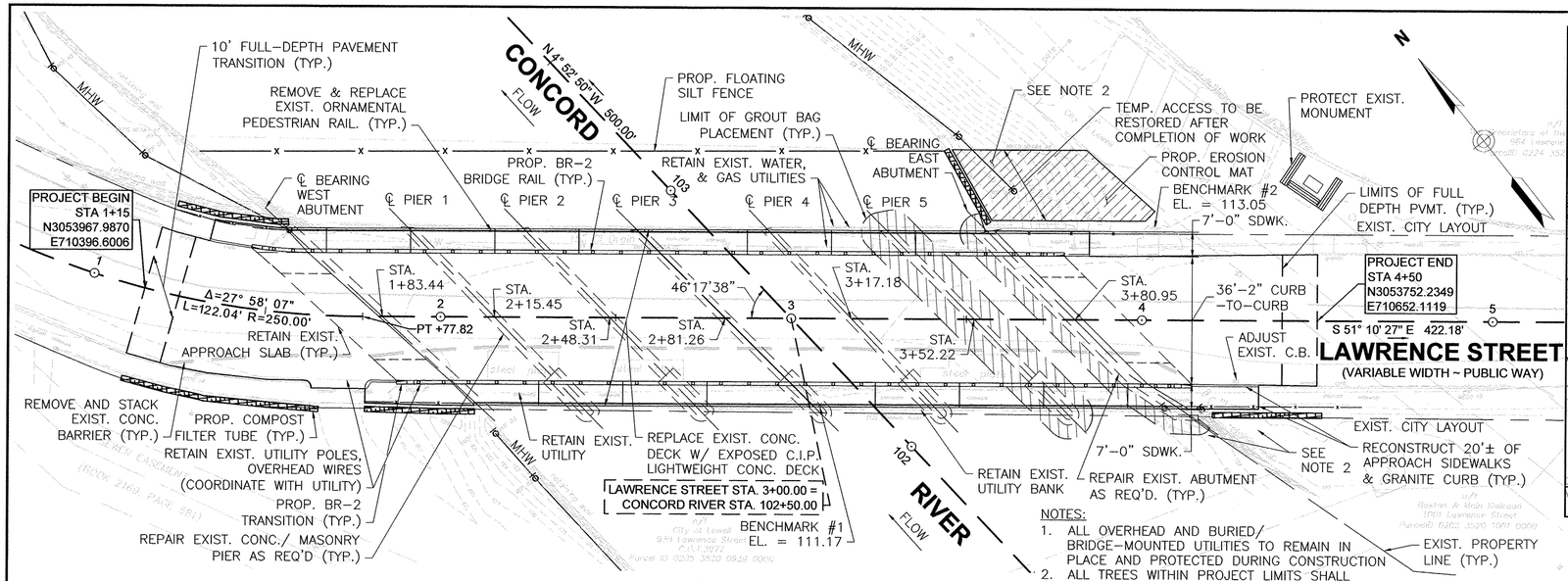
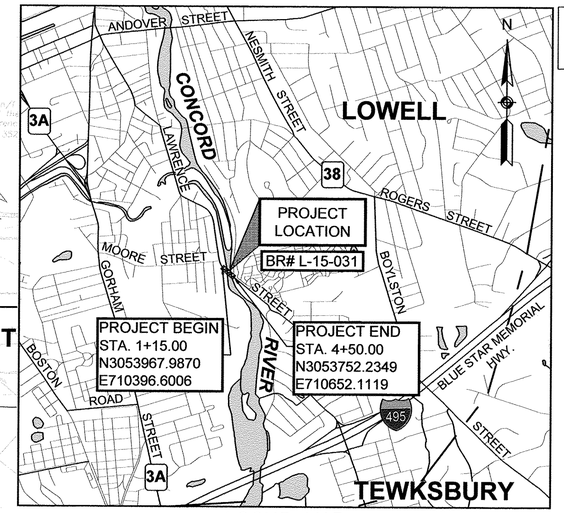


NOTES:
1. ALL OVERHEAD AND BURIED/ BRIDGE-MOUNTED UTILITIES TO REMAIN IN PLACE AND PROTECTED DURING CONSTRUCTION
2. ALL TREES WITHIN PROJECT LIMITS SHALL REMAIN IN PLACE AND PROTECTED ACCORDING TO SPEC. ITEMS 102.51 & 102.52.

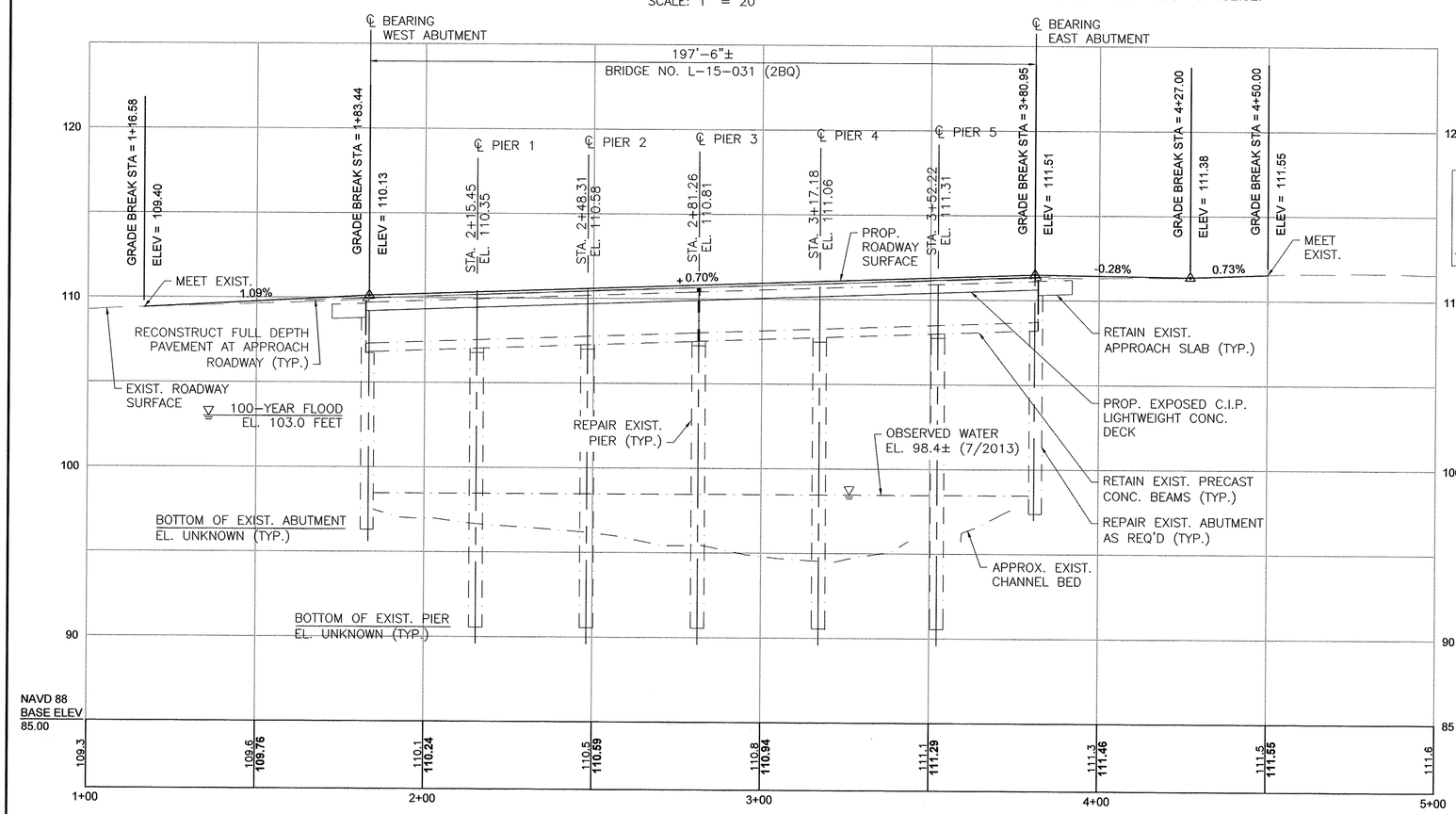
KEY PLAN
SCALE: 1" = 20'



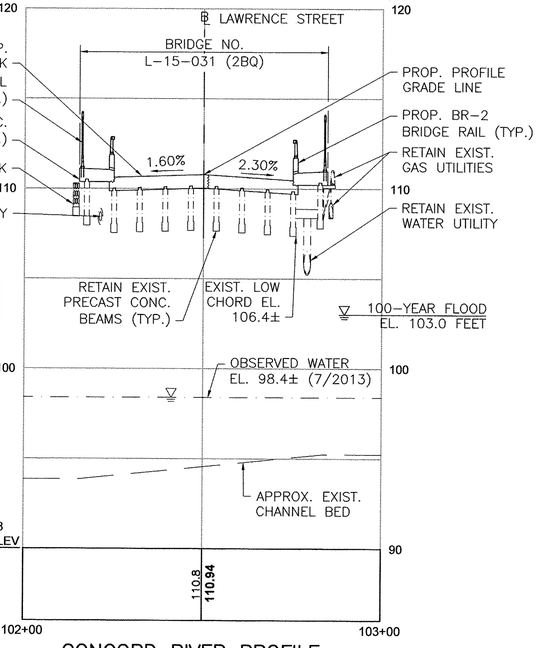
LOCUS MAP
SCALE: 1" = 1500'

LOWELL
LAWRENCE STREET
SHEET 1 OF 18

TITLE SHEET



LAWRENCE STREET PROFILE
HORIZONTAL SCALE: 1"=20'
VERTICAL SCALE: 1"=4'



CONCORD RIVER PROFILE
HORIZONTAL SCALE: 1"=20'
VERTICAL SCALE: 1"=4'

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
APPROVED UNDER PROVISIONS OF
MASS. GEN. LAWS CH 85 S 35
BRIDGE ENGINEER — DATE 5/3/16

GENERAL NOTES
SEE SHEET 2 FOR GENERAL NOTES.

COMMONWEALTH OF MASSACHUSETTS — JODY R. TRUNFIO — STRUCTURAL No. 46078 — REGISTERED PROFESSIONAL ENGINEER — 4/28/16

APRIL 28, 2016	ISSUED FOR CONSTRUCTION

TEC, INC.
65 GLENN STREET
LAWRENCE, MA 01843
169 OCEAN BOULEVARD
HAMPTON, NH 03842

PROPOSED BRIDGE REHABILITATION
LOWELL
LAWRENCE STREET OVER
CONCORD RIVER
CITY OF LOWELL
375 MERRIMACK STREET
LOWELL, MA 01852

T:\0491_51_1-2_COVER.DWG Plotted on 28-Apr-2016 3:05 PM

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GENERAL NOTES

DESIGN:

IN ACCORDANCE WITH THE 2002 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES 17TH EDITION FOR H-20 LOADING.

SPECIFICATIONS

THE MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES DATED 1988, AS AMENDED, THE SUPPLEMENTAL SPECIFICATIONS DATED FEBRUARY 25, 2010, THE 2012 CONSTRUCTION STANDARD DETAILS, THE 1996 CONSTRUCTION AND TRAFFIC STANDARD DETAILS (AS RELATES TO TRAFFIC STANDARD DETAILS ONLY), THE 2003 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS WITH MASSACHUSETTS AMENDMENTS, THE 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS, THE 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING AND THE LATEST EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK, WILL GOVERN.

SURVEY BENCHMARKS:

BENCHMARK 1:
CROSS CUT IN BRIDGE
ELEVATION = 111.17
N: 3053821.60
E: 710526.16

BENCHMARK 2:
CROSS CUT IN FRONT HYDRANT BOLT
ELEVATION = 113.05
N: 3053801.82
E: 710632.39

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.

EXISTING CONDITIONS:

ALL DIMENSIONS AND DETAILS SHOWN FOR THE EXISTING STRUCTURE ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE ADEQUACY AND ACCURACY THEREOF, AND NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION OR WORK UNTIL HE/SHE HAS MADE THE REQUIRED MEASUREMENTS ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER.

DOWEL BAR SPLICER:

ALL REINFORCING BARS SHALL BE MADE CONTINUOUS ACROSS STAGE CONSTRUCTION JOINTS BY DOWEL BAR SPLICERS. DOWEL BAR SPLICERS SHALL HAVE THE SAME COATINGS AS THE REINFORCING BARS THEY ARE SPLICING.

CONCRETE:

5000 PSI, $\frac{3}{8}$", 710 HP LIGHTWEIGHT CEMENT CONCRETE (115 PCF) SHALL BE USED TO CONSTRUCT THE CAST-IN-PLACE SIDEWALKS AND BR2 RAIL PEDESTALS AND TRANSITIONS.

4000 PSI, $\frac{3}{4}$" 650 HP LIGHTWEIGHT CEMENT CONCRETE (115 PCF) SHALL BE USED TO CONSTRUCT THE CAST-IN-PLACE DECK SLAB.

4000 PSI, $1\frac{1}{2}$" 565 CEMENT CONCRETE SHALL BE USED TO CONSTRUCT THE CAST-IN-PLACE MOMENT SLABS BELOW THE CONSTRUCTION JOINT.

LIGHTWEIGHT AGGREGATES FOR STRUCTURAL CONCRETE SHALL MEET AASHTO M 195.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 31 GRADE 60, EPOXY COATED. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS
1. NONE	21"	26"
2. 12" OF CONCRETE BELOW BARS	29"	36"
3. COATED BARS, COVER<3db, OR CLEAR SPACING<6db	31"	39"
4. COATED BARS, ALL OTHER CASES	25"	31"
5. CONDITION 2. AND 3.	35"	44"
6. CONDITION 2. AND 4.	34"	43"

FOR BARS IN SAND-LIGHTWEIGHT CONCRETE, MULTIPLY THE LAP LENGTHS BY 1.2.

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS.

TRAFFIC:

BRIDGE DECK REPLACEMENT SHALL BE CONSTRUCTED IN 2 STAGES. TRAFFIC MANAGEMENT SHALL BE IN ACCORDANCE WITH THE PROPOSED TRAFFIC MANAGEMENT PLAN.

HYDRAULIC DATA

DRAINAGE AREA:	UNKNOWN
DESIGN DISCHARGE:	6000 CFS
DESIGN FREQUENCY:	100-YEAR
DESIGN VELOCITY:	8.6 FPS
DESIGN HIGH WATER ELEVATION:	103.0 FT NAVD88

BASIC FLOOD DATA

Q (100 YEAR):	6000 CFS
WATER SURFACE ELEVATION:	103.0 FT NAVD 88

FLOOD OF RECORD

Q:	5,840 CFS
FREQUENCY:	100-YEAR
DATE:	MARCH, 2010
HISTORY OF ICE FLOES:	NONE DOCUMENTED
EVIDENCE OF SCOUR AND EROSION:	SCOUR VARIES AT EACH PIER UP TO 3 FT. PIER 5 AND EAST ABUTMENT ARE UNDERMINED.

INDEX OF SHEETS

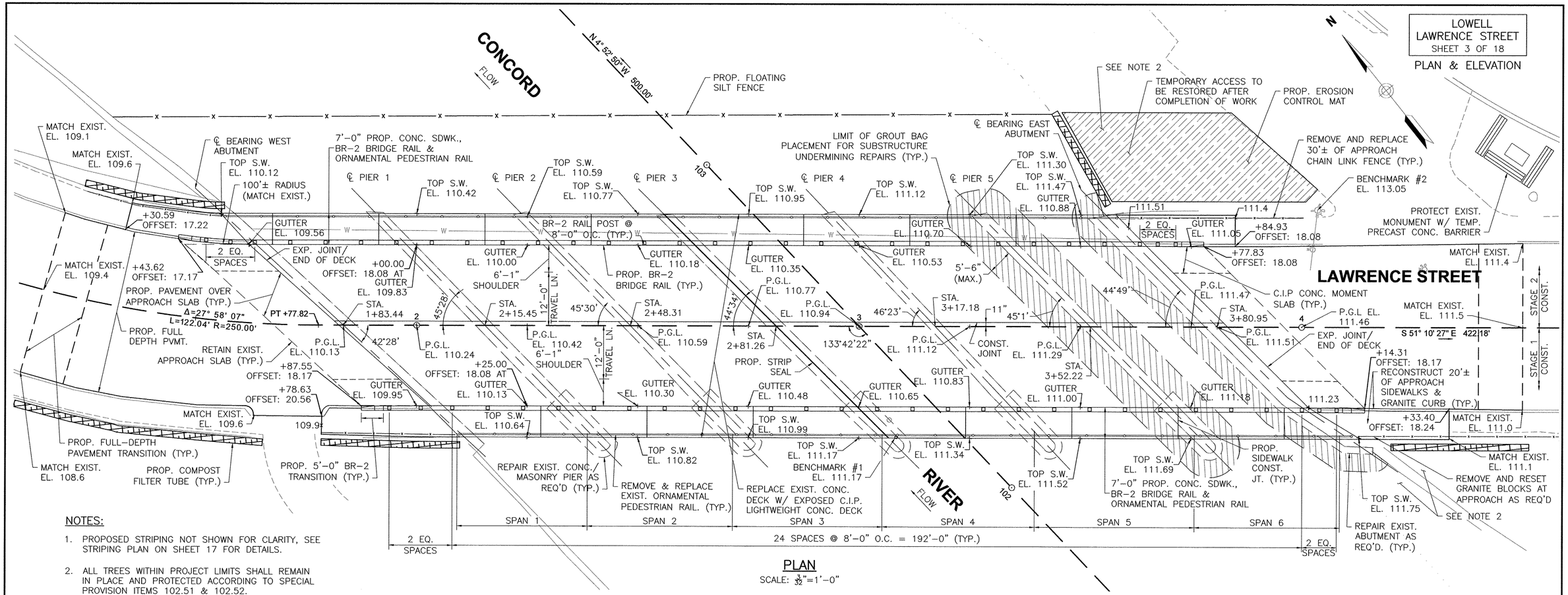
SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	GENERAL NOTES
3	PLAN & ELEVATION
4-5	STAGE CONSTRUCTION DETAILS
6-7	SUBSTRUCTURE REPAIRS
8	SUBSTRUCTURE REPAIR DETAILS
9	FRAMING PLAN
10	TRANSVERSE SECTIONS & DETAILS
11	DECK DETAILS
12	TOP OF FORM DETAILS
13	STRIP SEAL DETAILS
14-15	RAILING DETAILS
16-17	TRAFFIC MANAGEMENT PLAN
18	STRIPING PLAN

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
APPROVED UNDER PROVISIONS OF
MASS. GEN. LAWS CH 85 S 35
BRIDGE ENGINEER — DATE 5/3/16

DATE	DESCRIPTION
APRIL 28, 2016	ISSUED FOR CONSTRUCTION
USE ONLY PRINTS OF LATEST DATE	

LOWELL
LAWRENCE STREET
SHEET 3 OF 18

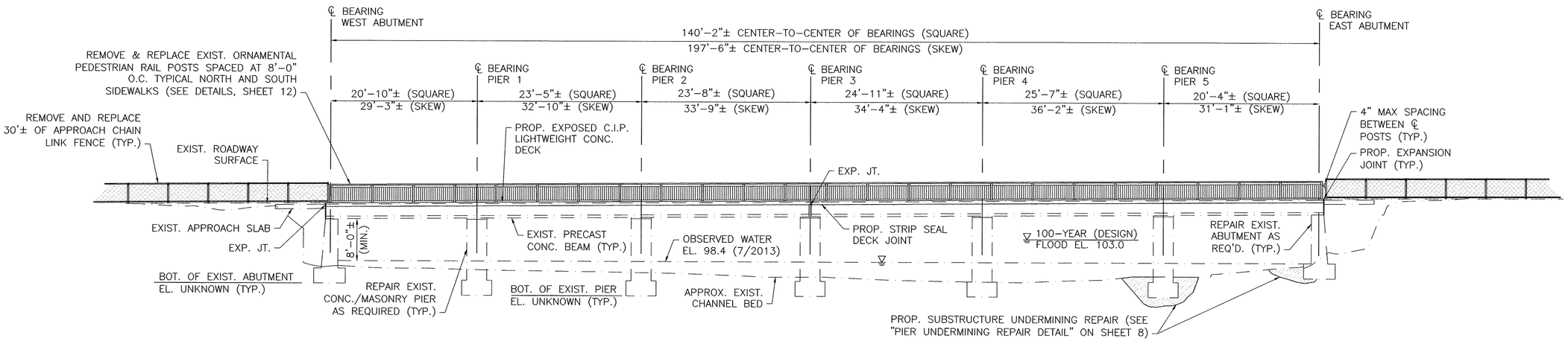
PLAN & ELEVATION



PLAN
SCALE: $\frac{3}{32}$"=1'-0"

NOTES:

1. PROPOSED STRIPING NOT SHOWN FOR CLARITY, SEE STRIPING PLAN ON SHEET 17 FOR DETAILS.
2. ALL TREES WITHIN PROJECT LIMITS SHALL REMAIN IN PLACE AND PROTECTED ACCORDING TO SPECIAL PROVISION ITEMS 102.51 & 102.52.



SOUTH ELEVATION
SCALE: $\frac{3}{32}$"=1'-0"

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
APPROVED UNDER PROVISIONS OF MASS. GEN. LAWS CH 85 S 35
BRIDGE ENGINEER P.E. 5/3/16 DATE

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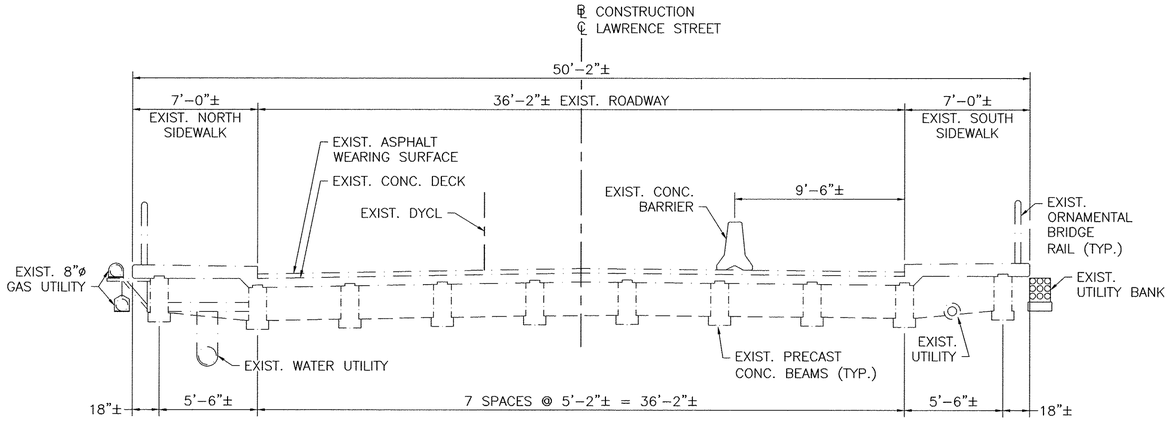
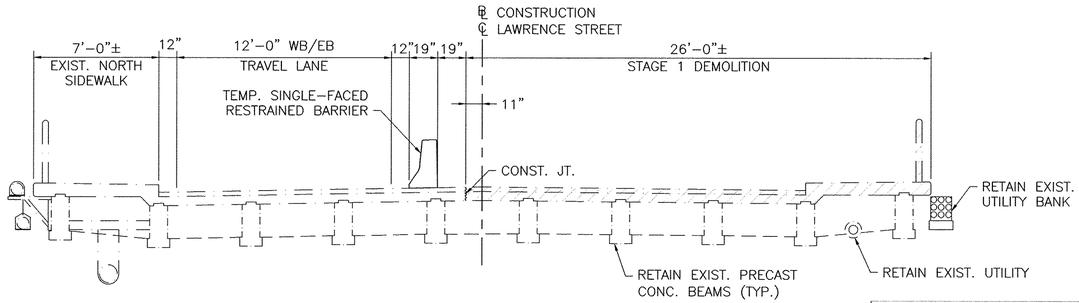
USE ONLY PRINTS OF LATEST DATE	

T0491_31_3_PLAN & ELEV.DWG Plotted on 27-Apr-2016 3:22 PM

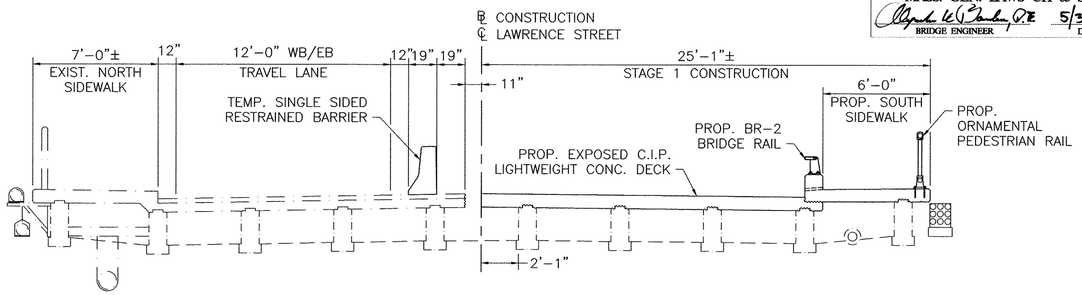
STAGE CONSTRUCTION DETAILS



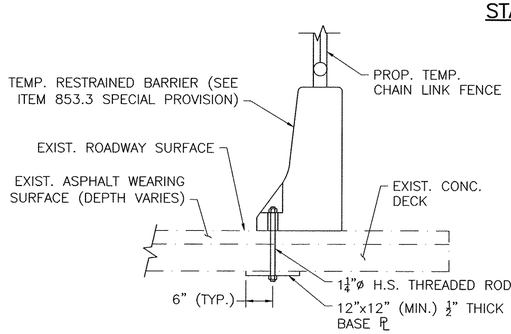
EXISTING CROSS SECTION
SCALE: $\frac{1}{4}$"=1'–0"



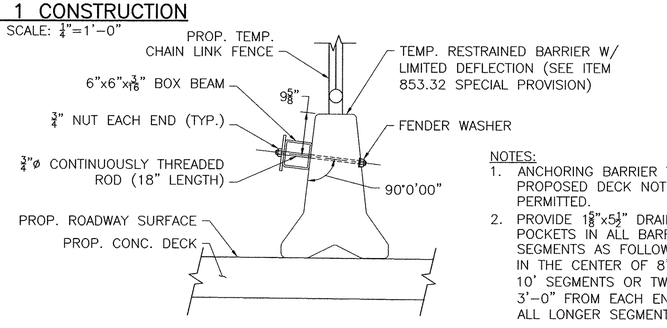
STAGE 1 DEMOLITION
SCALE: $\frac{1}{4}$"=1'–0"



STAGE 1 CONSTRUCTION
SCALE: $\frac{1}{4}$"=1'–0"



RESTRAINED BARRIER (EXISTING DECK)
SCALE: $\frac{3}{4}$"=1'–0"



NOTES:
1. ANCHORING BARRIER TO PROPOSED DECK NOT PERMITTED.
2. PROVIDE 1⅜"x5½" DRAINAGE POCKETS IN ALL BARRIER SEGMENTS AS FOLLOWS: ONE IN THE CENTER OF 8' AND 10' SEGMENTS OR TWO 3'–0" FROM EACH END OF ALL LONGER SEGMENTS.

RESTRAINED BARRIER W/LIMITED DEFLECTION (PROPOSED DECK)
SCALE: $\frac{3}{4}$"=1'–0"

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
APPROVED UNDER PROVISIONS OF MASS. GEN. LAWS CH 85 S 35
BRIDGE ENGINEER — 5/3/16 DATE

GENERAL NOTES:

1. ALL ROADWAY DIMENSIONS ARE TAKEN PERPENDICULAR TO THE BASELINE OF CONSTRUCTION.
2. THE TEMPORARY SINGLE–FACED RESTRAINED BARRIER SHALL BE THRU–BOLTED ON THE EXISTING DECK. THRU–BOLTING ON THE PROPOSED DECK SHALL NOT BE ALLOWED.
3. ALL OVERHEAD AND BURIED/BRIDGE MOUNTED UTILITIES SHALL REMAIN IN PLACE AND SHALL BE PROTECTED THROUGHOUT CONSTRUCTION.
4. THE CONTRACTOR SHALL MAKE ALL EFFORTS NECESSARY TO PREVENT DEBRIS FROM ENTERING THE WATERWAY. TEMPORARY WORK PLATFORMS SHALL BE EQUIPPED TO RESTRICT THE DISBURSEMENT OF ANY DEBRIS FALLING DURING CONSTRUCTION. ANY CONSTRUCTION DEBRIS THAT FALLS INTO THE WATERWAY SHALL BE REMOVED IMMEDIATELY AT THE CONTRACTOR'S EXPENSE.
5. THE MONUMENT MADE OF A STACK OF GRANITE BLOCKS WITH A BIRD CARVING LOCATED AT THE SOUTHEAST CORNER OF THE PARKING LOT AT THE NORTHEAST APPROACH SHALL BE PROTECTED THROUGHOUT CONSTRUCTION BY TEMPORARY CONCRETE BARRIERS.
6. ALL IN–STREAM WORK SHALL OCCUR ONLY BETWEEN JUNE 30 AND SEPTEMBER 1, PER THE ARMY CORPS OF ENGINEERS GENERAL PERMIT.

DEMOLITION NOTES:

1. THE EXISTING CONCRETE DECK INCLUDING THE SIDEWALKS SHALL BE REMOVED AND PROPERLY DISPOSED OF.
2. THE CONTRACTOR SHALL SUBMIT A DETAILED WORK PLAN, PREPARED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS, SHOWING ALL PROPOSED METHODS OF REMOVAL, EQUIPMENT TO BE USED, AND SCHEDULE OF OPERATION.
3. THE CONTRACTOR SHALL MAINTAIN THE STABILITY OF THE STRUCTURE AT ALL TIMES DURING DEMOLITION.
4. THE CONTRACTOR SHALL BE REQUIRED TO DESIGN, CONSTRUCT, AND REMOVE A TEMPORARY SHIELDING SYSTEM TO PREVENT DEBRIS FROM ENTERING THE WATERWAY. TEMPORARY SHIELDING SYSTEM SHALL BE PREPARED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS. ALTERNATE METHODS OF PREVENTING DEBRIS FROM ENTERING THE WATERWAY MAY BE USED WITH PRIOR APPROVAL FROM THE ENGINEER.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING A SAFE WORK AREA AND SHALL CONSTRUCT TEMPORARY FENCES AND GATES AS REQUIRED TO PREVENT UNAUTHORIZED INDIVIDUALS FROM ACCESSING THE WORK AREA.
6. ALL EXISTING BEAM SHEAR CONNECTORS SHALL REMAIN IN PLACE (SEE DETAIL ON THIS SHEET).
7. WHERE EXISTING SHEAR STIRRUPS EXHIBIT EXCESSIVE CORROSION AS DIRECTED BY THE ENGINEER, USE ALTERNATE DETAIL TO DRILL AND GROUT REPLACEMENT DOWELS INTO BEAMS BETWEEN STIRRUPS.

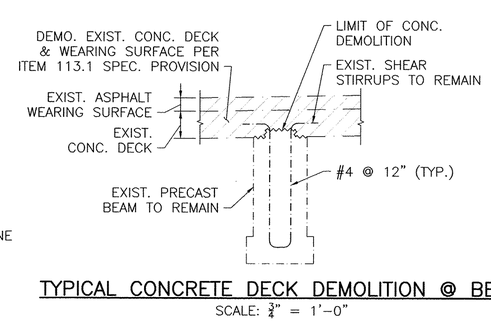
CONSTRUCTION SEQUENCE:

STAGE 1 DEMOLITION:

1. INSTALL ALL TEMPORARY TRAFFIC MANAGEMENT, EROSION CONTROL, AND TREE PROTECTION MEASURES AS REQUIRED.
2. INSTALL TEMPORARY SINGLE SIDED RESTRAINED BARRIER TO THE EXISTING DECK TO FORM A SINGLE 12' (MINIMUM) WIDE TEMPORARY TRAVEL LANE WITH 1' (MINIMUM) WIDE SHOULDERS ON THE NORTH SIDE OF THE EXISTING ROADWAY AS SHOWN. INSTALL TEMPORARY TWO PHASE SIGNAL AND ALL TEMPORARY STRIPING AS REQUIRED FOR ALTERNATING TRAFFIC WITHIN THE SINGLE 12' (MINIMUM) TEMPORARY TRAVEL LANE.
3. SHIFT TRAFFIC TO THE NORTH SIDE OF THE BRIDGE.
4. INSTALL TEMPORARY SHIELDING TO PROTECT EXISTING UTILITIES AND TO PREVENT CONSTRUCTION DEBRIS FROM ENTERING THE WATERWAY.
5. DEMOLISH THE SOUTH SIDE OF THE EXISTING DECK, LEAVING THE EXISTING CONCRETE BEAMS AND UTILITIES IN PLACE.

STAGE 1 CONSTRUCTION:

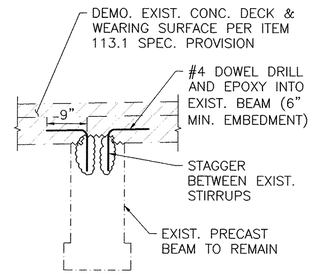
1. REMOVE THE TEMPORARY SHIELDING UNDERNEATH THE PORTION OF THE DECK DEMOLISHED IN STAGE 1.
2. CONSTRUCT THE SOUTH SIDE OF THE PROPOSED CAST–IN–PLACE COMPOSITE LIGHTWEIGHT CONCRETE DECK.
3. CONSTRUCT THE SOUTH CAST–IN–PLACE LIGHTWEIGHT CONCRETE SIDEWALK, BR–2 BRIDGE RAIL, AND ORNAMENTAL RAILING.
4. RECONSTRUCT SOUTH PORTION OF APPROACH FULL–DEPTH PAVEMENT AND SIDEWALKS TO MEET EXISTING GRADE.
5. REMOVE AND REPLACE APPROACH CHAIN LINK FENCE SOUTH OF THE ROADWAY.



TYPICAL CONCRETE DECK DEMOLITION @ BEAM
SCALE: $\frac{3}{4}$" = 1'–0"

ESTIMATED QUANTITIES*	
STIRRUP REPAIR	400 EA

*QUANTITIES ARE NOT GUARANTEED. CONTRACTOR SHALL V.I.F. ALL QUANTITIES BEFORE COMMENCEMENT OF DECK PLACEMENT.



SHEAR STIRRUP REPAIR
SCALE: $\frac{3}{4}$" = 1'–0"

DATE	DESCRIPTION
APRIL 28, 2016	ISSUED FOR CONSTRUCTION
USE ONLY PRINTS OF LATEST DATE	

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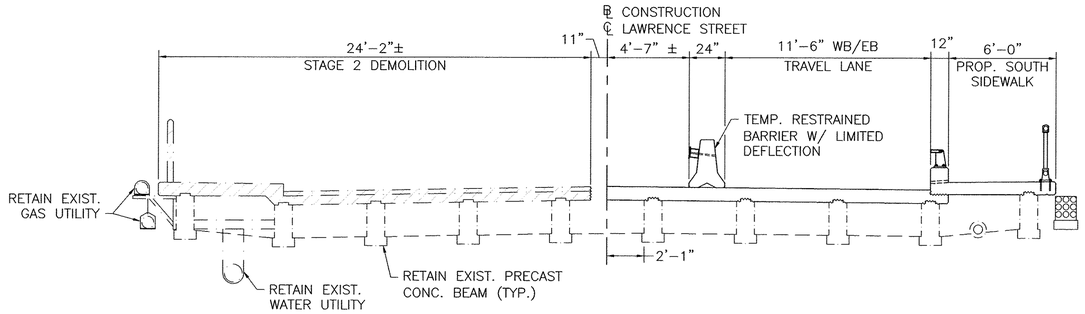
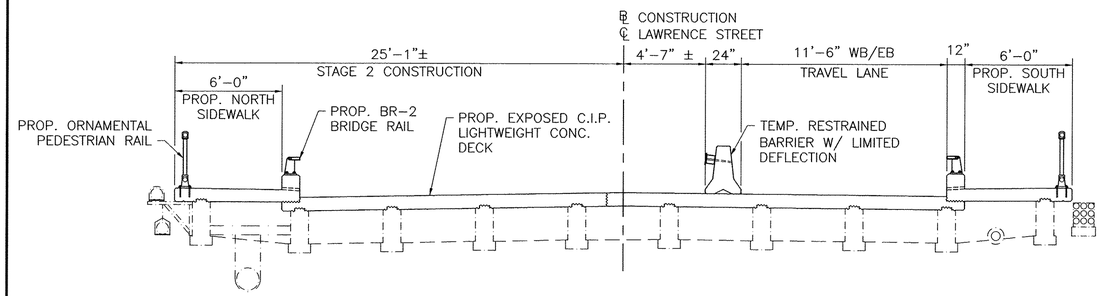
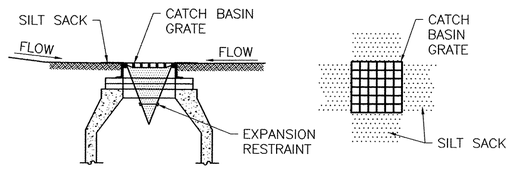
STAGE CONSTRUCTION DETAILS



STAGE 2 DEMOLITION
SCALE: $\frac{1}{4}$"=1'–0"



STAGE 2 CONSTRUCTION
SCALE: $\frac{1}{4}$"=1'–0"



SECTION VIEW PLAN VIEW

NOTES:
1. INSTALL SILT SACK IN EXISTING CATCH BASINS BEFORE COMMENCING WORK. MAINTAIN UNTIL BINDER COURSE PAVING IS COMPLETE OR A PERMANENT STAND OF GRASS HAS BEEN ESTABLISHED.
2. GRATE TO BE PLACED OVER SILT SACK.
3. SILTSACK SHALL BE INSPECTED PERIODICALLY AND AFTER ALL STORM EVENTS AND CLEANING OR REPLACEMENT SHALL BE PERFORMED PROMPTLY AS NEEDED.
4. REMOVE SILT SACK AT COMPLETION OF PROJECT.

INLET PROTECTION SILT SACK IN CATCH BASIN
N.T.S.

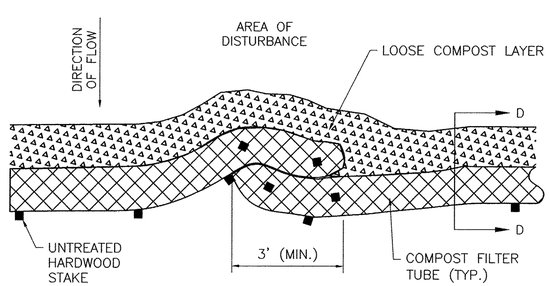
CONSTRUCTION SEQUENCE:

STAGE 2 DEMOLITION:

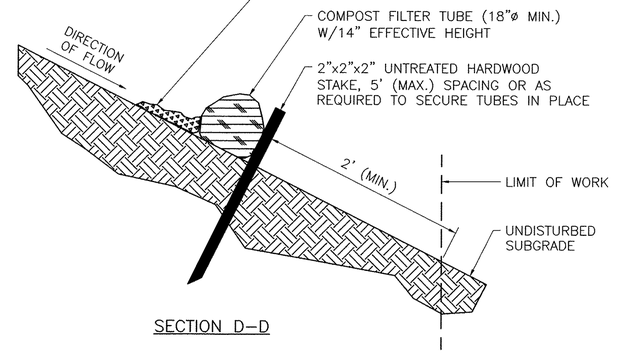
1. INSTALL TEMPORARY RESTRAINED BARRIER WITH LIMITED DEFLECTION ON THE NEWLY CONSTRUCTED SOUTH SIDE OF THE STRUCTURE TO FORM A SINGLE 11'–6" (MINIMUM) TEMPORARY TRAVEL LANE AS SHOWN. RELOCATE TEMPORARY TWO PHASE SIGNAL AND INSTALL ALL TEMPORARY STRIPING AS REQUIRED FOR ALTERNATING TRAFFIC WITHIN THE SINGLE 11'–6" (MINIMUM) TEMPORARY TRAVEL LANE.
2. SHIFT TRAFFIC TO THE SOUTH SIDE OF THE BRIDGE.
3. DEMOLISH THE NORTH SIDE OF THE EXISTING DECK, LEAVING THE EXISTING CONCRETE BEAMS AND UTILITIES IN PLACE.

STAGE 2 CONSTRUCTION:

1. REMOVE THE REMAINING TEMPORARY SHIELDING.
2. CONSTRUCT THE REMAINING NORTH SIDE OF THE PROPOSED CAST–IN–PLACE COMPOSITE LIGHTWEIGHT CONCRETE DECK.
3. CONSTRUCT THE NORTH CAST–IN–PLACE LIGHTWEIGHT CONCRETE SIDEWALK, BR–2 BRIDGE RAIL, AND ORNAMENTAL RAILING.
4. RECONSTRUCT THE REMAINING NORTH PORTION OF APPROACH FULL–DEPTH PAVEMENT AND SIDEWALKS TO MEET EXISTING GRADE.
5. RECONSTRUCT PORTION OF APPROACH FULL–DEPTH PAVEMENT AND SIDEWALKS TO MEET EXISTING GRADE.
6. REMOVE AND REPLACE APPROACH CHAIN LINK FENCE NORTH OF THE ROADWAY.
7. PAVE THE SURFACE COURSE OF THE PAVEMENT SECTION AT THE APPROACHES.
8. ERADICATE ALL TEMPORARY PAVEMENT MARKINGS AND CONSTRUCT PROPOSED STRIPING TO PROJECT SPECIFICATIONS.
9. SHIFT TRAFFIC TO PERMANENT LOCATION AS SHOWN ON THE PLANS.
10. REMOVE ALL EROSION CONTROL MEASURES.
11. RESTORE TEMPORARY RIVER ACCESS AREA TO PROJECT SPECIFICATIONS.
12. REMOVE TEMPORARY PRECAST CONCRETE BARRIERS PROTECTING MONUMENT.



PROTECTED AREA



SECTION D–D

NOTES:
1. PROVIDE A MINIMUM TUBE DIAMETER OF 18" FOR SLOPES UP TO 50 FEET IN LENGTH WITH A SLOPE RATIO OF 3H:1V OR STEEPER. LONGER SLOPES OF 3H:1V MAY REQUIRE LARGER TUBE DIAMETER OR ADDITIONAL COURSING OF FILTER TUBES TO CREATE A FILTER BERM. REFER TO MANUFACTURER'S RECOMMENDATIONS FOR SITUATIONS WITH LONGER OR STEEPER SLOPES.
2. INSTALL TUBES ALONG CONTOURS AND PERPENDICULAR TO SHEET OR CONCENTRATED FLOW.
3. DO NOT INSTALL IN PERENNIAL, EPHEMERAL OR INTERMITTENT STREAMS.
4. CONFIGURE TUBES AROUND EXISTING SITE FEATURES TO MINIMIZE SITE DISTURBANCE AND MAXIMIZE CAPTURE AREA OF STORMWATER RUN–OFF.
5. TUBES FOR COMPOST FILTERS SHALL BE JUTE MESH OR APPROVED BIODEGRADABLE MATERIAL. ADDITIONAL TUBES SHALL BE USED AT THE DIRECTION OF THE ENGINEER.
6. TAMP TUBES IN PLACE TO ENSURE GOOD CONTACT WITH SOIL SURFACE. IT IS NOT NECESSARY TO TRENCH TUBES INTO EXISTING GRADE.
7. WHEN STAKING IS NOT POSSIBLE, SUCH AS WHEN TUBES MUST BE PLACED ON PAVEMENT, HEAVY CONCRETE OR CINDER BLOCKS CAN BE USED BEHIND TUBES UP TO 5 FT. APART OR AS REQUIRED TO SECURE TUBES IN PLACE.
8. TUBES CAN BE PLACED DIRECTLY ON EXISTING PAVEMENT WHEN NECESSARY.
9. PROVIDE A 3' MINIMUM OVERLAP AT ENDS OF TUBES TO JOIN IN A CONTINUOUS BARRIER AND MINIMIZE UNIMPEDED FLOW.
10. STAKE JOINING TUBES SNUGLY AGAINST EACH OTHER TO PREVENT UNFILTERED FLOW BETWEEN THEM.
11. SECURE ENDS OF TUBES WITH STAKES SPACED 18" APART THROUGH TOPS OF TUBES.
12. UPON COMPLETION OF PROJECT, ALL TUBES USED FOR EROSION CONTROL SHALL BE REMOVED FROM PROJECT LIMITS.

COMPOST FILTER TUBE
N.T.S.

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
APPROVED UNDER PROVISIONS OF
MASS. GEN. LAWS CH 85 S 35
BRIDGE ENGINEER — DATE 5/3/16

DATE	DESCRIPTION
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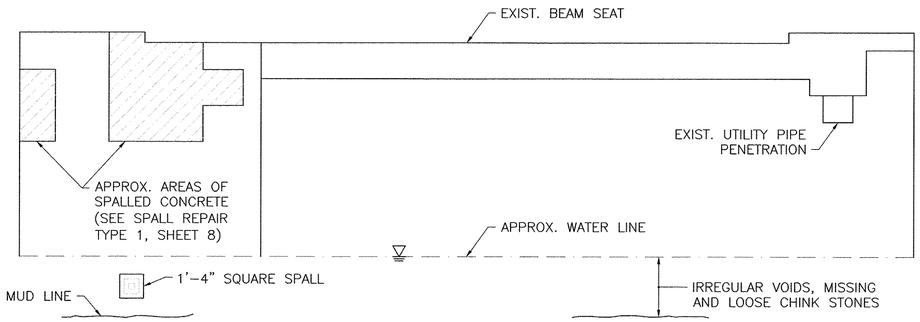
T0481_31_4-6_STAGED CONST.DWG Plotted on: 27-Apr-2016 3:22 PM

LOWELL
LAWRENCE STREET
SHEET 6 OF 18

SUBSTRUCTURE REPAIRS

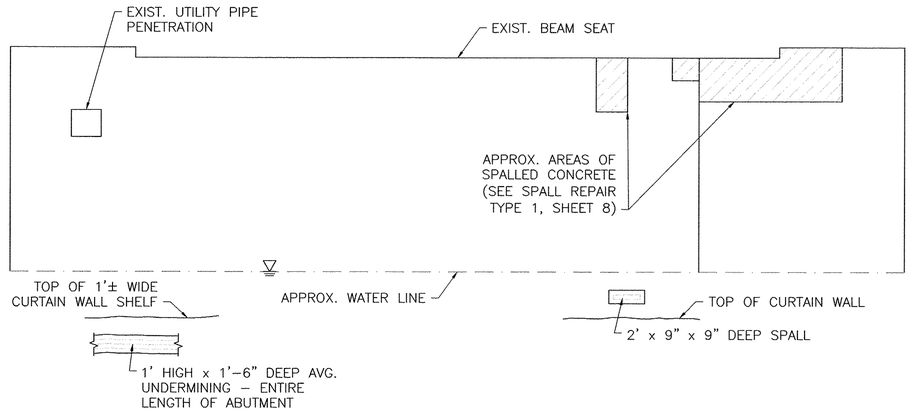
NOTES:

1. ALL CONCRETE AND MASONRY SPALLS, VOIDS AND CRACKS ABOVE THE WATERLINE SHALL BE REPAIRED IN ACCORDANCE WITH THE "SUBSTRUCTURE REPAIR DETAILS" SHOWN ON SHEET 8.
2. THE AREAS OF KNOWN DETERIORATION SHOWN ARE BASED ON LIMITED INVESTIGATION. ADDITIONAL AREAS IDENTIFIED DURING THE PROGRESS OF THE WORK SHALL BE REPAIRED. THE ENGINEER SHALL APPROVE ALL LIMITS OF REPAIR PRIOR TO COMMENCEMENT OF THE WORK.
3. SEE SHEET 8 FOR ABUTMENT AND PIER UNDERMINING REPAIRS.



WEST ABUTMENT

SCALE: $\frac{1}{4}$"=1'-0"



EAST ABUTMENT

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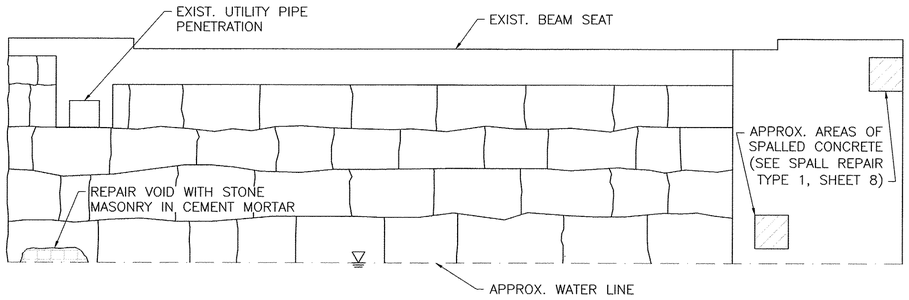
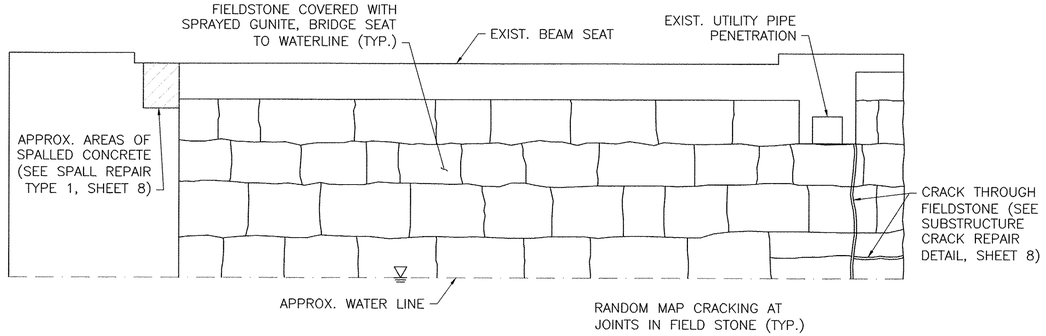


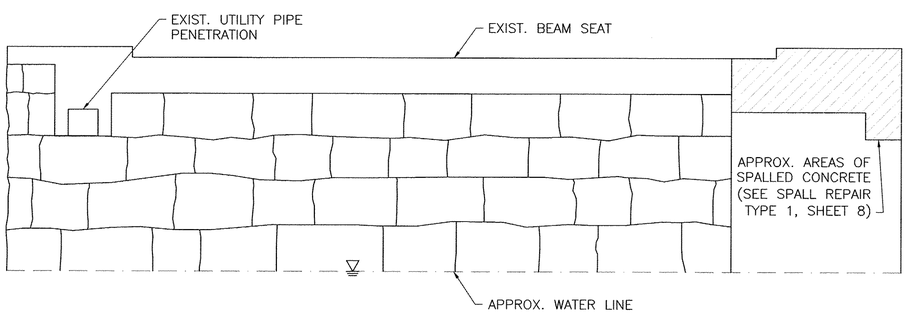
PIER 1 WEST FACE

SCALE: $\frac{1}{4}$"=1'-0"



PIER 1 EAST FACE

SCALE: $\frac{1}{4}$"=1'-0"



PIER 2 WEST FACE

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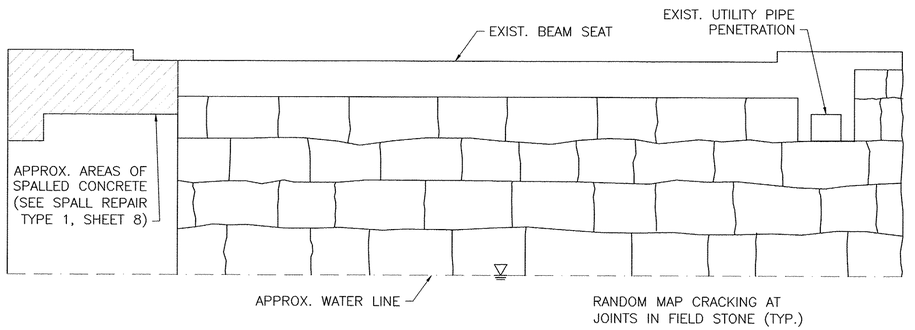

PIER 2 EAST FACE

SCALE: $\frac{1}{4}$"=1'-0"

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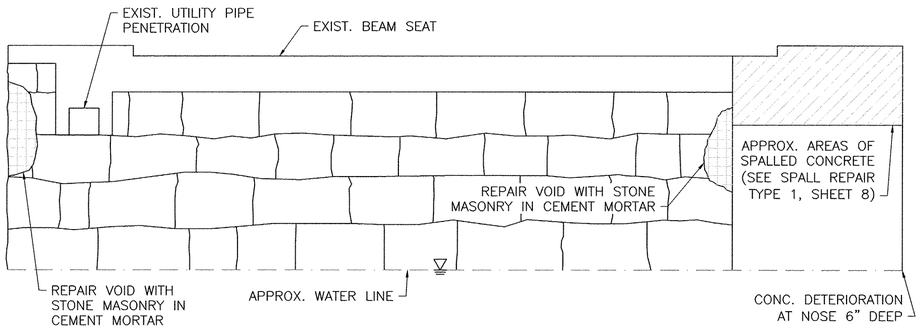
T0491_31_6-7_SUB REPAIRS.DWG Plotted on 27-Apr-2016 3:23 PM

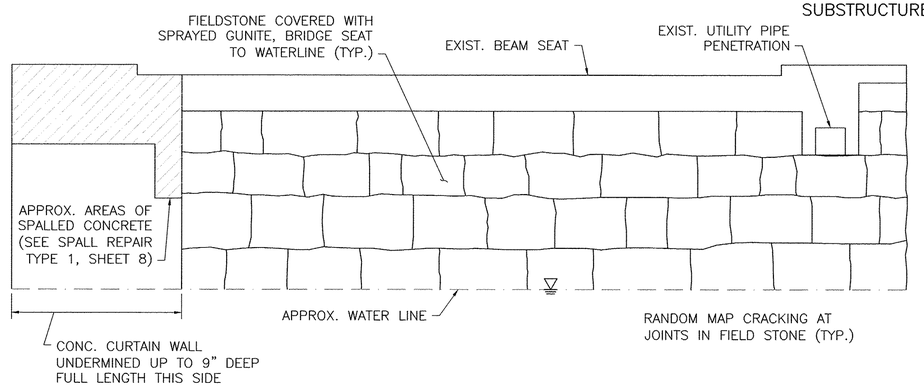
SUBSTRUCTURE REPAIRS

T0491_31_6-7_SUB REPAIRS.DWG Plotted on: 27-Apr-2016 3:23 PM



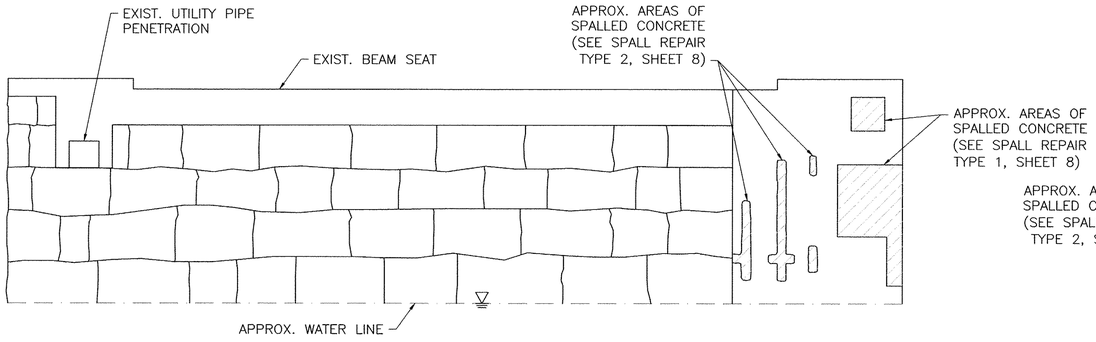
PIER 3 WEST FACE

SCALE: $\frac{1}{4}$"=1'–0"



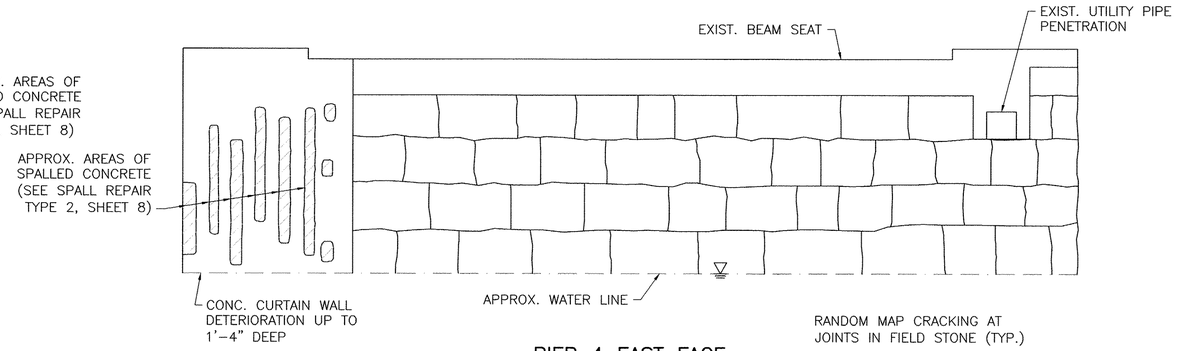
PIER 3 EAST FACE

SCALE: $\frac{1}{4}$"=1'–0"



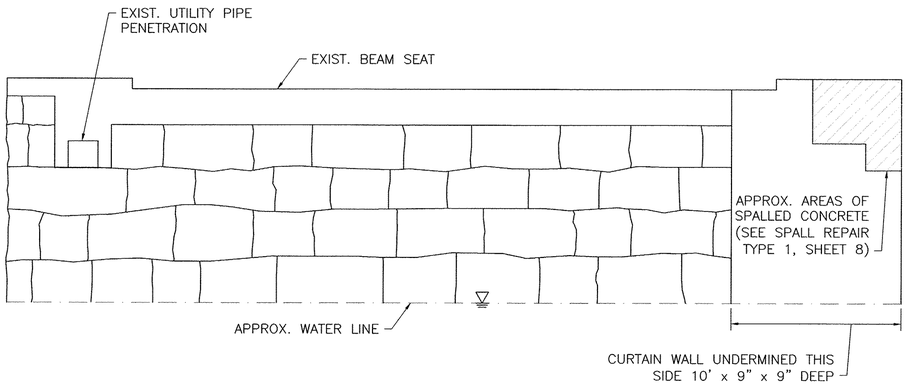
PIER 4 WEST FACE

SCALE: $\frac{1}{4}$"=1'–0"



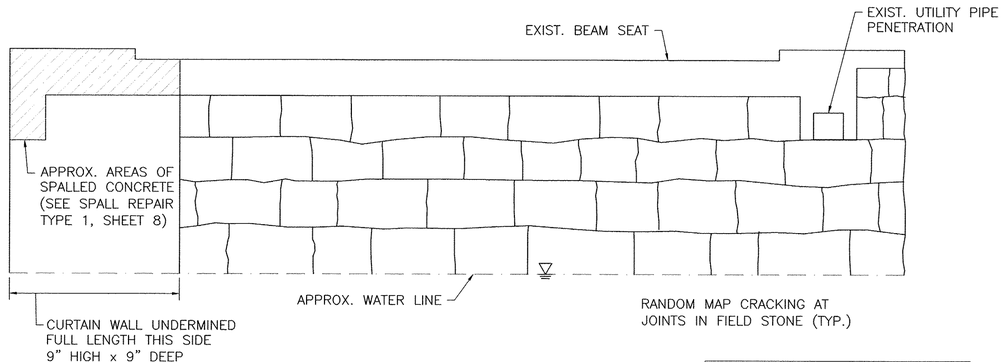
PIER 4 EAST FACE

SCALE: $\frac{1}{4}$"=1'–0"



PIER 5 WEST FACE

SCALE: $\frac{1}{4}$"=1'–0"



PIER 5 EAST FACE

SCALE: $\frac{1}{4}$"=1'–0"

ESTIMATED QUANTITIES*	
REPAIR TYPE 1	650 SF
REPAIR TYPE 2	1,500 SF
MASONRY REPAIRS	1,000 SF

*QUANTITIES ARE NOT GUARANTEED. CONTRACTOR SHALL V.I.F. ALL QUANTITIES BEFORE COMMENCEMENT OF WORK.

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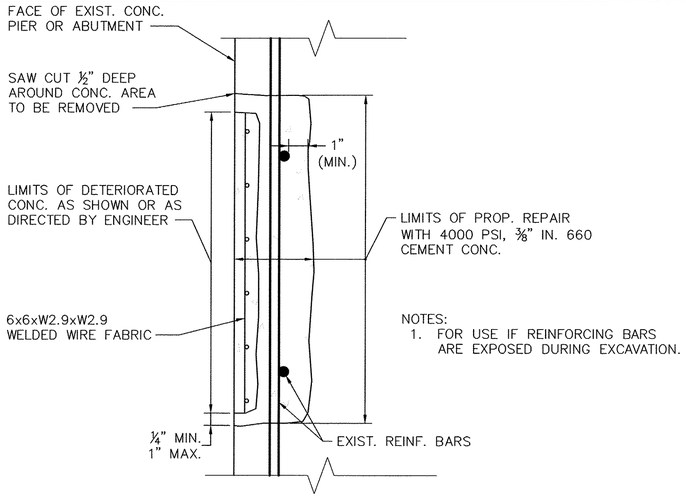
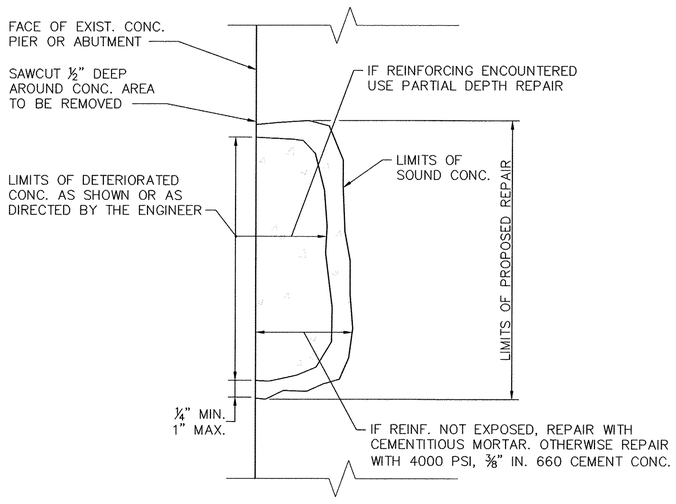


REPAIR TYPE I – PARTIAL DEPTH

SCALE: N.T.S.



REPAIR TYPE II – SHALLOW DEPTH

SCALE: N.T.S.

SURFACE PREPARATION FOR CONCRETE REPAIRS:

1. EXTENT, LOCATION, AND REPAIR TYPE OF ALL CONCRETE REPAIRS TO BE FIELD VERIFIED AND APPROVED BY THE ENGINEER AFTER CONTRACTOR HAS SOUNDED AND MARKED OUT ALL REPAIR AREAS. REPAIR CONFIGURATIONS SHOULD BE KEPT AS SIMPLE AS POSSIBLE, PREFERABLY WITH SQUARE CORNERS.

2. SAW CUT ALONG NEAT LINES AROUND REPAIR AREA PRIOR TO CONCRETE EXCAVATION. USE SAW CUT DEPTH OF ½" OR LESS AS REQUIRED TO AVOID CUTTING REINFORCING STEEL.

TYPE 1 REPAIR:

3. REMOVE DETERIORATED AND DELAMINATED CONCRETE, UNDERCUT EXPOSED REINFORCING STEEL TO PROVIDE MINIMUM CLEARANCE AROUND BARS, REMOVE ADDITIONAL CONCRETE AS REQUIRED TO PROVIDE MINIMUM REQUIRED THICKNESS OR REPAIR MATERIAL. NOTE: IF REINFORCING BARS ARE NOT EXPOSED AFTER REMOVING DETERIORATED CONCRETE, REPAIR USING CEMENTITIOUS MORTAR.

4. IF DURING REMOVAL OF DETERIORATED CONCRETE, THE CONTRACTOR DAMAGES EXISTING REINFORCEMENT TO THE EXTENT REQUIRING REPLACEMENT, ANY ADDITIONAL CONCRETE REMOVAL, PATCHING MATERIAL, CLEANING EXISTING REINFORCING STEEL, AND FURNISHING AND INSTALLING REPLACEMENT REINFORCING STEEL SHALL BE AT THE CONTRACTOR'S EXPENSE.

5. REINFORCEMENT, INCLUDING WELDED WIRE FABRIC, USED TO REPLACE EXISTING DETERIORATED REINFORCING STEEL (SECTION LOSS OF 15% OR MORE OF THE ORIGINAL CROSS SECTION, AS DETERMINED BY THE ENGINEER) SHALL BE EPOXY COATED. COST OF REPLACEMENT SHALL BE INCLUDED IN THE RESPECTIVE REPAIR ITEMS.

6. REMOVE ALL RUST FROM EXPOSED REINFORCING STEEL BY HAND. SANDBLASTING, HIGH–PRESSURE WATER, NOR CHEMICAL CLEANING SHALL NOT BE PERMITTED.

7. AFTER PATCH REMOVALS AND EDGE PREPARATIONS ARE COMPLETE, REMOVE BOND INHIBITING MATERIALS (DIRT, GREASE, LOOSELY BONDED AGGREGATE). CHECK THE CONCRETE SURFACES AFTER CLEANING TO INSURE THAT SURFACE IS FREE FROM ADDITIONAL LOOSE AGGREGATE OR THAT ADDITIONAL DELAMINATIONS ARE NOT PRESENT.

8. ALL EXISTING SURFACES THAT WILL HAVE NEW CONCRETE CAST AGAINST IT MUST BE ROUGHENED TO A MINIMUM AMPLITUDE OF ¼".

TYPE 2 REPAIR:

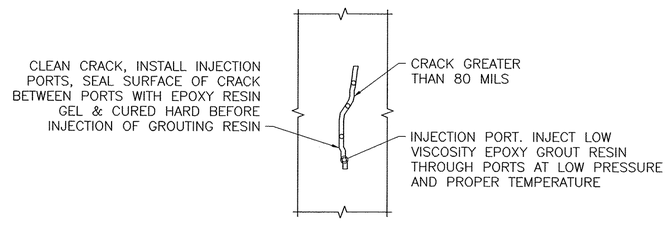
9. CONCRETE REPAIR WORK INCLUDES REMOVING ALL DETERIORATED, LOOSE, SPALLED, POPCORNED AND MAP CRACKED CONCRETE, CONCRETE WHICH HAS SPALLED OR OTHERWISE DETERIORATED ADJACENT TO SURFACE CRACK SHALL BE REPAIRED. REINFORCING STEEL REPAIR WORK INCLUDES REPLACEMENT OF DETERIORATED REINFORCING, AND CLEANING OF EXPOSED SURFACE AND REINFORCING BARS AS DIRECTED BY THE ENGINEER.

10. CRACKS THAT ARE 80 MILS OR GREATER IN WIDTH SHALL BE REPAIRED BY EPOXY INJECTION CRACK REPAIR.

11. THOROUGHLY PRE–WET CONCRETE REPAIR AREA FOR 24 HOURS PRIOR TO REPAIR CONCRETE PLACEMENT. SUBSTRATE SHALL BE SATURATED SURFACE DRY (SSD) WITH NO STANDING WATER AT TIME OF REPAIR CONCRETE PLACEMENT.

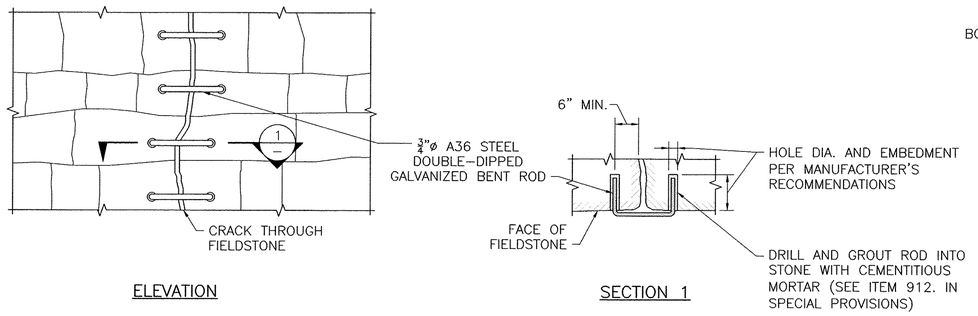
12. PLACEMENT AND SUBSEQUENT CURING SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

NOTE: CONTRACTOR TO PROVIDE NECESSARY PROTECTIVE MEASURES TO PREVENT DEBRIS FROM ENTERING THE RESOURCE AREA DURING ALL REPAIRS.



CONCRETE CRACK REPAIR DETAIL

N.T.S.

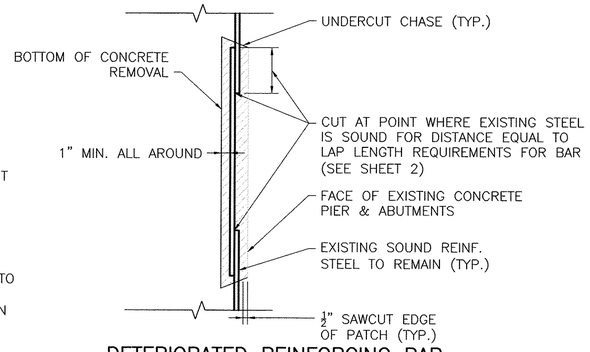


ELEVATION

SECTION 1

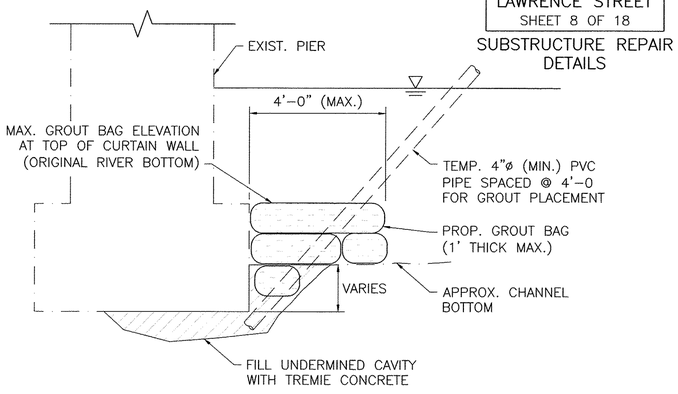
SUBSTRUCTURE MASONRY CRACK REPAIR DETAIL

N.T.S.



DETERIORATED REINFORCING BAR REPAIR DETAIL (TYP.)

N.T.S.



SUBSTRUCTURE REPAIR DETAILS

NOTE: DETAIL SHOWN FOR CONCEPT PURPOSES ONLY. MAGNITUDE OF SCOUR & UNDERMINING VARIES AROUND PIER 5 & THE EAST ABUTMENT. LIMITS OF PIER AND ABUTMENT UNDERMINING TO BE REPAIRED SHALL BE DETERMINED BY THE CONTRACTOR AND FIELD VERIFIED AND APPROVED BY THE ENGINEER.

PIER UNDERMINING REPAIR DETAIL

N.T.S.

PIER UNDERMINING REPAIR PROCEDURE

1. DETAIL APPLICABLE FOR REPAIRING LOCAL UNDERMINING OBSERVED AT PIER 5 AND THE EAST ABUTMENT.

2. A COFFERDAM SHALL BE CONSTRUCTED FROM GROUT BAGS AS REQUIRED, GENERALLY AND TO THE LIMITS AS SHOWN TO RETAIN THE TREMIE CONCRETE. THE COFFERDAM SHALL ENCOMPASS ALL AREAS AROUND PIER 5 AND THE EAST ABUTMENT THAT EXPERIENCE UNDERMINING.

3. TREMIE CONCRETE SHALL BE PLACED IN A SINGLE PLACEMENT. THE TOP LEVEL OF THE CONCRETE SHALL BE BROUGHT UP TO THE TOP OF THE GROUT BAG COFFERDAM AT THE COMPLETION OF THE PLACEMENT. CONCRETE SHALL NOT BE PLACED ABOVE THE TOP OF THE PIER/ABUTMENT FOOTINGS (I.E. THE ORIGINAL RIVER BOTTOM).

4. CONCRETE SHALL BE PLACED SLOWLY TO ALLOW SUFFICIENT TIME FOR IT TO FLOW INTO THE SCOUR HOLE AND ALSO TO RESIST THE CONCRETE MIXING WITH THE RIVER WATER.

5. THE CONCRETE MIX SHALL BE A MASSDOT APPROVED 4000 PSI, ⅜" MAX AGGREGATE MIX DESIGN WITH AN ANTI–WASHOUT AGENT AND SHALL HAVE AN 8" SLUMP. TREMIE CONCRETE SHALL CONFORM TO MASSDOT STANDARD SPECIFICATION SECTION 901.63.D.

6. IT SHALL BE PERMISSIBLE TO ADD WATER IN THE MIX TRUCK TO IMPROVE FLOWABILITY AS NECESSARY.

7. CONCRETE PLACEMENT SHALL BE PERFORMED WITH A CONCRETE PUMP TRUCK FITTED WITH A FLEXIBLE TREMIE PIPE CAPABLE OF REACHING UNDER THE BRIDGE. THE CONCRETE PUMP SHALL BE LOCATED NO CLOSER THAN 15 FEET BEHIND THE ABUTMENT.

8. ONCE THE FLOW CHARACTERISTICS OF THE CONCRETE ARE SATISFACTORY, PLACEMENT SHALL BE CONTINUOUS AND SHALL PROCEED AT A PACE WHICH WILL ALLOW THE CONCRETE TO FILL THE VOIDS UNDER AND AROUND THE PIER.

9. THE GROUT BAG COFFERDAM SHALL REMAIN IN PLACE AND TO ACT AS A PERMANENT TOE FOR THE TREMIE PLACEMENT.

10. ALL IN–STREAM WORK SHALL OCCUR ONLY BETWEEN JUNE 30 AND SEPTEMBER 1, PER THE ARMY CORPS OF ENGINEERS GENERAL PERMIT.

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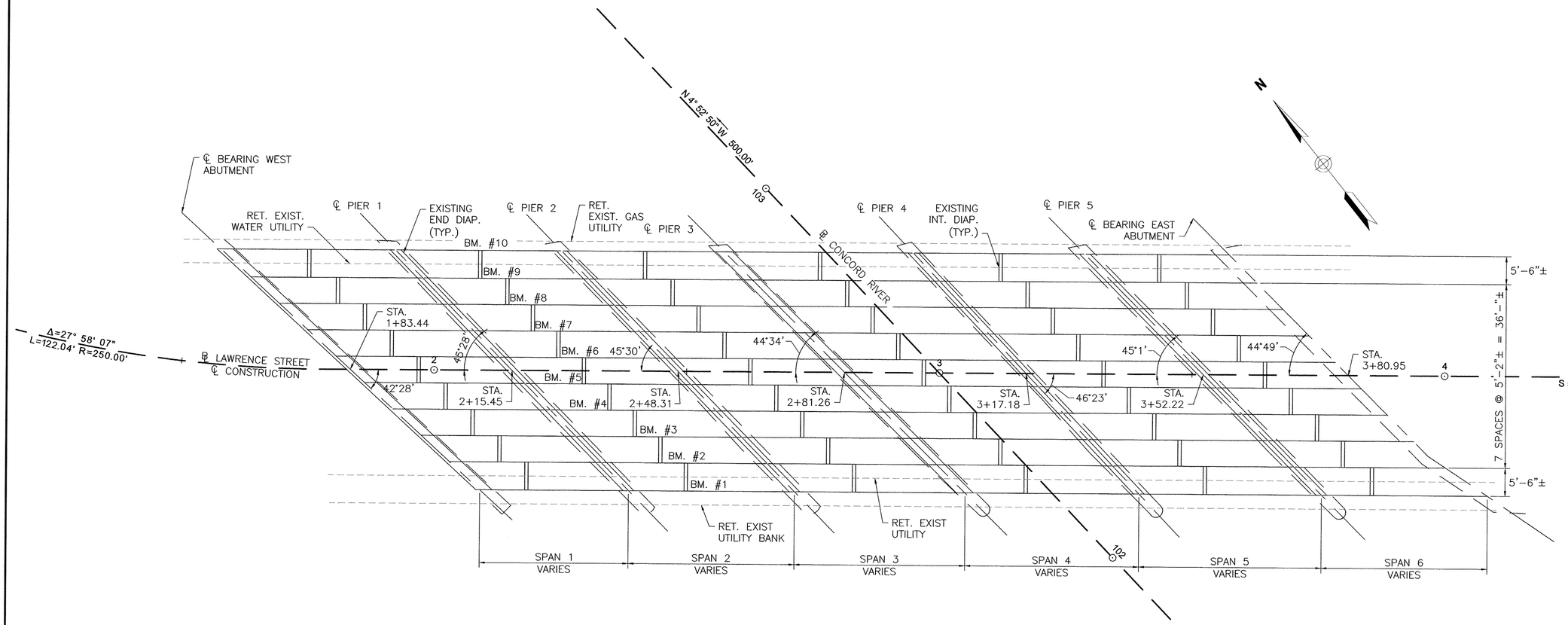
FRAMING PLAN



EXISTING FRAMING PLAN

SCALE: $\frac{3}{32}$"=1'-0"

NOTES:

1. BEAM LENGTHS VARY ALONG EACH SPAN. SEE EXISTING BRIDGE PLANS FOR EACH SPAN LENGTH.
2. EXISTING PLANS SHOW 4" BETWEEN BEAMS AT PIERS 1, 2, 4, AND 5. EXISTING PLANS SHOW 1" BETWEEN BEAMS AT PIER 3.
3. SEE EXISTING PLANS FOR BEAM AND DIAPHRAGM CROSS SECTIONS.
4. UTILITY SUPPORT LOCATIONS ARE APPROXIMATE AND SHOULD BE VERIFIED IN FIELD.

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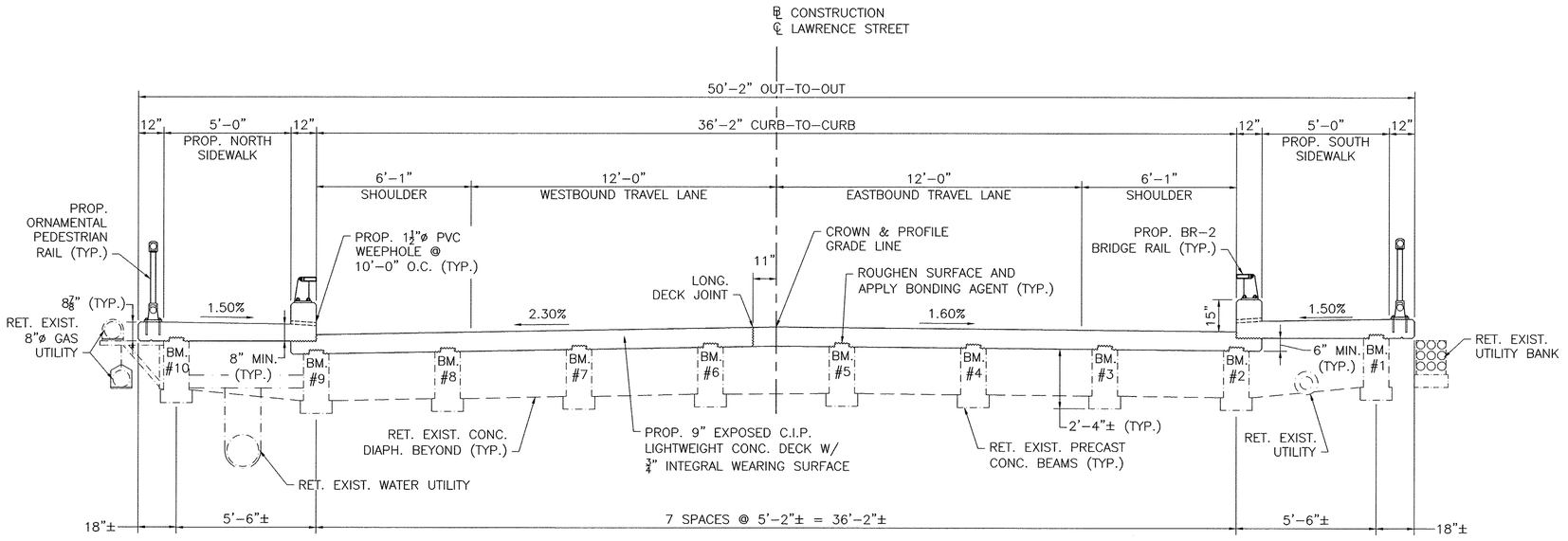
SHEET 9 OF 18 SHEETS BRIDGE NO. L-15-031 (2BQ)

T0491_31_S-10_TRANSVERSE SECTION.DWG Plotted on 27-Apr-2016 3:24 PM

TRANSVERSE SECTIONS
& DETAILS

T0491_31_9-10_TRANSVERSE SECTION.DWG Plotted on: 27-Apr-2016 3:24 PM



TRANSVERSE SECTION

SCALE: ⅜"=1'–0"

TRANSVERSE SECTON NOTES:

1. CROSS SLOPE AT APPROACH ROADWAY VARIES FROM THAT SHOWN ON THE TRANSVERSE SECTION TO EXISTING AT LIMITS OF APPROACH ROADWAY WORK (SEE PLAN).
2. CONTRACTOR SHALL UNIFORMLY TRANSITION APPROACH GRADE FROM PROPOSED TO MEET EXISTING GRADE AT THE LIMITS SHOWN ON THE PLANS.
3. SEE KEY PLAN FOR LIMITS OF APPROACH SIDEWALKS TO BE REPAIRED. WIDTH OF SIDEWALK VARIES FROM 7 FEET AT THE BRIDGE TO MEET EXISTING.

PAVEMENT NOTES:

FULL–DEPTH PAVEMENT SECTION:

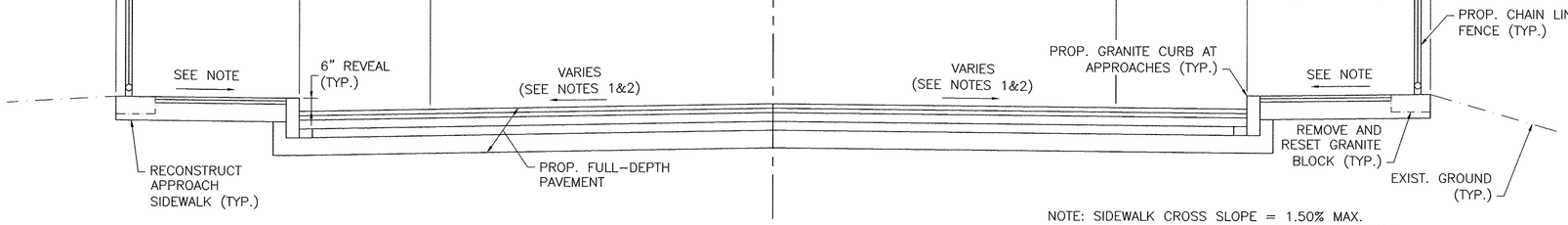
1.5" SUPERPAVE SURFACE COURSE 12.5 (SSC–12.5) OVER
2.25" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC–12.5) OVER
4" SUPERPAVE BASE COURSE 37.5 (SBC 37.5) OVER
4" (LIFTS AS REQUIRED TO FILL TO EXISTING APPROACH SLAB)
DENSE GRADED CRUSHED STONE

PAVEMENT OVER APPROACH SLAB SECTION:

1.5" SUPERPAVE SURFACE COURSE 12.5 (SSC–12.5) OVER
1.5" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC–12.5)

PROPOSED HMA SIDEWALK

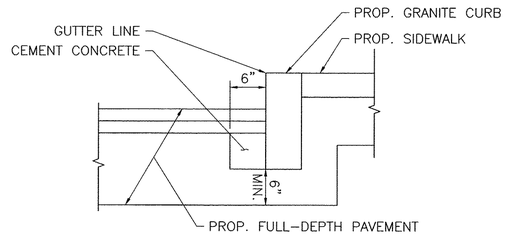
1.25" SUPERPAVE SURFACE COURSE 12.5 (SSC–12.5) OVER
1.5" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC–12.5) OVER
8" GRAVEL BORROW, TYPE b (COMPACTED)



ROADWAY APPROACH SECTION

SCALE: ⅜"=1'–0"

NOTE: SIDEWALK CROSS SLOPE = 1.50% MAX.
TRANSITION TO MEET EXISTING APPROACH SIDEWALK.



GRANITE CURB IN FULL–DEPTH PAVEMENT

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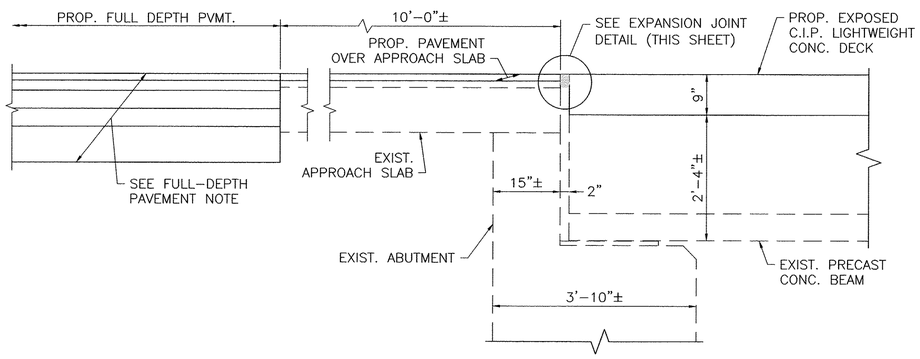
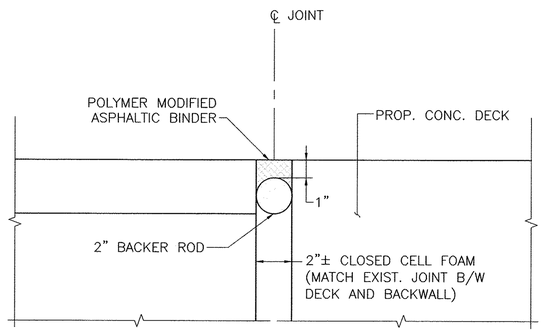


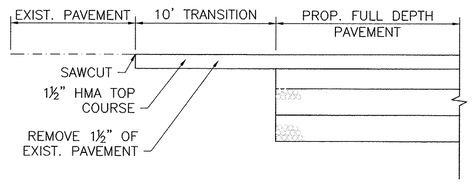
ROADWAY APPROACH SECTION

SCALE: ¾"=1'–0"



EXPANSION JOINT DETAIL

SCALE: 3" = 1'–0"



LONGITUDINAL SECTION

FULL–DEPTH PAVEMENT TRANSITION

N.T.S.

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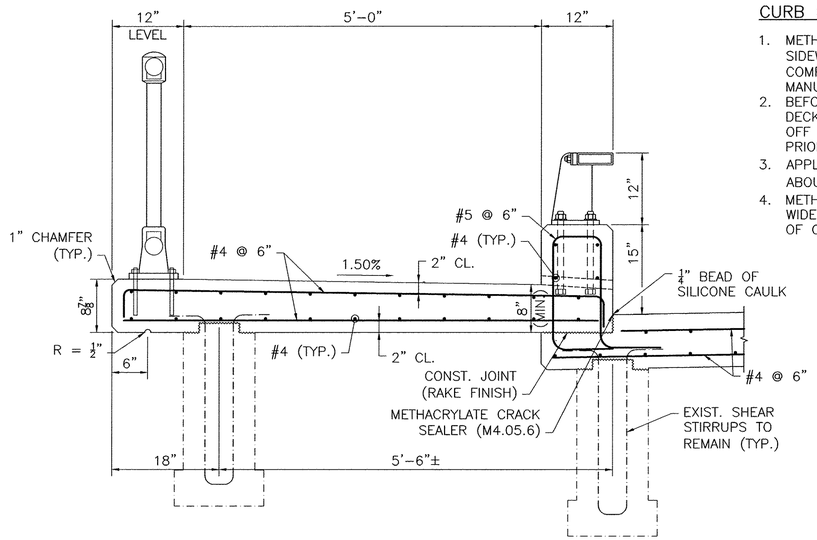
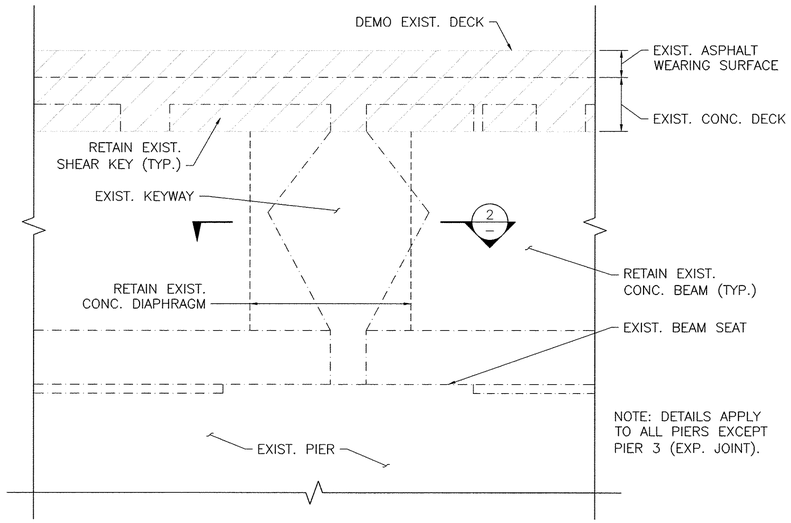
DECK DETAILS



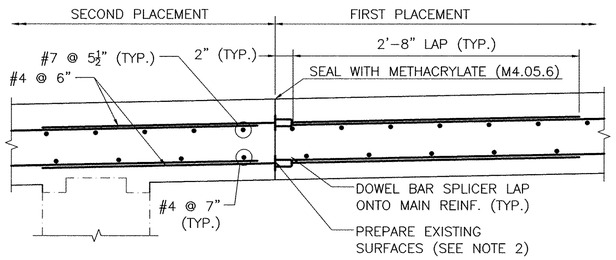
SECTION THRU SIDEWALK & BR-2 BRIDGE RAIL
SCALE: 1"=1'-0"

CURB NOTES:

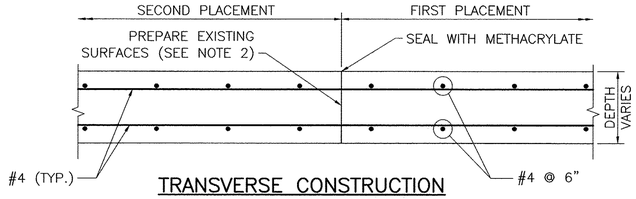
1. METHACRYLATE CRACK SEALER SHALL BE APPLIED AFTER SIDEWALK OR SAFETY CURB/BARRIER CURING PERIOD IS COMPLETE AND IN ACCORDANCE WITH REQUIREMENTS OF MANUFACTURER AND THE STANDARD SPECIFICATIONS.
2. BEFORE SEALING, THE CONCRETE AT THE INTERFACE OF DECK AND CURB SHALL BE SWEPT CLEAN AND BLOWN OFF USING OIL FREE COMPRESSED AIR IMMEDIATELY PRIOR TO APPLYING THE SEALER.
3. APPLY 1/4" HIGH BEAD OF SILICONE CAULKING COMPOUND ABOUT 1/4" FROM THE FACE OF CURB.
4. METHACRYLATE SHALL THEN BE POURED INTO THE 1/4" WIDE GAP BETWEEN THE FACE OF CURB AND THE BEAD OF CAULK.



TYPICAL CONCRETE DECK DEMOLITION @ PIER
SCALE: 1 1/2"=1'-0"



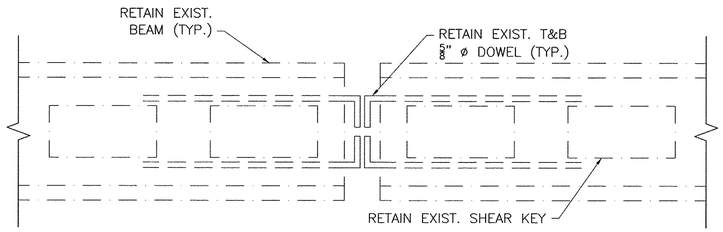
LONGITUDINAL CONSTRUCTION JOINT DETAIL IN DECK SLAB
SCALE: 1 1/2" = 1'-0"



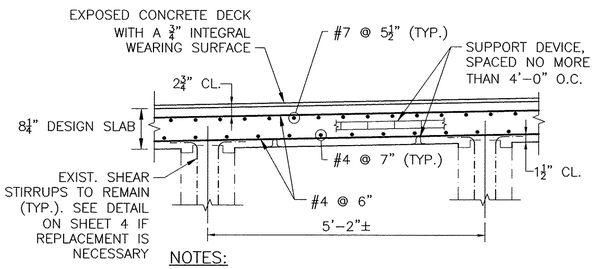
TRANSVERSE CONSTRUCTION JOINT DETAIL IN SIDEWALK
SCALE: 1 1/2" = 1'-0"

NOTE:

1. LONGITUDINAL LAP LENGTHS SHALL BE 2'-8".



SECTION 2
SCALE: 1 1/2" =1'-0"



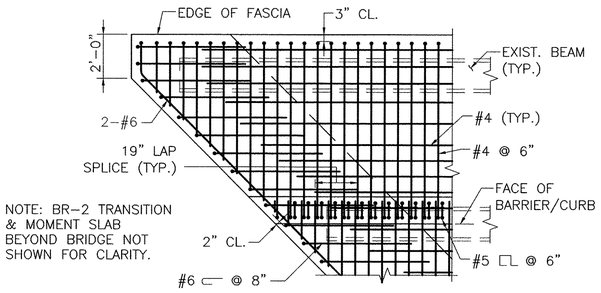
NOTES:

1. ROADWAY DECK SLAB SHALL BE 4000 PSI, 3/4 IN, 585 HP LIGHTWEIGHT CEMENT CONCRETE.
2. LONGITUDINAL REINFORCEMENT SHALL BE PLACED PARALLEL TO THE ℄ OF CONSTRUCTION. TRANSVERSE (PRIMARY) REINFORCEMENT SHALL BE PLACED PERPENDICULAR TO THE ℄ OF CONSTRUCTION.
3. ALL REINFORCEMENT AND SUPPORT DEVICES SHALL BE COATED.
4. BRIDGE DECK SHALL BE GROOVED TRANSVERSELY USING MULTI-BLADED SELF-PROPELLED SAWCUTTING EQUIPMENT.

TYPICAL DECK REINFORCEMENT
SCALE: 3/4" = 1'-0"

CONSTRUCTION JOINT NOTES:

1. THE CONTRACTOR SHALL PLACE EACH STAGE OF THE DECK IN ONE CONTINUOUS OPERATION WITHOUT TRANSVERSE CONSTRUCTION JOINTS. THE INITIAL SET (Fc = 500 PSI) OF ALL CONCRETE SHALL NOT OCCUR UNTIL AFTER THE COMPLETION OF THE PLACEMENT. AN APPROVED RETARDER SHALL BE USED, WHEN NECESSARY, TO RETAIN THE WORKABILITY OF THE CONCRETE.
2. THE SURFACE OF THE PREVIOUSLY CAST CONCRETE SHALL BE BLAST CLEANED, ROUGHENED, WETTED WITH CLEAN WATER, AND THEN FLUSHED WITH A MORTAR COMPOSED OF EQUAL PARTS OF THE CEMENT AND SAND SPECIFIED FOR THE NEW CONCRETE, BEFORE NEW CONCRETE IS PLACED ADJACENT THERETO. NEW CONCRETE SHALL BE PLACED BEFORE MORTAR HAS TAKEN INITIAL SET.
3. IN LIEU OF THE MORTAR, AN EPOXY ADHESIVE SUITABLE FOR BONDING FRESH CONCRETE TO HARDENED CONCRETE FOR LOAD BEARING APPLICATIONS MAY BE USED. THE EPOXY ADHESIVE SHALL CONFORM TO AASHTO M 235 TYPE V AND SHALL BE APPLIED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
4. DOWEL BAR SPLICERS SHALL BE USED WHERE USE OF LAP SPLICES IS NOT FEASIBLE.
5. LONGITUDINAL JOINT IN SIDEWALK SHOULD BE SQUARE TO THE FACE OF BR-2 RAIL PEDESTAL.



NOTE: BR-2 TRANSITION & MOMENT SLAB BEYOND BRIDGE NOT SHOWN FOR CLARITY.

PLAN AT ACUTE CORNER
SCALE: 3/8" = 1'-0"

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
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MASS. GEN. LAWS CH 85 S 35
BRIDGE ENGINEER — DATE 5/3/16

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T0491_31_11_DECK DETAILS.DWG Plotted on 27-Apr-2016 4:07 PM

TOP OF FORM DETAILS

TOP OF FORM ELEVATIONS FOR DECK
SLAB PRIOR TO PLACEMENT OF CONCRETE

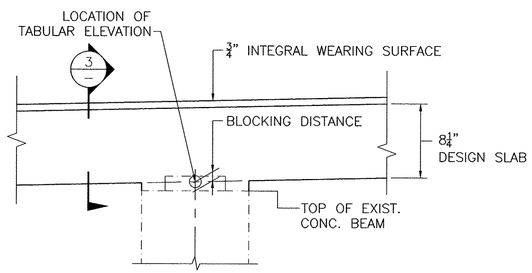
INCREASING STATIONS →

BEAM NO.	SPAN 1									SPAN 2								SPAN 3							
	℄ BRG.	1/8 PT.	1/4 PT.	3/8 PT.	1/2 PT.	5/8 PT.	3/4 PT.	7/8 PT.	℄ PIER 1	1/8 PT.	1/4 PT.	3/8 PT.	1/2 PT.	5/8 PT.	3/4 PT.	7/8 PT.	℄ PIER 2	1/8 PT.	1/4 PT.	3/8 PT.	1/2 PT.	5/8 PT.	3/4 PT.	7/8 PT.	℄ PIER 3
1																									
2																									
3																									
4																									
5																									
6																									
7																									
8																									
9																									
10																									

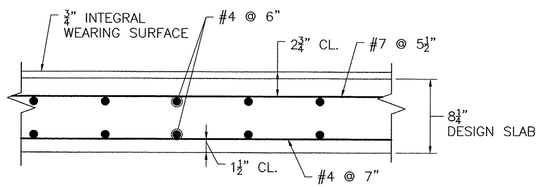
TOP OF FORM ELEVATIONS FOR DECK
SLAB PRIOR TO PLACEMENT OF CONCRETE

INCREASING STATIONS →

BEAM NO.	SPAN 4								SPAN 5								SPAN 6							
	1/8 PT.	1/4 PT.	3/8 PT.	1/2 PT.	5/8 PT.	3/4 PT.	7/8 PT.	℄ PIER 4	1/8 PT.	1/4 PT.	3/8 PT.	1/2 PT.	5/8 PT.	3/4 PT.	7/8 PT.	℄ PIER 5	1/8 PT.	1/4 PT.	3/8 PT.	1/2 PT.	5/8 PT.	3/4 PT.	7/8 PT.	℄ BRG.
1																								
2																								
3																								
4																								
5																								
6																								
7																								
8																								
9																								
10																								



HAUNCH DETAIL



SECTION 3

FORM NOTES:

1. AFTER THE DECK IS REMOVED BUT BEFORE THE FORMS ARE INSTALLED, THE ELEVATIONS ON TOP OF THE BEAMS ARE TO BE OBTAINED AT THE POINTS INDICATED IN THE TABLE. THE DIFFERENCE BETWEEN THE ELEVATIONS OBTAINED AND THOSE SHOWN IN THE TABLE GIVES THE ACTUAL BLOCKING DISTANCE FROM THE TOP OF BEAM TO THE BOTTOM OF THE SLAB AT CENTER LINE OF BEAM.
2. TOP OF FORM ELEVATIONS SHALL BE RECORDED ON THE APPROPRIATE SPACES PROVIDED ON THE TABLE ABOVE ONCE FIELD MEASUREMENTS HAVE BEEN OBTAINED THROUGH SURVEY DURING CONSTRUCTION.
3. BLOCKING DISTANCE (VARIABLE) WILL BE FURNISHED BY THE ENGINEER WITHIN 7 WORKING DAYS FROM THE TIME THE EXISTING DECK IS REMOVED AND TOP OF BEAM ELEVATIONS ARE PROVIDED BY THE CONTRACTOR.

REMOVABLE FORM DETAILS
NOT TO SCALE

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BRIDGE ENGINEER 5/3/16 DATE

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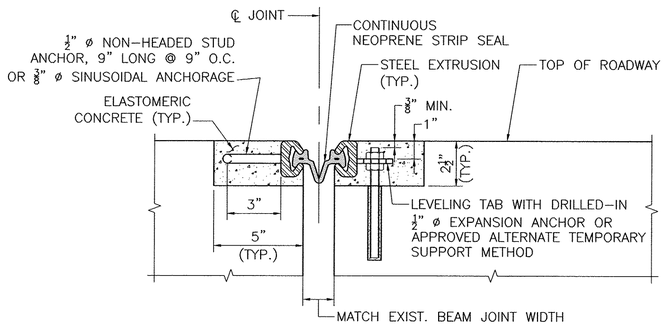
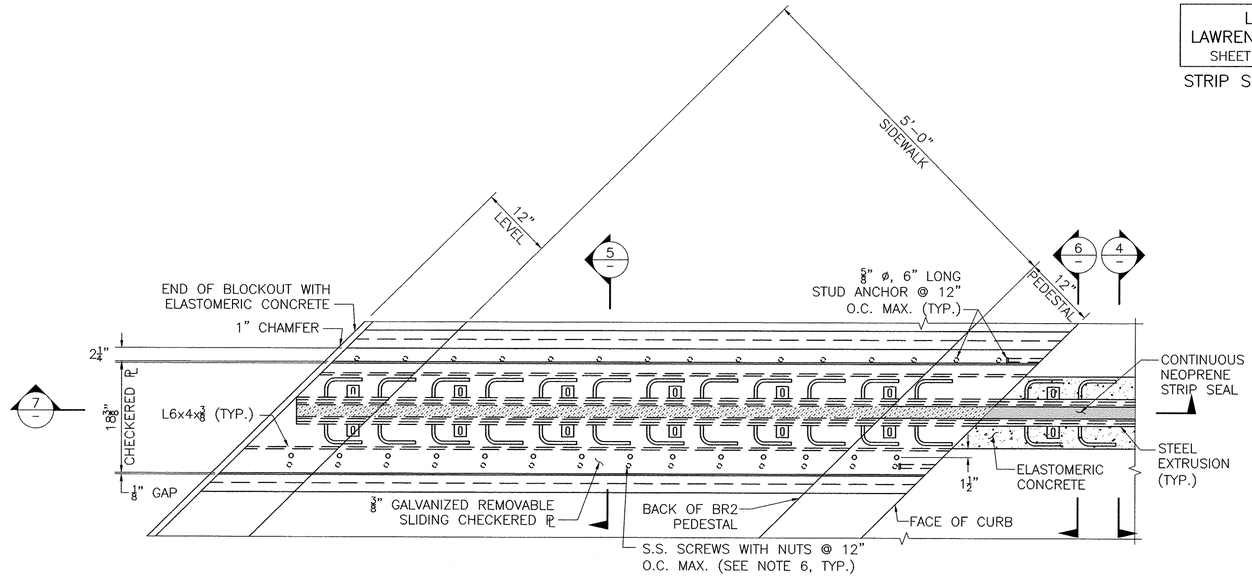
T0491_31_12_TOP OF FORM DETAILS.DWG Plotted on: 27-Apr-2016 3:28 PM

STRIP SEAL DETAILS

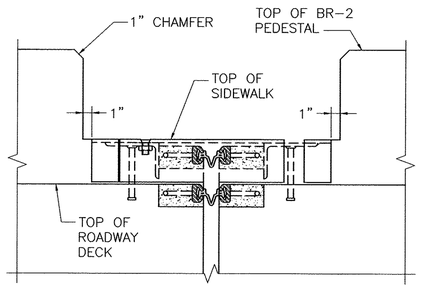


AT ANCHOR LOCATION AT TEMPORARY SUPPORT LOCATION

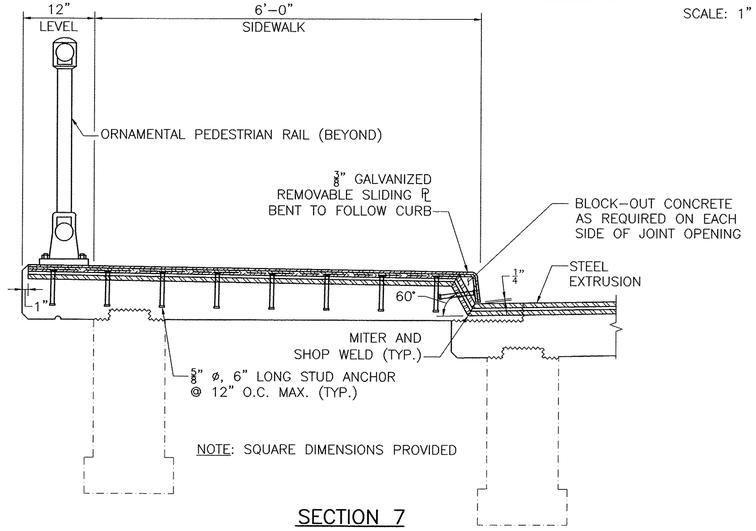
SECTION 4
SCALE: 3" = 1'–0"



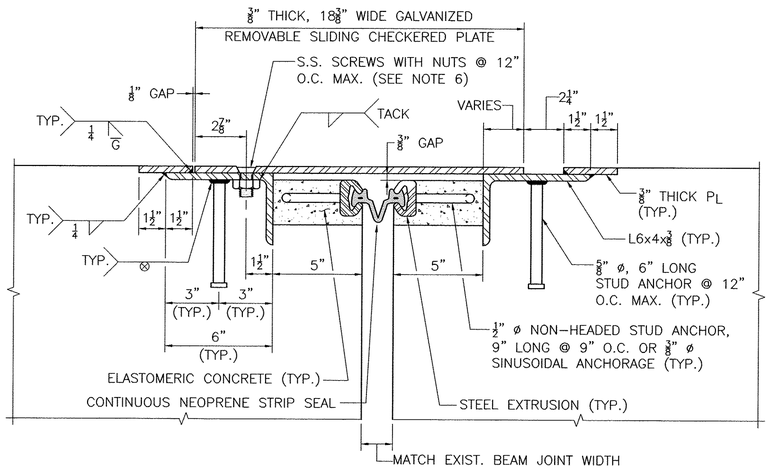
PLAN – STRIP SEAL JOINT AT SIDEWALK
SCALE: 1" = 1'–0"



SECTION 6
SCALE: 1½" = 1'–0"



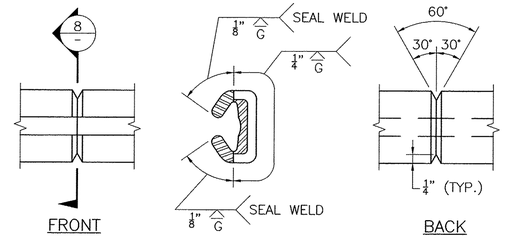
SECTION 7
SCALE: 1" = 1'–0"



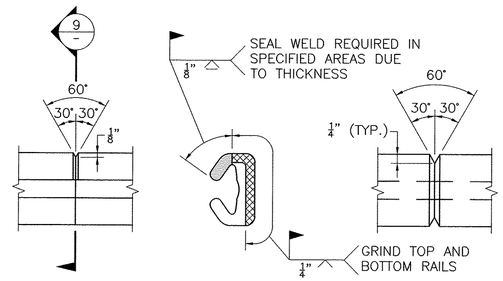
SECTION 5
SCALE: 3" = 1'–0"

STRIP SEAL JOINT NOTES:

1. THE DETAILS SHOWN HERE ARE INTENDED AS A GENERAL GUIDE FOR A TYPICAL GLANDULAR TYPE STRIP SEAL JOINT SYSTEM. SHOP DRAWINGS WHICH INCLUDE DETAILS OF THE GLAND SHAPE, STEEL EXTRUSION SHAPE, WELDING PROCEDURE SPECIFICATIONS, ANCHOR ARRANGEMENT, TEMPERATURE CORRECTION REQUIREMENTS, AND TEMPORARY SUPPORT DETAILS SHALL BE SUBMITTED FOR APPROVAL OF THE ENGINEER ACCORDING TO THE STANDARD SPECIFICATIONS.
2. ALL STRUCTURAL STEEL COMPONENTS SHALL CONFORM TO AASHTO M270 GRADE 36. AFTER THE COMPLETION OF ALL WELDING OPERATIONS STEEL PLATE ASSEMBLIES SHALL BE HOT–DIP GALVANIZED.
3. ELASTOMERIC CONCRETE BLOCKOUT SHALL BE SANDBLASTED, CLEANED WITH COMPRESSED OIL LESS AIR, AND PRIMED WITH BONDING COMPOUND PRIOR TO CASTING ELASTOMERIC CONCRETE.
4. NEOPRENE STRIP SEAL SHALL BE BONDED TO STEEL EXTRUSION WITH APPROVED ADHESIVE.
5. INSTALL CONTINUOUS NEOPRENE STRIP SEAL IN THE FIELD. SPLICING OF SEAL IS NOT PERMITTED. TEMPORARY SEAL SHALL BE REQUIRED ON STAGE CONSTRUCTION PROJECTS.
6. ¾" ø STAINLESS STEEL FLAT HEAD MACHINE SCREWS STAINLESS STEEL NUTS. RECESS 1/16" BELOW PLATE SURFACE. PRIOR TO PLACEMENT OF SIDEWALK/SAFETY CURB CONCRETE, LUBRICATE STAINLESS STEEL SCREWS WITH GRAPHITE AND SET SECURELY IN PLACE. MACHINE SCREWS TO BE TEMPORARILY REMOVED AFTER CONCRETE HAS ATTAINED FINAL SET.
7. NO WELDING OF PORTIONS OF STEEL EXTRUSIONS IN DIRECT CONTACT WITH NEOPRENE SEAL SHALL BE PERMITTED.



SECTION 8
STEEL EXTRUSION SHOP SPLICE DETAIL
SCALE: 6" = 1'–0"



SECTION 9
STEEL EXTRUSION FIELD SPLICE DETAIL
SCALE: 6" = 1'–0"

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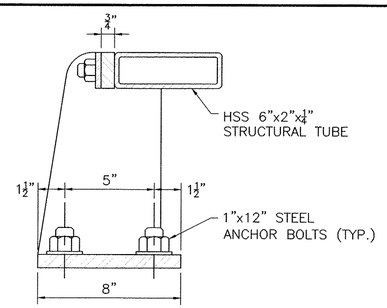
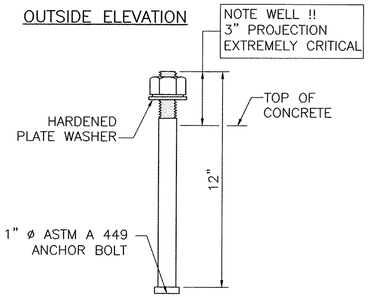
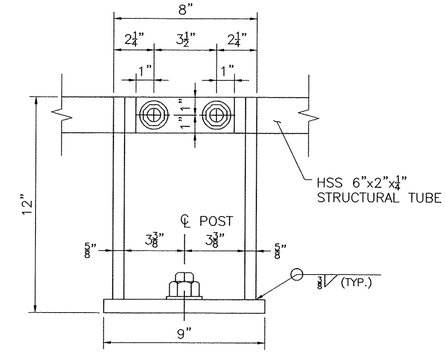
T0491_31_13_STRIP SEAL.DWG Plotted on 27-Apr-2016 3:27 PM



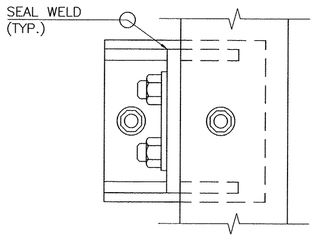
OUTSIDE ELEVATION



ANCHOR BOLT



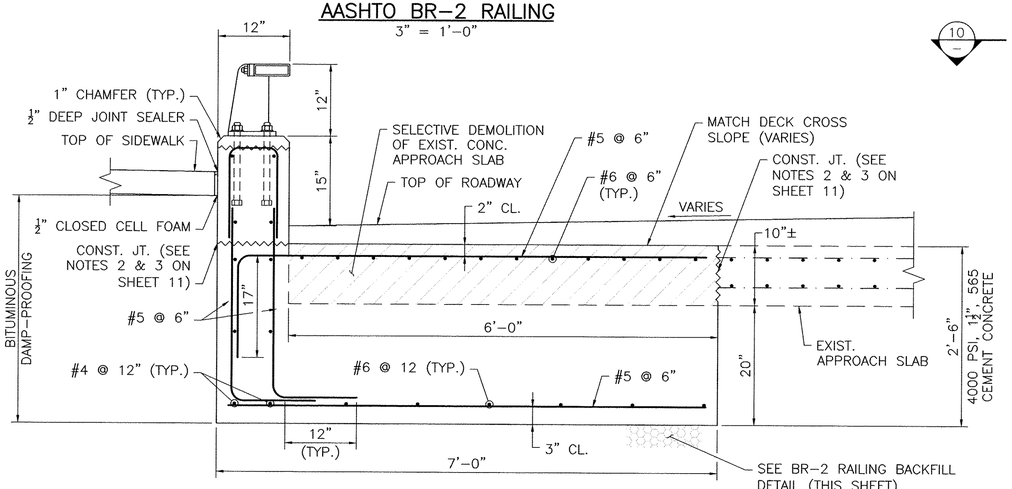
SECTION



PLAN

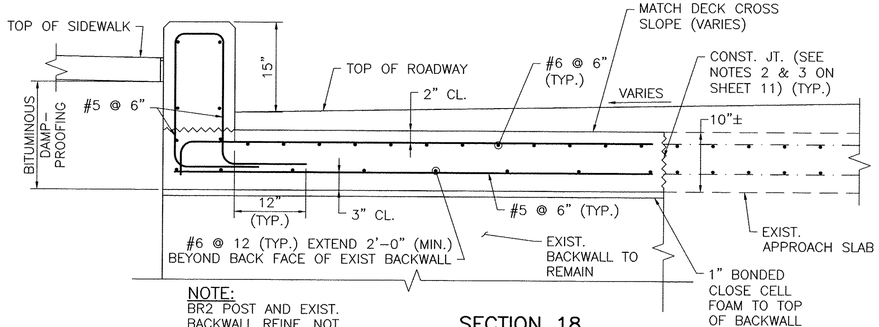
AASHTO BR–2 RAILING

3" = 1'–0"



SECTION 13

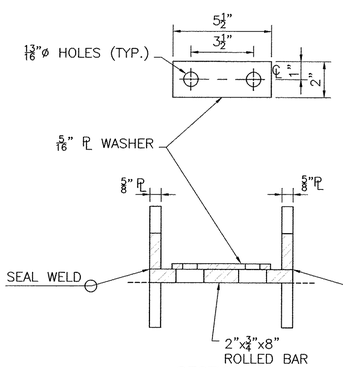
1" = 1'–0"



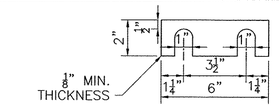
NOTE:
BR2 POST AND EXIST. BACKWALL REINF. NOT SHOWN FOR CLARITY

SECTION 18

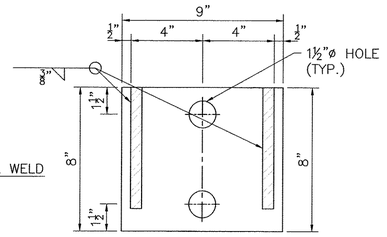
1" = 1'–0"



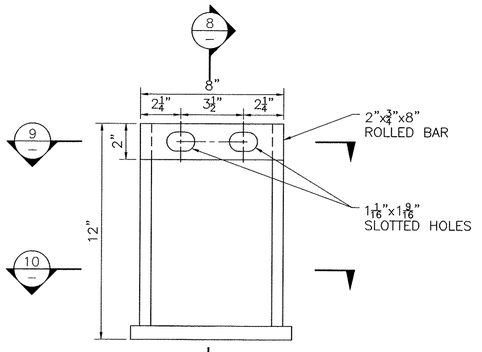
SECTION 9



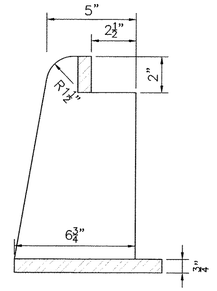
RAILING SHIM DETAIL



SECTION 10



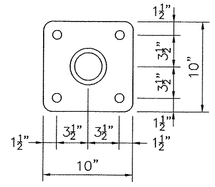
ELEVATION



SECTION 8

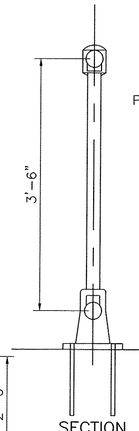
RAIL POST DETAILS

3" = 1'–0"

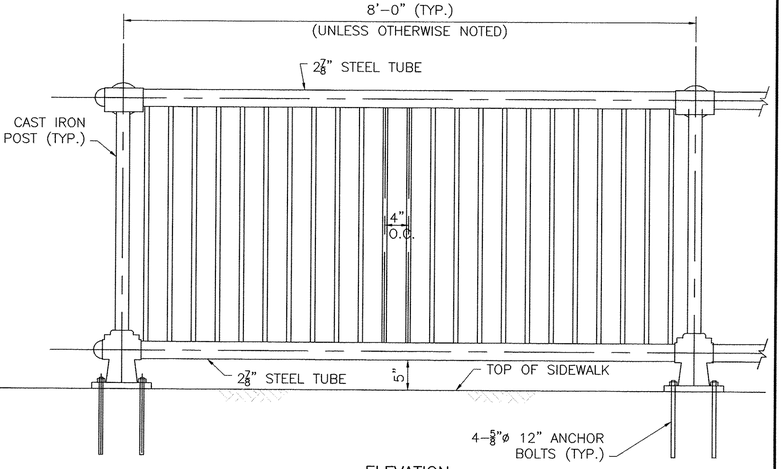


PLAN AT BASE

SCALE: 1½" = 1'–0"



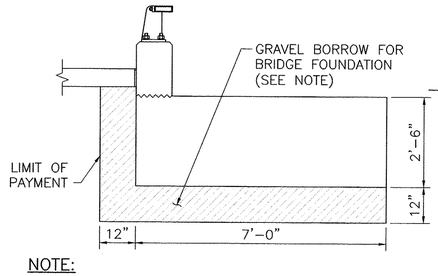
SECTION



ELEVATION

ORNAMENTAL PEDESTRIAN RAIL DETAIL

SCALE: 1" = 1'–0"



NOTE:
GRAVEL BORROW SHALL BE PLACED AND THOROUGHLY COMPACTED TO THE GRADE OF THE BOTTOM OF THE SLAB.

BR–2 RAILING BACKFILL

SCALE: ½" = 1'–0"

LOWELL
LAWRENCE STREET
SHEET 14 OF 18

RAILING DETAILS

ORNAMENTAL PEDESTRIAN RAILING NOTES:

1. ANCHOR BOLTS SHALL BE SET WITH TEMPLATES.
2. THE NUT SECURING THE POST BASE PLATE TO THE CONCRETE SHALL BE TIGHTENED A SNUG FIT, AND THEN GIVEN AN ADDITIONAL ⅛ TURN AFTER THE STEEL IS IN PLACE.
3. BOTTOM OF POST BASE PLATE TO BE SET ON A ⅛" MOLDED FABRIC BEARING PAD (M9.16.2). THE THICKNESS OF THE PAD SHALL BE IGNORED BY THE DETAILER.
4. POSTS SHALL BE SET PLUMB. RAILS SHALL BE PARALLEL TO THE PROFILE GRADE LINE.
5. MAXIMUM POST SPACING = 8'–0".
6. HORIZONTAL RAILING COMPONENTS ARE TO HAVE FIXED CONNECTIONS AT ONE POST AND SLIDING CONNECTIONS AT THE OTHER. EACH POST IS TO HAVE ALL SLIDING CONNECTIONS ON ONE SIDE AND HAVE ALL FIXED CONNECTIONS ON THE OTHER.
7. ENDS OF TUBE SECTIONS SHALL BE SAWED. GRIND SMOOTH EXPOSED EDGES. ALL CUT ENDS SHALL BE TRUE AND SMOOTH.
8. PROVIDE ¼"ø DRAIN HOLE IN RAILS AT LOW POINTS.
9. ALL STEEL SHAPES AND PLATES SHALL BE GALVANIZED AND PAINTED BLACK.
10. ALL STEEL, INCLUDING HEADS OF EXPOSED BOLTS, SHALL HAVE A FINISH COAT COLOR BLACK, FEDERAL COLOR ID #17038.

AASHTO BR–2 RAILING NOTES:

1. ALL RAILING IS TO BE FABRICATED AND ERECTED SO THAT THE RAIL IS PARALLEL TO THE CURBING. THE POSTS SHALL SET PERPENDICULAR TO THE PROFILE.
2. STRUCTURAL STEEL TUBING SHALL CONFORM TO THE REQUIREMENTS OF ASTM A 500 (GRADE B) AND SHALL BE GALVANIZED. REMAINING STRUCTURAL STEEL FOR BR–2 RAIL ASSEMBLY SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M270 (ASTM A 709) GRADE 36.
3. TUBING SHALL BE CONTINUOUS OVER A MINIMUM OF FOUR POSTS, IF POSSIBLE. SLEEVE SPLICES FOR THERMAL EXPANSION SHALL BE SPACED NO MORE THAN 50 FEET APART.
4. RAILS SHALL HAVE A TUBE SPLICE IN THE PANEL OVER THE BRIDGE EXPANSION JOINTS.
5. POSTS SHALL BE SET PERPENDICULAR TO GRADE.
6. STEEL NUTS, BOLTS, AND WASHERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A 325 SHALL BE GALVANIZED. ANCHOR BOLTS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A 449 AND SHALL BE GALVANIZED. STUDS FOR ATTACHMENT OF STRUCTURAL STEEL TUBE FOR RAILING SHALL CONFORM TO THE REQUIREMENTS OF ASTM A 108.
7. HIGH STRENGTH RODS THREADED BOTH ENDS WITH TWO HEX NUTS AND WASHERS (ALL GALVANIZED) MAY BE SUBSTITUTED FOR HIGH STRENGTH ANCHOR BOLTS.
8. ANCHOR BOLTS SHALL BE SET WITH TEMPLATES. THE NUT SECURING THE POST BASE PLATE TO THE CONCRETE SHALL BE TIGHTENED TO A SNUG FIT AND GIVEN AN ADDITIONAL 1/8 TURN AFTER STEEL IS IN PLACE.
9. WHERE GALVANIZING IS DAMAGED, THE DAMAGED AREAS SHALL BE THOROUGHLY CLEANED AND GIVEN ONE COAT OF ZINC DUST–OXIDE PAINT CONFORMING TO THE REQUIREMENTS FOR TYPE III AS SPECIFIED IN FEDERAL SPECIFICATION TT–P–641B.
10. WELDING SHALL CONFORM TO THE REQUIREMENTS OF ANSI/AASHTO/AWS D.1.5, EXCEPT THAT WELDING OF THE TUBE–WELDED SPLICE SHALL CONFORM TO THE REQUIREMENTS OF AWS D.1.1.
11. ALL STEEL SHALL HAVE A FINISH COAT COLOR BLACK, FEDERAL COLOR ID #17038.

COMMONWEALTH OF MASSACHUSETTS
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BRIDGE ENGINEER — DATE 5/3/16

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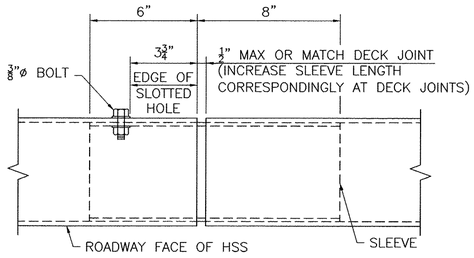
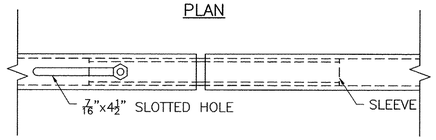
USE ONLY PRINTS OF LATEST DATE	

TG491_31_14-15_BR-2 DETAILS.DWG Plotted on 27-Apr-2016 3:28 PM

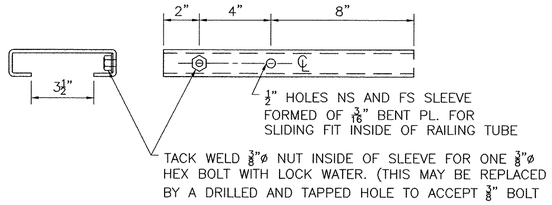
RAILING DETAILS



PLAN

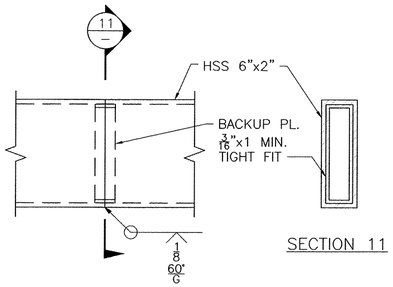


REAR ELEVATION



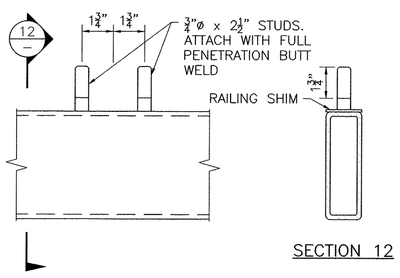
SLEEVE

EXPANSION JOINT TUBE SPLICE
3" = 1'–0"



SECTION 11

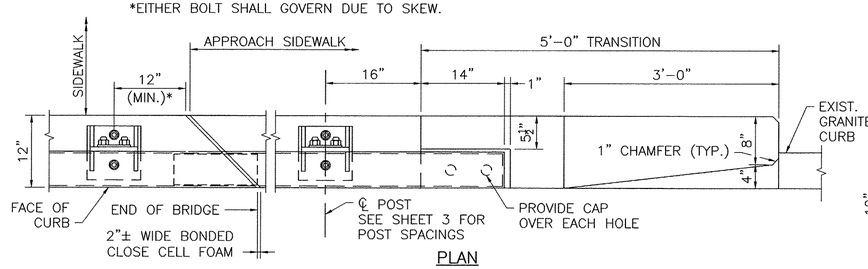
TUBE–WELDED SPLICE
3" = 1'–0"



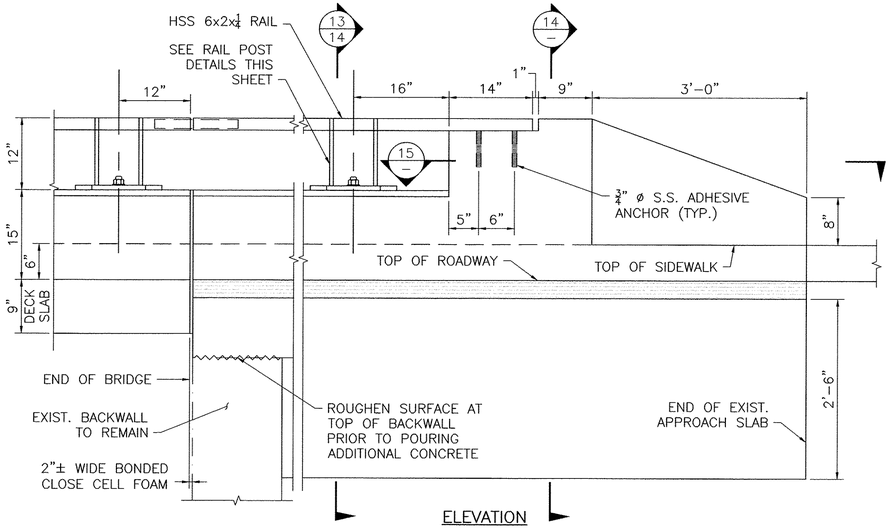
SECTION 12

STRUCTURAL BOLT DETAILS
3" = 1'–0"

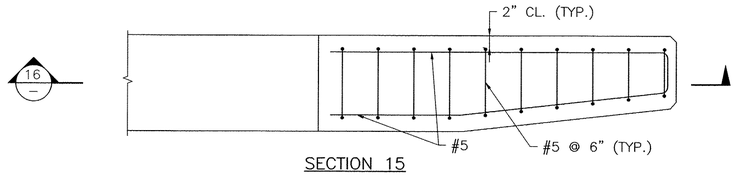
*EITHER BOLT SHALL GOVERN DUE TO SKEW.



PLAN

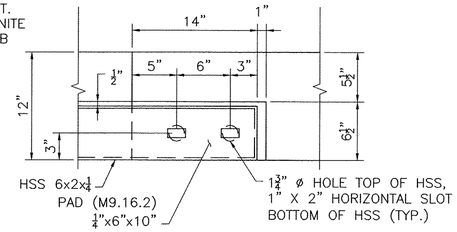


ELEVATION

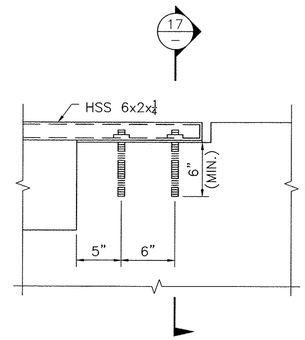


SECTION 15

BR–2 TRANSITION
SCALE: 1" = 1'–0"

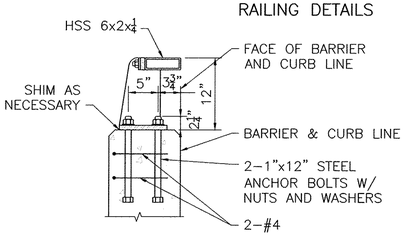


PLAN
SCALE: 1½" = 1'–0"

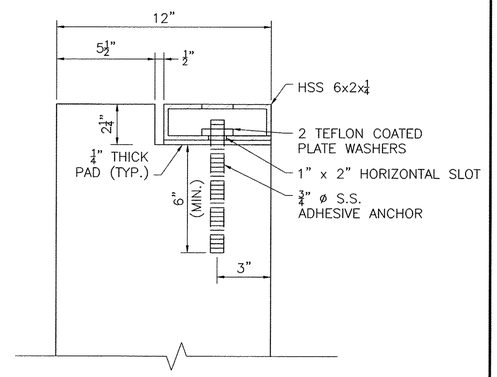


ELEVATION

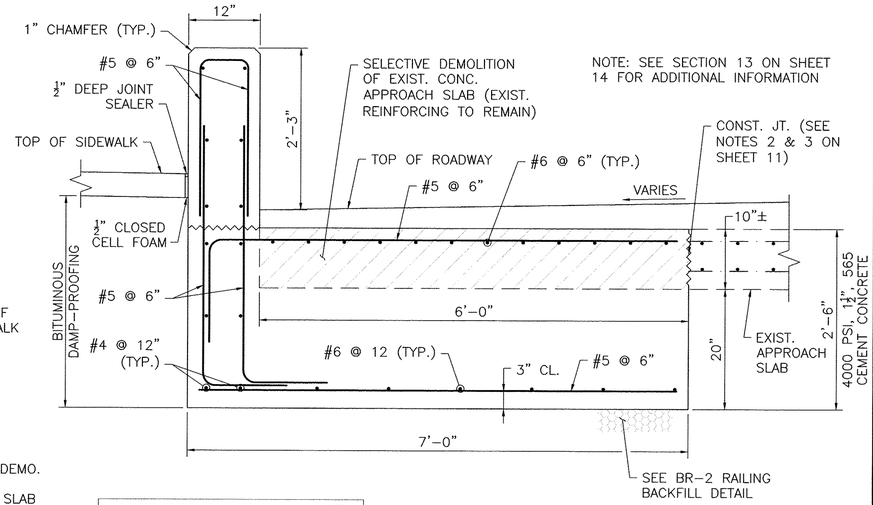
RAIL ATTACHMENT
SCALE: 1½" = 1'–0"



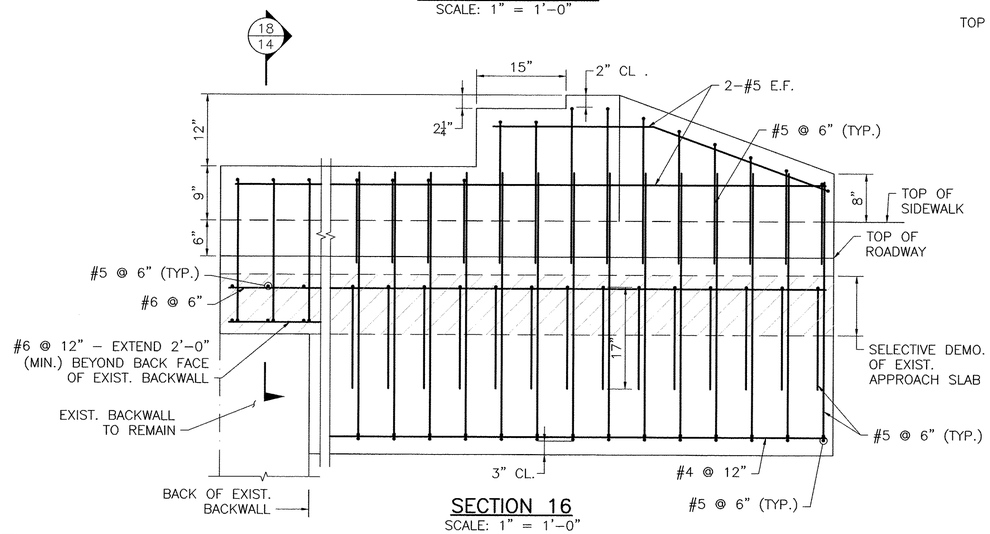
SECTION W/ PEDESTAL
1" = 1'–0"



SECTION 17



SECTION 14
1" = 1'–0"



SECTION 16
SCALE: 1" = 1'–0"

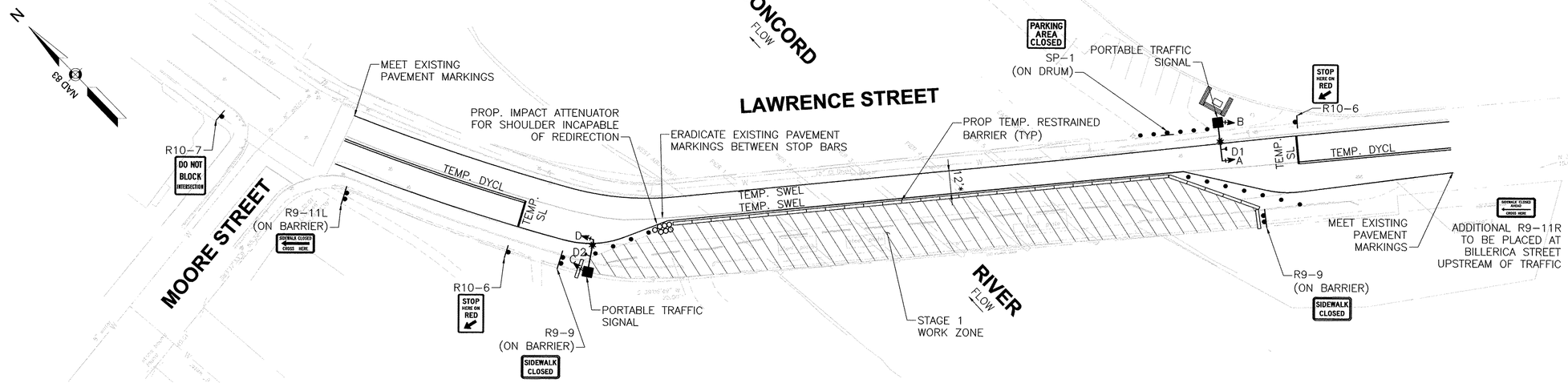
COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
APPROVED UNDER PROVISIONS OF
MASS. GEN. LAWS CH 85 S 35
BRIDGE ENGINEER — DATE 5/3/16

DATE	DESCRIPTION
APRIL 28, 2016	ISSUED FOR CONSTRUCTION
USE ONLY PRINTS OF LATEST DATE	

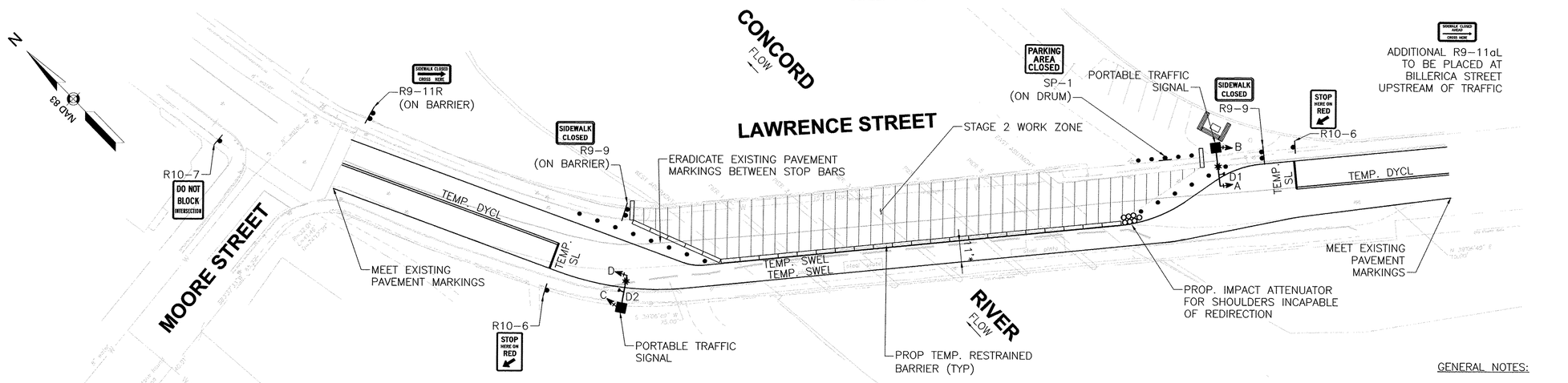
T0491_31_14-15_BR-2 DETAILS.DWG Plotted on: 27-Apr-2016 3:28 PM

LOWELL
LAWRENCE STREET
SHEET 16 OF 18

TRAFFIC MANAGEMENT PLAN



STAGE 1 PLAN
SCALE: 1"=30'



STAGE 2 PLAN
SCALE: 1"=30'

GENERAL NOTES:

1. SEE ADVANCED SIGNAGE SCHEMATIC FOR COMPLETE ADVANCE WORK ZONE SIGNAGE ON SHEET 17.
2. THE CONTRACTOR MAY SUBMIT AN ALTERNATIVE DESIGN OF THE TEMPORARY SIGNAL HOUSING PLACEMENT, SUCH AS WOODEN POLES AND SPAN WIRE, FOR REVIEW AND APPROVAL BY THE ENGINEER AND THE CITY OF LOWELL, PRIOR TO IMPLEMENTATION. ALL TEMPORARY SIGNAL HEADS SHALL MEET THE MINIMUM VERTICAL AND HORIZONTAL VISIBILITY REQUIREMENTS OF THE MUTCD AT ALL TIMES DURING THE CONSTRUCTION PHASES.

* WIDTH FROM SWEL TO SWEL

THE PROPOSED WORK AND TRAFFIC MANAGEMENT PLAN WILL BE IN EFFECT FOR APPROXIMATELY 15 MONTHS, AND OPERATE 24 HOURS A DAY DURING CONSTRUCTION.

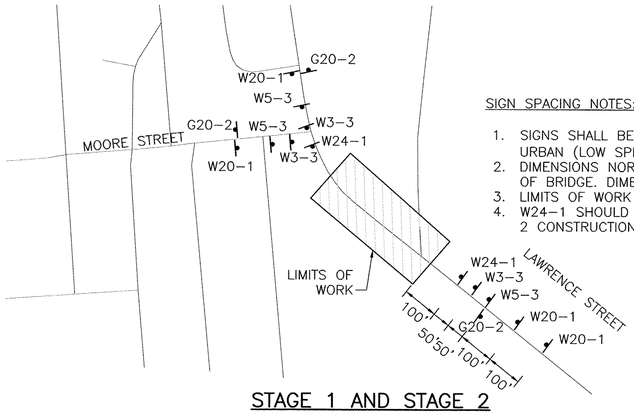
1. ALL CONSTRUCTION SIGNING, DRUMS, BARRICADES AND OTHER DEVICES SHALL CONFORM WITH THE 2009 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (M.U.T.C.D.) AS AMENDED.
2. ALL DRUMS SHALL BE SET @ 20' O.C. MAX. UNLESS OTHERWISE NOTED OR ADJUSTED BY THE ENGINEER.
3. ALL DRUMS SHALL BE APPROXIMATELY PLACED AND MOVED AS NECESSARY TO MAINTAIN ADEQUATE ABUTTER ACCESS AT ALL TIMES. WORK MAY REQUIRE ADDITIONAL SIGNS, DRUMS AND OTHER TRAFFIC CONTROL DEVICES, GRADING AND TEMPORARY PAVEMENT FOR PASSAGE OF PEDESTRIAN, VEHICULAR AND EMERGENCY TRAFFIC THROUGH THE WORK AREAS, BOTH DURING AND AFTER WORKING HOURS, TO MAINTAIN SUCH ACCESS.
4. THE CONTRACTOR SHALL NOTIFY EACH ABUTTOR AT LEAST 24 HOURS IN ADVANCE OF THE START OF ANY WORK THAT WILL REQUIRE THE TEMPORARY CLOSURE OF ACCESS, SUCH AS CONDUIT INSTALLATION, EXISTING PAVEMENT EXCAVATION, TEMPORARY DRIVEWAY PAVEMENT PLACEMENT AND SIMILAR OPERATIONS.
5. ONE LANE OF TRAFFIC IN EACH DIRECTION SHALL BE MAINTAINED AT ALL TIMES.
6. GRADE SEPARATIONS IN EXCESS OF 2" DURING NON-WORKING HOURS WILL REQUIRE DELINEATION BY USE OF DRUMS.
7. EXCAVATION EDGES IN EXCESS OF 4" DEEP SHALL BE PROTECTED DURING NON-WORKING HOURS BY BACKFILLING WITH A WEDGE OF GRAVEL OR SOIL TO COMPACTED 4:1 SLOPE.
8. 11' MINIMUM LANE WIDTHS SHALL BE MAINTAINED. (SEE ABOVE FOR EXACT SWEL TO SWEL DIMENSIONS)
9. NON-ESSENTIAL TRAFFIC CONTROL DEVICES SHALL BE COVERED OR REMOVED DURING NON-WORKING HOURS.
10. IF CONDITIONS SHOWN IN PLAN DO NOT MATCH EXISTING CONDITIONS (IE TAPERS, LANE WIDTHS) CONTRACTOR SHALL NOTIFY ENGINEER.

DATE	DESCRIPTION
APRIL 28, 2016	ISSUED FOR CONSTRUCTION
USE ONLY PRINTS OF LATEST DATE	

T0461_31_16-17_TMP.DWG Plotted on 28-Apr-2016 8:25 AM

TRAFFIC MANAGEMENT PLAN

T0491_31_16-17_TMP.DWG Plotted on 28-Apr-2016 8:25 AM



STAGE 1 AND STAGE 2
ADVANCED SIGNING SCHEMATIC
N.T.S.

SIGN SPACING NOTES:

1. SIGNS SHALL BE A CONSISTENT 100' APART AS PER TABLE 6H-3 OF THE MUTCD FOR URBAN (LOW SPEED) ROADWAY. (W3-3 TO BE 50' BETWEEN W24-1 AND W5-3)
2. DIMENSIONS NORTH OF BRIDGE SHOULD BE CONSISTENT WITH DIMENSIONS SHOWN SOUTH OF BRIDGE. DIMENSIONS NOT SHALL NORTH OF BRIDGE FOR CLARITY.
3. LIMITS OF WORK FOR SIGNAGE SHALL BE CONSIDERED THE STRIPED STOP LINE.
4. W24-1 SHOULD BE MOVED TO OPPOSING ENDS OF BRIDGE BETWEEN STAGE 1 AND STAGE 2 CONSTRUCTION.

TEMPORARY TRAFFIC SIGNAL CONTROL

TEMPORARY TRAFFIC SIGNAL TIMING AND PHASING									
APPROACH	DIRECTION	HOUSING	1	2	3	4	5	6	FLASHING OPERATION
MINIMUM INTERVAL			19			19			
VEHICLE EXTENSION			0			0			
MAXIMUM 1			19			19			
MAXIMUM 2			–			–			
YELLOW CLEARANCE				3.0			3.0		
RED CLEARANCE					8.0			8.0	
LAWRENCE STREET	NB	A,B	G	Y	R	R	R	R	-
LAWRENCE STREET	SB	C,D	R	R	R	G	Y	R	-
DETECTOR			NONE			NONE			
RECALL			OFF			OFF			
			ø1			ø2			
			↑			↓			

NOTES:
1. MAXIMUM 1 = NORMAL OPERATION

SEQUENCE & TIMING NOTES:

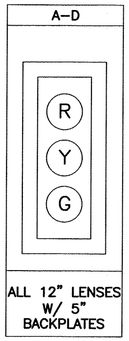
1. SIGNAL TIMING IS TO BE PRE-TIMED AND TO NOT ALTER DURING COURSE OF CONSTRUCTION UNLESS APPROVED BY THE CITY OF LOWELL TRAFFIC ENGINEER.

ITEM 816.81	
LAWRENCE STREET OVER CONCORD RIVER	
LIST OF MAJOR ITEMS REQUIRED	
QUANTITY	DESCRIPTION
2	PORTABLE TRAFFIC SIGNAL ASSEMBLIES (INTERNAL RADIO INTERCONNECT)
2	EMERGENCY VEHICLE PREEMPTION CONFIRMATION STROBE
2	EMERGENCY VEHICLE PREEMPTION DETECTORS

PREEMPTION PHASING & PRIORITY			
DETECTOR	PREEMPT PHASE ASSIGNMENT	MOVEMENT	VEHICLE PHASE ASSIGNMENT
D1	1	↑	ø1
D2	2	↓	ø2

EXAMPLE PORTABLE TRAFFIC SIGNAL

TEMPORARY SIGNAL HEADS



EMERGENCY VEHICLE PRE-EMPTION NOTES:

1. EMERGENCY VEHICLE PRE-EMPTION SIGNALS SHALL BE OPTICALLY TRANSMITTED BY OPTICAL EMITTERS MOUNTED IN EMERGENCY VEHICLES AND RECEIVED BY OPTICAL DETECTORS LOCATED AT EACH INTERSECTION.
2. EMERGENCY VEHICLE PRE-EMPTION SIGNALS SHALL BE SERVICED ON A FIRST DETECTED FIRST SERVE BASIS.
3. IN RESPONSE TO A PRE-EMPTION SIGNAL RECEIVED AT AN INTERSECTION BY OPTICAL DETECTOR D1 (OR D2) THE CONTROLLER SHALL HOLD OR ADVANCE TO AND HOLD IN EMERGENCY VEHICLE PRE-EMPTION PHASE #1 (OR #2) GREEN FOR A MINIMUM OF TEN (10) SECONDS OR UNTIL PRE-EMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME PRE-EMPTION PHASE CLEARANCE (3 SECONDS: YELLOW AND 8 SECONDS: ALL RED) AND SERVICE SUBSEQUENT EMERGENCY VEHICLE PRE-EMPTION PHASES AS NECESSARY.
4. NORMAL CLEARANCE INTERVALS SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PRE-EMPTION DEMAND.
5. ONCE PRE-EMPTION PHASING HAS CLEARED, THE SYSTEM SHALL RESTART NORMAL OPERATIONS ACCORDING TO THE PREFERENTIAL PHASE SEQUENCE.
6. CONFIRMATION STROBE SHALL BE ILLUMINATED WHENEVER ANY EMERGENCY VEHICLE PRE-EMPTION GREEN IS ON.

CONSTRUCTION NOTES:

1. LOCATION OF PORTABLE TRAFFIC SIGNAL ASSEMBLY MUST BE AT LEAST 40 FEET BEYOND TEMPORARY STOP LINE TO ALLOW FOR VISIBILITY REQUIREMENTS OF THE MUTCD.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR MONITORING PORTABLE TRAFFIC SIGNAL LIGHT OUTPUT ON REGULAR BASIS.

TEMPORARY TRAFFIC SIGN SUMMARY

IDENTIFICATION NUMBER	SIZE OF SIGN (in)		LEGEND	TEXT DIMENSIONS (INCHES)			NUMBER OF SIGNS REQUIRED	COLOR			NUMBER OF P-5 POSTS REQUIRED	UNIT AREA (S.F.)	AREA IN SQUARE FEET
	WIDTH	HEIGHT		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACK-GROUND	LEGEND	BORDER			
R9-9	24	12	SIDEWALK CLOSED	SEE 2009 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS			2	WHITE	BLACK	BLACK	0 (2 MTD. ON BARRICADE	2.00	4.00
R9-11L	24	12	SIDEWALK CLOSED AHEAD ← CROSS HERE				2	WHITE	BLACK	BLACK	0 (2 MTD. ON BARRICADE)	2.00	4.00
R9-11R	24	12	SIDEWALK CLOSED AHEAD → CROSS HERE				2	WHITE	BLACK	BLACK	0 (2 MTD. ON BARRICADE)	2.00	4.00
R10-6	24	36	STOP HERE ON RED				2	WHITE	BLACK	BLACK	2	6.00	12.00
R10-7	24	30	DO NOT BLOCK INTERSECTION				1	WHITE	BLACK	BLACK	1	5.00	5.00
SP-1	48	36	PARKING AREA CLOSED				1	WHITE	BLACK	BLACK	0 (1 MTD. ON DRUM)	12.00	12.00
W3-3	30	30					1	ORANGE	BLACK	BLACK	3	6.25	6.25
W5-3	30	30	ONE LANE BRIDGE				2	ORANGE	BLACK	BLACK	3	6.25	12.50
W20-1	30	30	ROAD CLOSED AHEAD				3	ORANGE	BLACK	BLACK	3	6.25	18.75
W24-1L	30	30					1	ORANGE	BLACK	BLACK	1	6.25	6.25
W24-1R	30	30					1	ORANGE	BLACK	BLACK	1	6.25	6.25
G20-2	48	24	END ROAD WORK				3	ORANGE	BLACK	BLACK	3	8.00	24.00

APRIL 28, 2016	ISSUED FOR CONSTRUCTION
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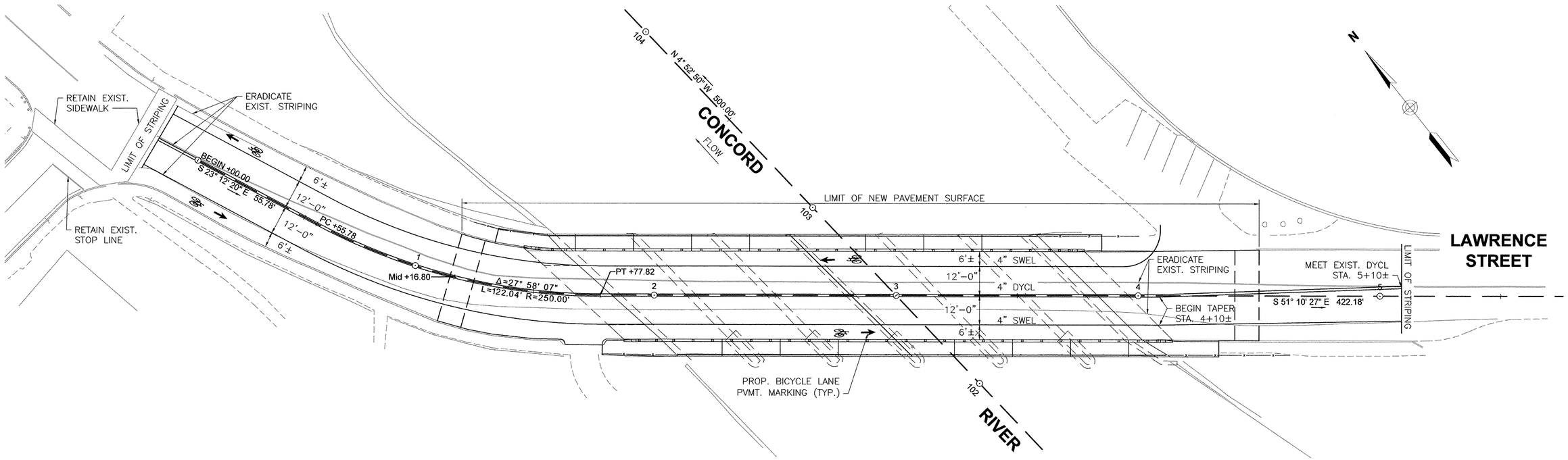
LOWELL
LAWRENCE STREET
SHEET 18 OF 18

STRIPING PLAN



FINAL STRIPING PLAN
SCALE: 1" = 20'

PAVEMENT MARKING NOTES:

1. ALL EXISTING PAVEMENT MARKINGS WITHIN THE LIMITS OF WORK NOT BEING RE-APPLIED SHALL BE REMOVED BY APPROVED METHOD.
2. ALL PAVEMENT MARKINGS SHALL BE THERMOPLASTIC.

DATE	DESCRIPTION
APRIL 28, 2016	ISSUED FOR CONSTRUCTION
USE ONLY PRINTS OF LATEST DATE	

SHEET 18 OF 18 SHEETS BRIDGE NO. L-15-031 (2BQ)

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