TRANSPORTATION IMPROVEMENT PROJECT

1 ~~4~~ LOCATION~~S~~

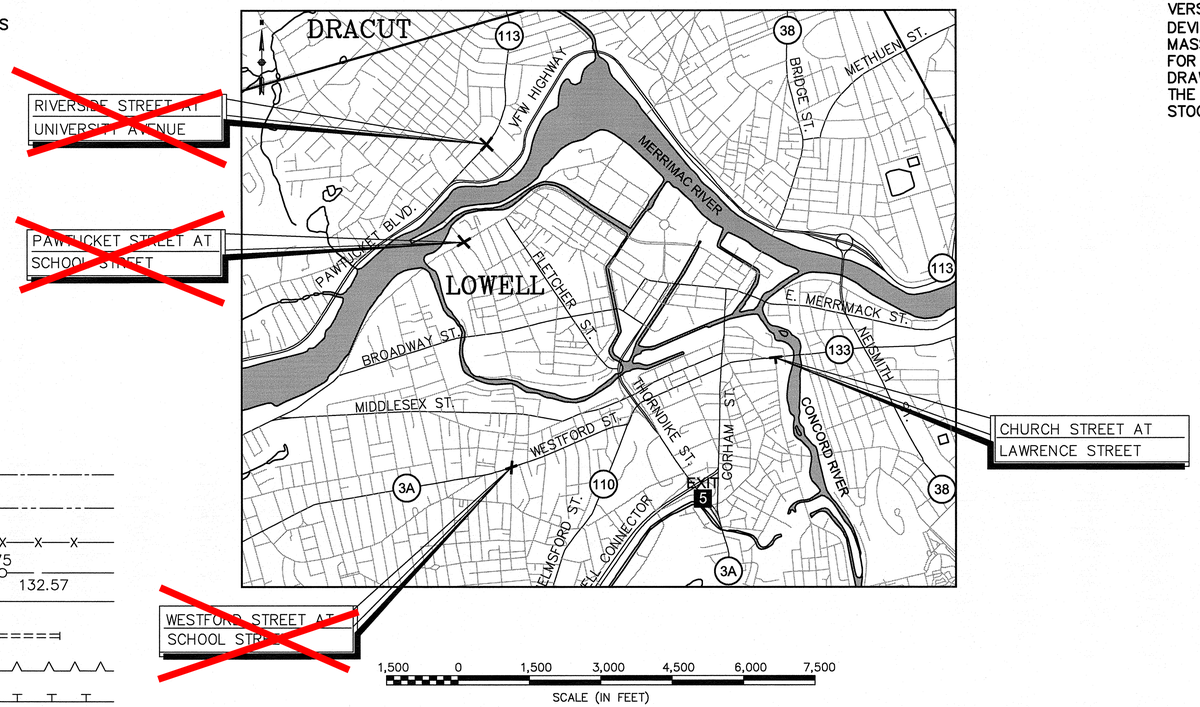
IN THE CITY OF

LOWELL, MASSACHUSETTS

MIDDLESEX COUNTY

INDEX

SHEET NO.	DESCRIPTION
1.	TITLE & INDEX SHEET
2.	LEGEND & GENERAL NOTES & PAVEMENT NOTES
3.–9.	CONSTRUCTION DETAILS
10.–13.	CONSTRUCTION PLANS
14.–21.	TRAFFIC PLANS
22.–25.	TIE PLANS
26.	SIGN SUMMARY
27.–28.	MAST ARM DETAILS
29.–31.	TEMPORARY TRAFFIC CONTROL PLANS



REFERENCE MANUALS

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 CURRENT VERSION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) FOR STREETS AND HIGHWAYS WITH MASSACHUSETTS AMENDMENTS; THE 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS, AS AMENDED; THE 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING AND THE LATEST EDITION OF AMERICAN STANDARD FOR NURSERY STOCK WILL GOVERN.

CONVENTIONAL SIGNS

COUNTY, CITY OR TOWN BOUNDARY
COUNTY, CITY OR TOWN SIDE LINE
FENCE LINE
BASE LINE OR SURVEY LINE — 75 — N00°–31'–37"W 132.57
RIGHT OF WAY LINE
CULVERT
RETAINING WALL
GUARD RAIL
STONE WALL
TREE LINE
POLE
ELEVATIONS — PROPOSED SURFACE / EXISTING SURFACE — EXIST 90.7 / PROP 90.91 — 10+20

PS&E SUBMISSION

NO.	REVISIONS	DATE

COMMONWEALTH OF MASSACHUSETTS — DAVID M. GREENBERG — CIVIL — No. 40100 — REGISTERED PROFESSIONAL ENGINEER

1-30-14
ENGINEER DATE

VHB Vanasse Hangen Brustlin, Inc.
Transportation • Land Development • Environmental Services
101 Walnut St., P.O. Box 9151
Watertown, MA 02472
617 924 1770 FAX 617 924 2286

DESIGNED BY	APPROVED BY	SHEET OF
AEB	DMG	1 31
DRAWN BY AEB	DFTG CHECKED BY PTN	VHB CAD FILE NAME 12274COV.DWG
CHECKED BY JL	DATE JAN 31, 2014	JOB NO. 12274.00

PROJECT ENGINEER
STRUCTURAL REVIEW
TRAFFIC SIGNAL REVIEW
HIGHWAY DEPT. AUTHORIZATION
HIGHWAY TECH. REVIEW
CONSTRUCTION REVIEW

LOWELL
1 LOCATION
LEGEND, GENERAL NOTES & PAVEMENT NOTES
SHEET 2 OF 31

GENERAL SYMBOLS

EXISTING	PROPOSED	
CB (OR GI, LB)	CB	CATCH BASIN (OR GUTTER INLET, OR LEACHING BASIN)
CBCI (OR GICI)	CBCI (OR GICI)	CATCH BASIN (OR GUTTER INLET) WITH CURB INLET (GUTTERMOUTH)
		EDGESTONE–TYPE NOTED
		EDGE OF ROAD
EHH	EHH	ELECTRIC HANDHOLE (NUMBER AS NOTED)
EMH	EMH	ELECTRIC MANHOLE "
TMH	TMH	TELEPHONE MANHOLE "
WMH	WMH	WATER MANHOLE "
SMH	SMH	SEWER MANHOLE "
DMH	DMH	DRAINAGE MANHOLE "
GG	GG	GAS GATE
WG	WG	WATER GATE
CS	CS	CURB STOP
Hyd	HYD	HYDRANT
FA	FA	FIRE ALARM BOX
PM	PM	PARKING METER
LP	LP	STREET LIGHT POLE
UP	UP	UTILITY POLE
Guy	GUY	GUY POLE
12" RCP D	D 21'–12"RCP	DRAIN PIPE (UNDER 24")
	D 21'–24"RCP	DRAIN PIPE (DOUBLE LINE 24" AND OVER)
8" VCP S	S 82'–8"VCP	SEWER MAIN " "
E	E	ELECTRIC DUCT " "
4" HP G	G 8"GAS	GAS MAIN " "
8" C.I. W	W 12"DI	WATER MAIN " "
T	T	TELEPHONE DUCT " "
MB	MB	MAIL BOX
		HIGHWAY GUARD (TYPE NOTED)
		FENCE (SIZE AND TYPE NOTED)
MHB	MHB	HIGHWAY/PROPERTY BOUND (TYPE NOTED)
LABEL/DATE	LABEL/DATE	CITY, TOWN, OR COUNTY LAYOUT
		STATE HIGHWAY LAYOUT (S.H.L.O.)
		EASEMENT LINE
℄	℄	PROPERTY LINE
NAME		CITY, TOWN, OR COUNTY BOUNDARY
NAME		STATE BOUNDARY
N00°00'00"E		BASE OR SURVEY LINE
	+57.59 10 P.C. N00°00'00"E	CONSTRUCTION BASELINE
		TREE (SIZE AND TYPE NOTED)
		APPROXIMATE FULL DEPTH AREA
	B–1	BORINGS, PAVEMENT CORES
	TP–1	TEST PIT
		HAYBALE

TRAFFIC SIGNAL SYMBOLS

EXISTING	PROPOSED	
		CONTROL CABINET GROUND MOUNTED (WITHOUT & WITH CONCRETE PAD)
		CONTROL CABINET POLE MOUNTED
		FLASHING BEACON CONTROL & METER PEDESTAL
TS		SIGNAL POST & BASE
		MAST ARM, SHAFT, & BASE (ARM LENGTH AS NOTED)
	A	VEHICULAR SIGNAL HEAD (ALPHA–NUMERIC DESIGNATION NOTED)
	A	VEHICULAR SIGNAL HEAD OPTICALLY PROGRAMMED "
		LIMIT OF VISIBILITY OF OPTICALLY PROGRAMMED SIGNAL HEAD
	A	FLASHING BEACON
		PEDESTRIAN SIGNAL HEAD
PB	PB	PULL BOX 12" x 12"
		PEDESTRIAN PUSH BUTTON
		PRE–EMPTION DETECTOR
		PRE–EMPTION STROBE
		SINGLE POINT VIDEO DETECTION CAMERA
		CONTROLLER PHASE
		CONDUIT (COND.)
		CONDUIT CROSSING ROADWAY WITH CONTROLLED DENSITY FILL
		"x" DUCT (CONCRETE ENCASED)
		OVERHEAD CABLE
		DIRECT BURIED CABLE

PAVEMENT MARKINGS AND SIGNING SYMBOLS

EXISTING	PROPOSED	
		PAVEMENT ARROW AND LEGEND
CW SL	CW SL	CROSSWALK, 2–12" WHITE LINES (WIDTH NOTED)
		STOP LINE, 12" WHITE LINE 4.0' BEHIND CW (TYP)
		YIELD LINE, 24" x 36" WHITE TRIANGLE, 36" O.C.
SWCHL	SWCHL	SOLID WHITE CHANNELIZING LINE–SIZE AS NOTED
SYCHL	SYCHL	SOLID YELLOW CHANNELIZING LINE–SIZE AS NOTED
BWLL	BWLL	BROKEN WHITE LANE LINE – 4"
SWLL	SWLL	SOLID WHITE LANE LINE – 4"
DYCL	DYCL	DOUBLE YELLOW CENTER LINE – 4"
SYEL	SYEL	SOLID YELLOW EDGE LINE – 4"
SWEL	SWEL	SOLID WHITE EDGE LINE – 4"
BYLL	BYLL	BROKEN YELLOW LANE LINE – 4"
		BICYCLE LANE
		BICYCLE DETECTION LEGEND
Sign		SIGN AND POST
		DELINEATOR

ABBREVIATIONS

GENERAL

ABAN	ABANDON	NTS	NOT TO SCALE
ADJ	ADJUST	PGL	PROFILE GRADE LINE
APPROX	APPROXIMATE	PROP	PROPOSED
BIT	BITUMINOUS	PVM'T	PAVEMENT
BOS	BOTTOM OF SLOPE	REM	REMOVE
(BO)	BY OTHERS	REMOD	REMODEL
CEM	CEMENT	RET	RETAIN
CLF	CHAINLINK FENCE	R&D	REMOVE AND DISCARD
CONC	CONCRETE	R&R	REMOVE AND RESET
ELEV	ELEVATION	R&S	REMOVE AND STACK
EOP	EDGE OF PAVEMENT	RT	RIGHT
EXIST	EXISTING	STA	STATION
FND	FOUNDATION	TEMP	TEMPORARY
GRAN	GRANITE	TOS	TOP OF SLOPE
HMA	HOT MIX ASPHALT	TYP	TYPICAL
LOAM	LOAM BORROW		
LT	LEFT		
MAX	MAXIMUM		
MIN	MINIMUM		

UTILITIES

ACCMP	ASHPALT COATED CORRIGATED METAL PIPE
CAP	CORRUGATED ALUMINUM PIPE
CIP	CAST IRON PIPE
CIT	CHANGE IN TYPE
COND	CONDUIT
DIP	DUCTILE IRON PIPE
FES	FLARED END SECTION
F&C	FRAME AND COVER
F&G	FRAME AND GRATE
HDPE	HIGH DENSITY POLYETHYLENE PIPE
HW	HEADWALL
HYD	HYDRANT
INV	INVERT
PVC	POLYVINYLCHLORIDE PIPE
PWW	PAVED WATER WAY
RCP	REINFORCED CONCRETE PIPE
TSV&B	TAPPING SLEEVE VALVE AND BOX
UP	UTILITY POLE

ALIGNMENT/GRADING

CC	CENTER OF CURVE
HP	HIGH POINT
LP	LOW POINT
PC	POINT OF CURVE
PI	POINT OF INTERSECTION
PNT	POINT
PCC	POINT OF COMPOUND CURVE
PRC	POINT OF REVERSE CURVE
PT	POINT OF TANGENT
25.45	SPOT ELEVATION

TRAFFIC SIGNAL SYSTEMS

R	STEADY CIRCULAR RED
Y	STEADY CIRCULAR YELLOW
G	STEADY CIRCULAR GREEN
FR	FLASHING CIRCULAR RED
–FR	FLASHING RED ARROW
FY	FLASHING CIRCULAR YELLOW
–FY	FLASHING YELLOW ARROW
G	STEADY VERTICAL GREEN ARROW
X–	STEADY LEFT ARROW (RED, YELLOW OR GREEN PREFIX)
–X	STEADY RIGHT ARROW (RED, YELLOW OR GREEN PREFIX)
W	STEADY WALK–WHITE
DW	STEADY DON'T WALK–PORTLAND ORANGE
FDW	FLASHING DON'T WALK–PORTLAND ORANGE

GENERAL NOTES

1. TOPOGRAPHICAL INFORMATION FROM A SURVEY BY HANCOCK ASSOCIATES, INC. INC., CHELMSFORD, MASSACHUSETTS IN MARCH 2013.
2. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.
3. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT.
4. THE CONTRACTOR SHALL ALTER THE MASONRY OF THE TOP SECTION OF ALL EXISTING DRAINAGE STRUCTURES AS NECESSARY FOR CHANGES IN GRADE, AND RESET ALL WATER AND DRAINAGE FRAMES, GRATES AND BOXES TO THE PROPOSED FINISH SURFACE GRADE. REQUIRED NEW MASONRY SHALL BE CLAY BRICK CONFORMING TO [M4.05.2.]
5. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY COMPANIES.
6. TREES AND SHRUBS WITHIN THE LIMITS OF GRADING SHALL BE REMOVED ONLY UPON APPROVAL OF THE ENGINEER.
7. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT NO EXPENSE TO THE OWNER.
8. THE TERM "PROPOSED" (PROP) MEANS WORK TO BE CONSTRUCTED USING NEW MATERIALS OR, WHERE APPLICABLE, RE–USING EXISTING MATERIALS IDENTIFIED AS "REMOVE AND RESET" (R&R).
9. JOINTS BETWEEN NEW BITUMINOUS CONCRETE ROADWAY PAVEMENT AND SAWCUT EXISTING PAVEMENT SHALL BE SEALED WITH BITUMEN AND BACKSANDED.
10. ALL EXISTING SIGNS WITHIN THE PROJECT LIMITS SHALL BE RETAINED UNLESS INDICATED OTHERWISE ON THE DRAWINGS.
11. ALL LATERAL DRAIN PIPES SHALL BE INSTALLED WITH A PITCH OF [.01 FOOT PER FOOT] (MINIMUM) UNLESS NOTED OTHERWISE ON THE DRAWINGS.
12. ALL EXISTING GRANITE CURB SHALL BE RE–USED IN THE PROPOSED WORK, EXCEPT CURVED STONES OF A DIFFERENT RADIUS THAN PROPOSED CURB.
13. ALL EXISTING STATE, COUNTY, CITY, AND TOWN LOCATION LINES AND PRIVATE PROPERTY LINES HAVE BEEN ESTABLISHED FROM AVAILABLE INFORMATION AND THEIR EXACT LOCATION ARE NOT GUARANTEED.

PAVEMENT NOTES

PROPOSED PAVEMENT MILLING & OVERLAY **(BY THE CITY)**

SURFACE: 1–3/4" HOT MIX ASPHALT (SURFACE COURSE TYPE B)

LEVELING COURSE: VARIABLE DEPTH HOT MIX ASPHALT SURFACE COURSE MATERIAL

BITUMEN FOR TACK COAT (RS–1) AT 0.07 GAL/SY OVER EXISTING PAVEMENT OR COBBELS

MILLING VARIABLE DEPTH 1" MIN

NOTE: COBBLES EXIST BENEATH EXISTING PAVED SURFACE

PROPOSED CEMENT CONCRETE SIDEWALK

SURFACE: 4" CEMENT CONCRETE AIR ENTRAINED 4000 PSI, 3/4", 610 WITH 6"X6" W1.4XW1.4 WWM REINFORCEMENT

FOUNDATION: 8" GRAVEL BORROW, TYPE b

PROPOSED CEMENT CONCRETE WHEELCHAIR RAMP

SURFACE: 6" CEMENT CONCRETE AIR ENTRAINED 4000 PSI, 3/4", 610 WITH 6"X6" W1.4XW1.4 WWM REINFORCEMENT

FOUNDATION: 8" GRAVEL BORROW, TYPE b

PROPOSED CEMENT CONCRETE SIDEWALK AT DRIVEWAYS

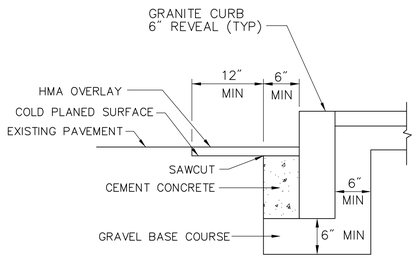
SURFACE: 6" CEMENT CONCRETE AIR ENTRAINED 4000 PSI, 3/4", 610 WITH 6"X6" W1.4XW1.4 WWM REINFORCEMENT

FOUNDATION: 8" GRAVEL BORROW, TYPE b

PROPOSED HOT MIX ASPHALT DRIVEWAY

SURFACE: 3–1/2" HOT MIX ASPHALT (1–1/2" TOP COURSE OVER 2" BINDER COURSE)

FOUNDATION: 8" GRAVEL BORROW, TYPE b

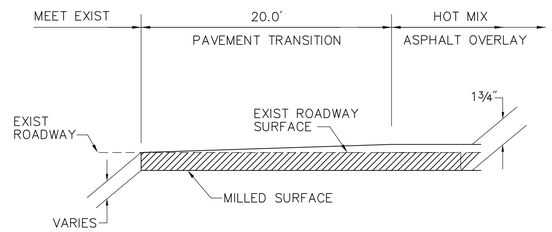


NOTES:

1. CONCRETE SHALL BE INCLUDED IN PRICE BID FOR GRANITE CURB.
2. SAWCUT 6" FROM CURB LINE AND REMOVE EXISTING PAVEMENT AND GRAVEL. REPLACE WITH CEMENT CONCRETE.
3. ANY DESIGNATED CEMENT CONCRETE THAT IS ACCEPTABLE UNDER SECTION M4 OF THE STANDARD SPECIFICATIONS MAY BE USED. ALL TEST REQUIREMENTS ARE WAIVED. HOT MIX ASPHALT SHALL NOT BE USED AS A SUBSTITUTE.
4. OVERLAY ON CANAL STREET SHALL EXTEND 12" FROM EXCAVATION LIMITS.

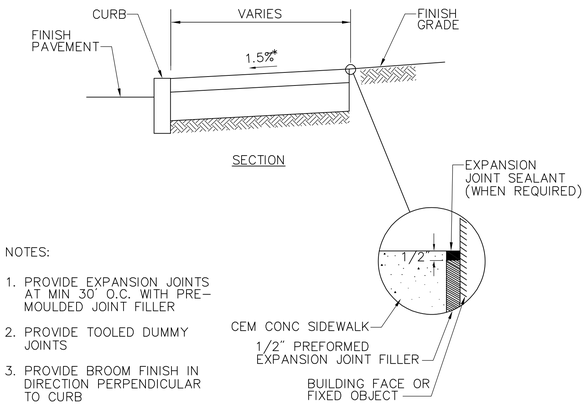
GRANITE CURB IN EXISTING PAVEMENT

SCALE: NOT TO SCALE
DATE:
DWG:



PVM'T MILLING & OVERLAY TRANSITION SECTION (BY THE CITY)

NOT TO SCALE
DATE:
DWG:



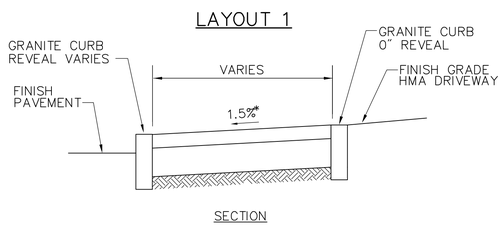
NOTES:

1. PROVIDE EXPANSION JOINTS AT MIN 30' O.C. WITH PRE-MOULDED JOINT FILLER
2. PROVIDE TOOLED DUMMY JOINTS
3. PROVIDE BROOM FINISH IN DIRECTION PERPENDICULAR TO CURB

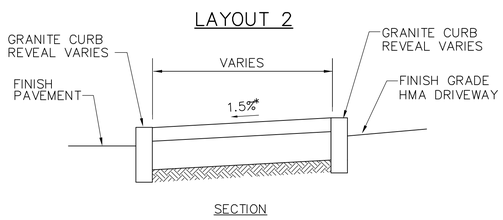
CEMENT CONCRETE SIDEWALK

SCALE: NOT TO SCALE
DATE:
DWG:

* TOLERANCE FOR CONSTRUCTION ±0.5%



FOR USE AT CHURCH STREET WEST OF LAWRENCE STREET

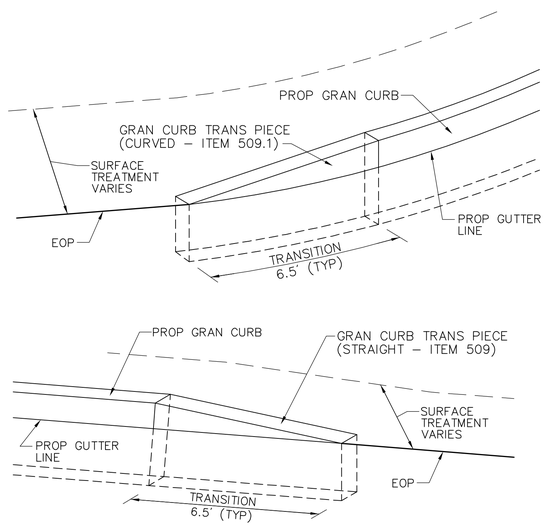


FOR USE AT CHURCH STREET EAST OF LAWRENCE STREET

SIDEWALK WITH GRANITE CURB BUFFER

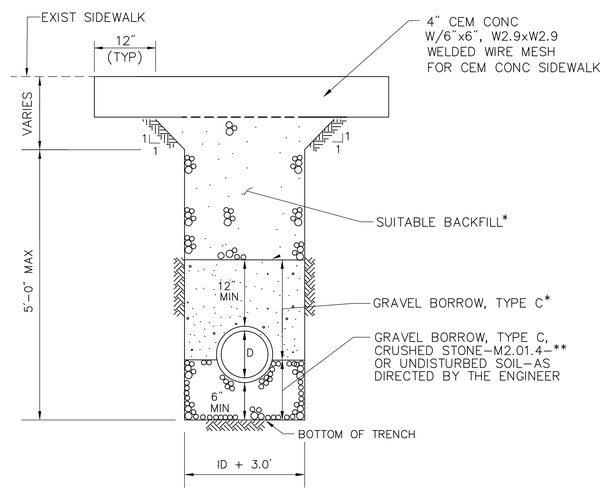
SCALE: NOT TO SCALE
DATE:
DWG:

* TOLERANCE FOR CONSTRUCTION ±0.5%



GRANITE CURB TRANSITION PIECE

SCALE: NOT TO SCALE
DATE:
DWG:

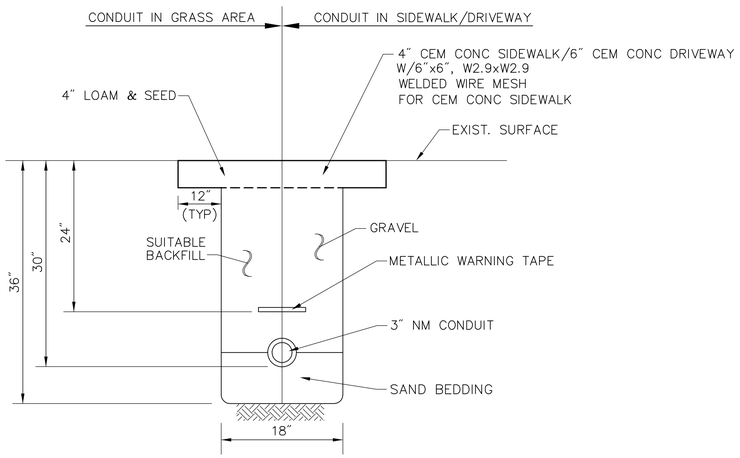


* CONTROLLED DENSITY FILL TO BE USED IN WHEN PROPOSED PIPES CROSS EXISTING CEM CONC BASE AND WHEN COMPACTION USING CONVENTIONAL METHODS IS UNUSUALLY DIFFICULT AS DETERMINED BY THE ENGINEER DUE TO OBSTRUCTIONS.

** CRUSHED STONE TO BE USED DURING WET CONDITIONS AS DIRECTED BY THE ENGINEER.

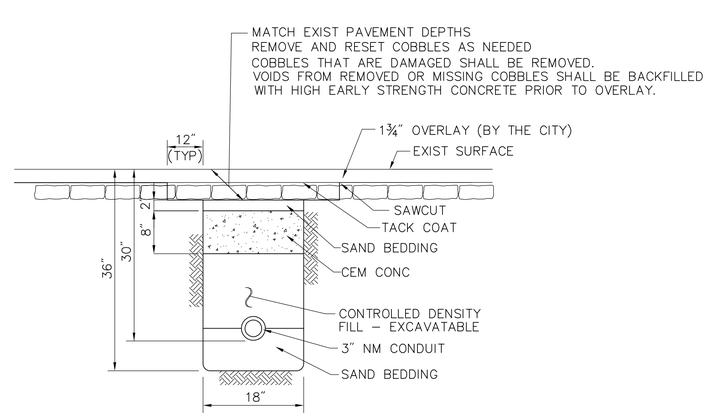
TRENCH DETAIL IN SIDEWALK

SCALE: NOT TO SCALE
DATE: APRIL 2003
DWG: TRENCH-05



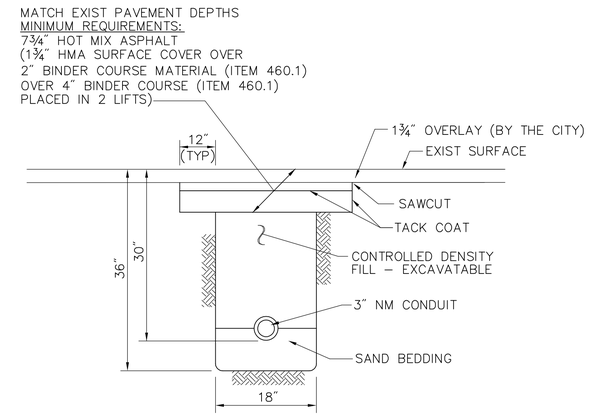
CONDUIT IN GRASS AND SIDEWALK/DRIVEWAY

SCALE: NOT TO SCALE
DWG:



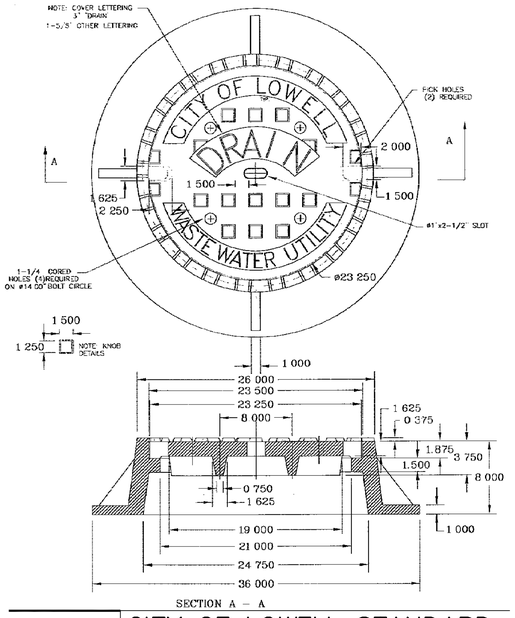
CONDUIT CROSSING ROADWAY IN COBBLE AREAS

SCALE: NOT TO SCALE
DATE:
DWG:



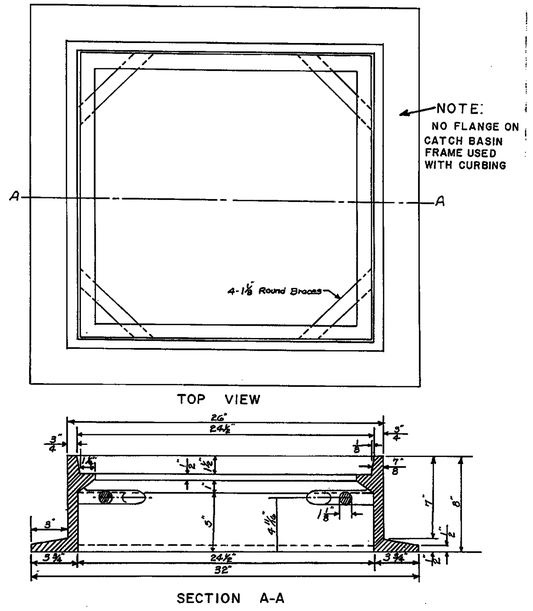
CONDUIT CROSSING ROADWAY

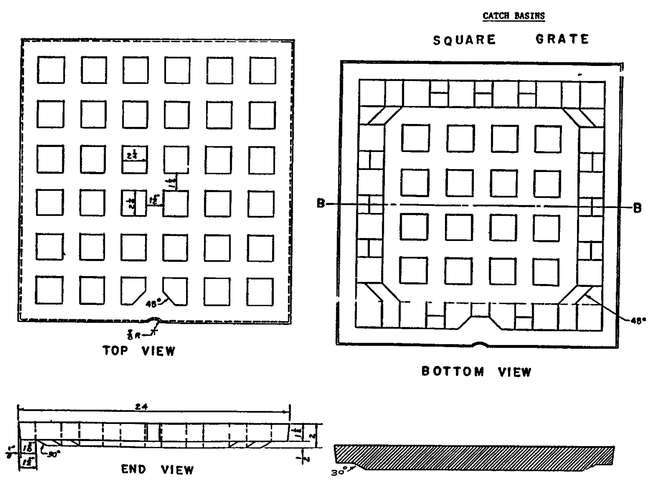
SCALE: NOT TO SCALE
DATE:
DWG:



CITY OF LOWELL STANDARD DRAIN FRAME & COVER

SCALE: NOT TO SCALE
DATE: 10-22-2008
DWG: –

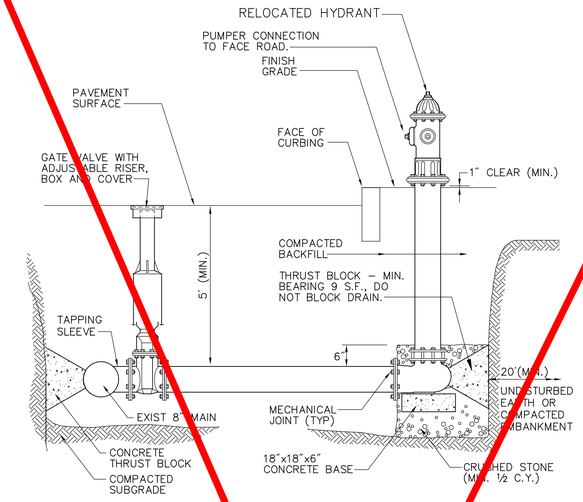




CITY OF LOWELL STANDARD CATCH BASIN FRAME AND GRATE

SCALE: NOT TO SCALE
DATE: 4-30-2009
DWG: –

LOWELL
LOCATIONS
CONSTRUCTION DETAILS
SHEET 5 OF 31



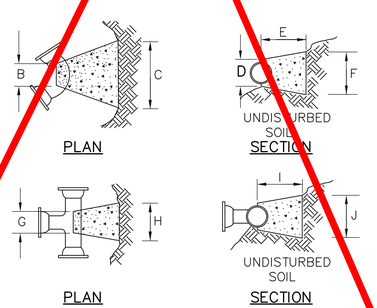
Notes:

1. CONCRETE THRUST BLOCKS TO BE USED ONLY WHERE THEY CAN BEAR ON UNDISTURBED EARTH AS SHOWN. USE CLAMPS AND TIE RODS OR OTHER ACCEPTABLE METHOD OF JOINT RESTRAINT WHERE SOIL CONDITIONS PROHIBIT THE USE OF THRUST BLOCKS.
2. HYDRANT SHALL BE SET 12" FROM BACK OF CURB.

HYDRANT RELOCATION

SCALE: NOT TO SCALE
DATE: 6–2008
DWG: LD–250

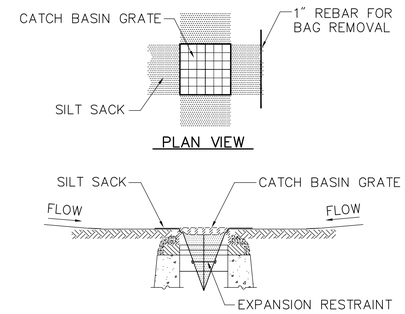
BENDS		B	C	D	E	F	BENDS		B	C	D	E
6"	11–1/4°	8"	15"	12"	24"	12"	6"	45°	8"	30"	12"	24"
6"	22–1/2°	"	19"	"	"	13"	6"	90°	"	30"	"	"
8"	11–1/4°	"	20"	"	"	12"	8"	45°	"	30"	"	"
8"	22–1/2°	"	22"	"	"	17"	8"	90°	"	38"	"	"
12"	11–1/4°	"	30"	"	"	15"	12"	45°	"	40"	"	"
12"	22–1/2°	"	35"	"	"	25"	12"	90°	"	60"	"	"
TEES		G	H	I	J		TEES		G	H	I	J
6"x 6"x 6"		12"	24"	24"	18"		12"x12"x6"		12"	24"	24"	12"
8"x 8"x 6"		"	"	"	"		12"x12"x8"		"	"	"	24"
8"x 8"x 8"		"	"	"	24"		12"x12"x12"		"	36"	"	36"



NOTES:
1. PROVIDE BLOCKS FOR TAPPING SLEEVES, DEAD ENDS, GATE VALVES AND VERTICAL BENDS, SAME SIZE AS REQUIRED FOR TEES.
2. PROVIDE ANCHOR RODS AT VERTICAL BENDS AND GATE VALVES
3. CONCRETE SHALL NOT BE PLACED AGAINST PIPE BEYOND FITTING.

CONCRETE THRUST BLOCK

SCALE: NOT TO SCALE
DATE: APRIL 2003
DWG: WS–02

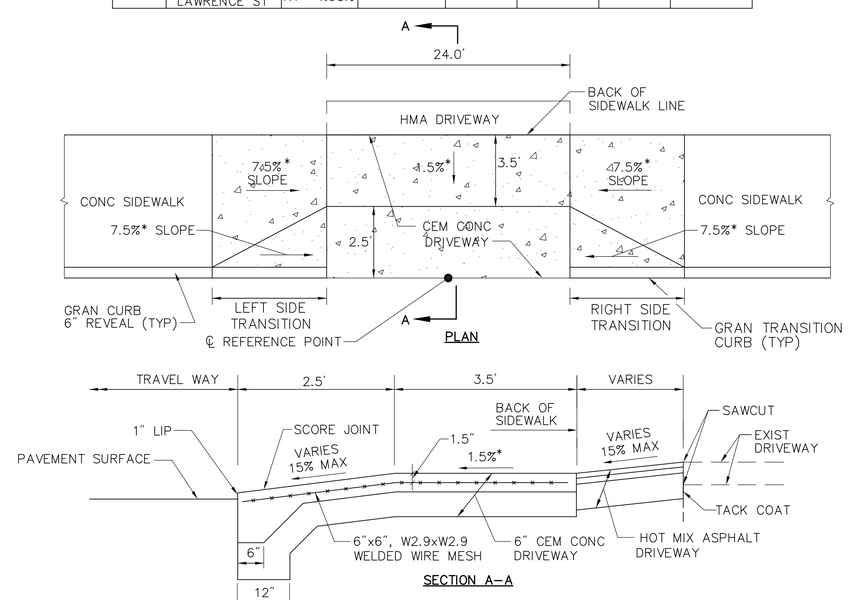


NOTES:
1. INSTALL SILT SACK IN EXISTING CATCH BASINS, BEFORE COMMENCING WORK, AND IN NEW CATCH BASINS, GUTTER INLETS, AND ALL CURB INLETS IMMEDIATELY AFTER INSTALLATION OF STRUCTURE. MAINTAIN UNTIL BINDER COURSE PAVING IS COMPLETE OR A PERMANENT STAND OF GRASS HAS BEEN ESTABLISHED.
2. GRATE TO BE PLACED OVER SILT SACK.
3. SILT SACK SHALL BE INSPECTED PERIODICALLY AND AFTER ALL STORM EVENTS AND CLEANING OR REPLACEMENT SHALL BE PERFORMED PROMPTLY AS NEEDED.

SILT SACK IN CATCH BASIN

SCALE: NOT TO SCALE
DATE:
DWG:

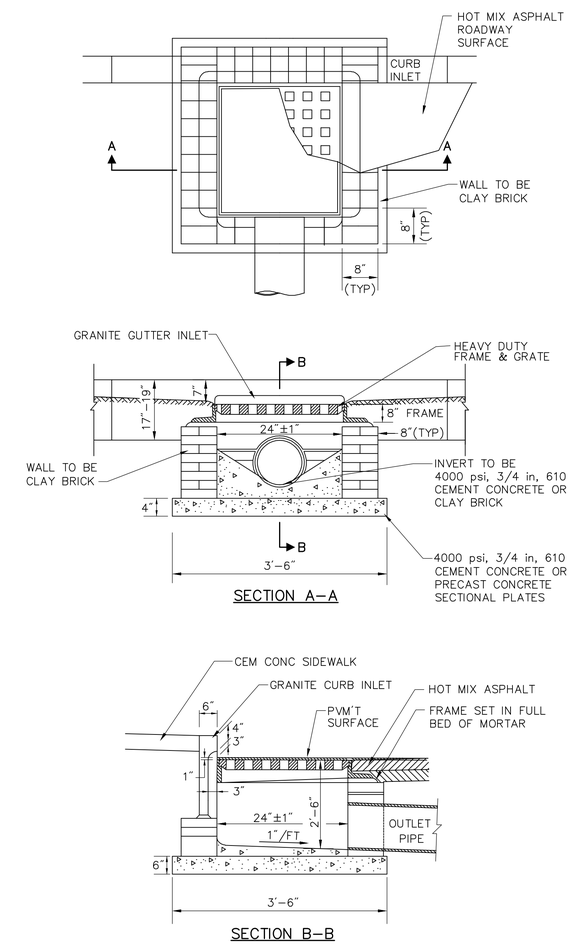
TRANSITION CURB FOR DRIVEWAYS WITH SIDEWALK							
NO.	LOCATION	ROADWAY GUTTER	SIDEWALK WIDTH	LEFT SIDE		RIGHT SIDE	
				REVEAL	TRANSITION	REVEAL	TRANSITION
1	CHURCH ST OPPOSITE LAWRENCE ST	LT 0.09% RT –1.93%	6.0'	4"	6.5'	5"	6.0'



CEM CONC DRIVEWAY WITH SIDEWALK AND GRANITE TRANSITION CURB

SCALE: NOT TO SCALE
DATE: APRIL 2003
DWG: DRIVE–04

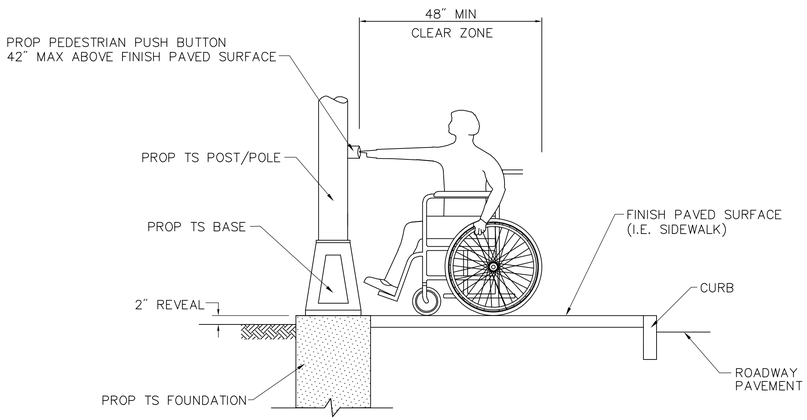
*TOLERANCE FOR CONSTRUCTION ±0.5%



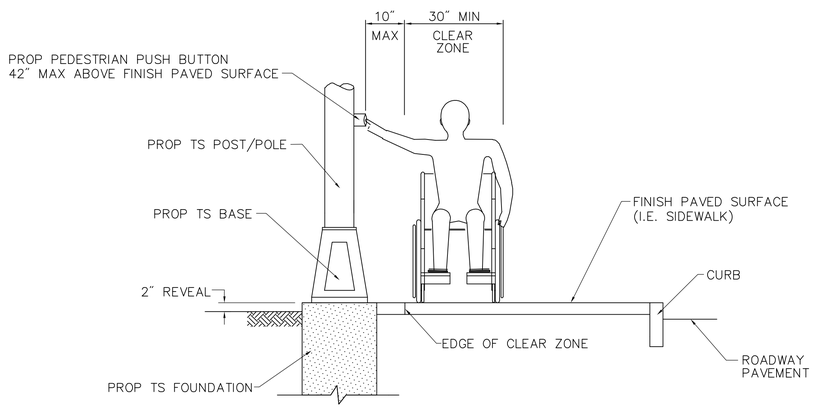
GUTTER INLET – SPECIAL

SCALE: NOT TO SCALE
S–STD.
H–STD.

\\vhb\proj\Wat–TS\12274.00\cad\ts\planset\12274–det.dwg



FORWARD APPROACH (FORWARD REACH)



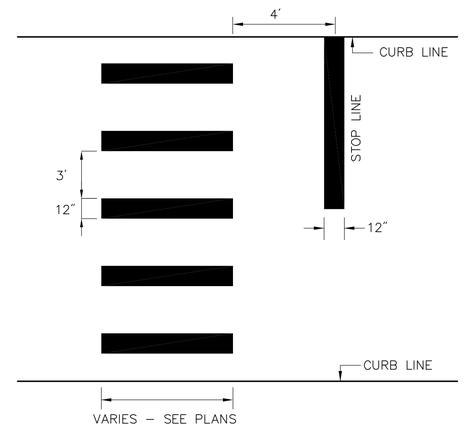
PARALLEL APPROACH (SIDE REACH)

NOTE 1: A CLEAR GROUND SPACE SHALL CONSIST OF A STABLE AND FIRM AREA, COMPLYING WITH 521 CMR 6.5 (FORWARD REACH) OR 521 CMR 6.6 (SIDE REACH) AND SHALL BE PROVIDED AT EACH OF THE PEDESTRIAN PUSH BUTTONS.

a) WHERE A FORWARD APPROACH IS PROVIDED, PEDESTRIAN PUSH BUTTONS SHALL ABUT AND BE CENTERED ON THE CLEAR GROUND SPACE.

b) WHERE A PARALLEL APPROACH IS PROVIDED, PEDESTRIAN PUSH BUTTONS SHALL BE WITHIN TEN INCHES (10") HORIZONTALLY OF AND CENTERED ON THE CLEAR GROUND SPACE.

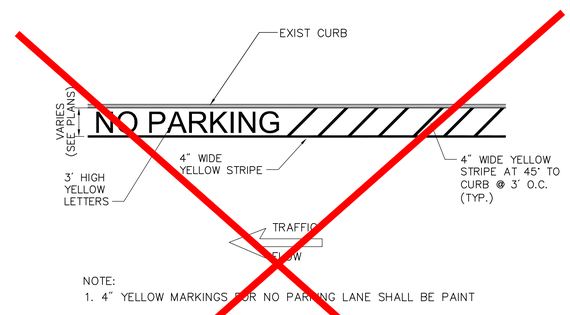
	PEDESTRIAN PUSH BUTTON CLEAR ZONE
	SCALE: NOT TO SCALE
	DATE:
	DWG:



NOTES:

1. ALL 12" THERMOPLASTIC LINES SHALL BE APPLIED IN ONE APPLICATION, NO COMBINATION OF LINES (TWO – 6" LINES) WILL BE ACCEPTED.
2. LAYOUT OF CROSSWALKS SHALL BE APPROVED BY A LOWELL DPW REPRESENTATIVE PRIOR TO APPLICATION OF THERMOPLASTIC.
3. ALL CROSSWALKS INSTALLED SHALL CONFORM TO THE RELEVANT PROVISIONS OF THE MASSACHUSETTS HIGHWAY DEPARTMENT "STANDARD SPECIFICATION FOR HIGHWAY AND BRIDGES" DATED 1988, SECTION 860 FOR REFLECTORIZED LINE (THERMO–PLASTIC) & MATERIAL M7.01.20, LATEST REVISIONS.

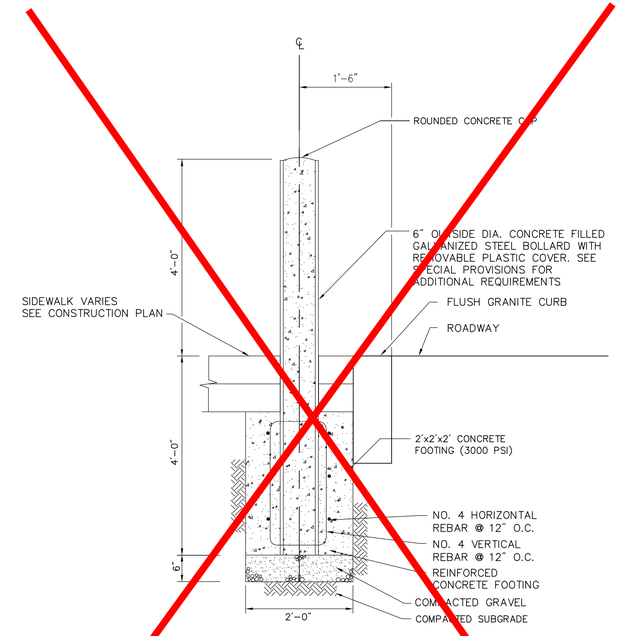
	STANDARD CROSSWALK (BY THE CITY)
	SCALE: NOT TO SCALE
	DATE: APRIL 2003
	DWG: PM–07



NOTE:

1. 4" YELLOW MARKINGS FOR NO PARKING LANE SHALL BE PAINT

	NO PARKING LANE STRIPING (BY THE CITY)
	SCALE: NOT TO SCALE
	DATE: JUNE 2008
	DWG: LD_556



	STEEL BOLLARD
	SCALE: NOT TO SCALE
	DATE:
	DWG:

LEGEND

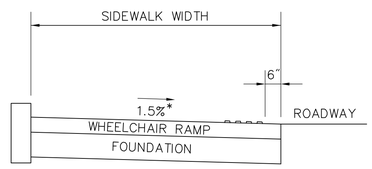
= DETECTABLE WARNING PANEL

= LIMITS OF CEM CONC RAMP

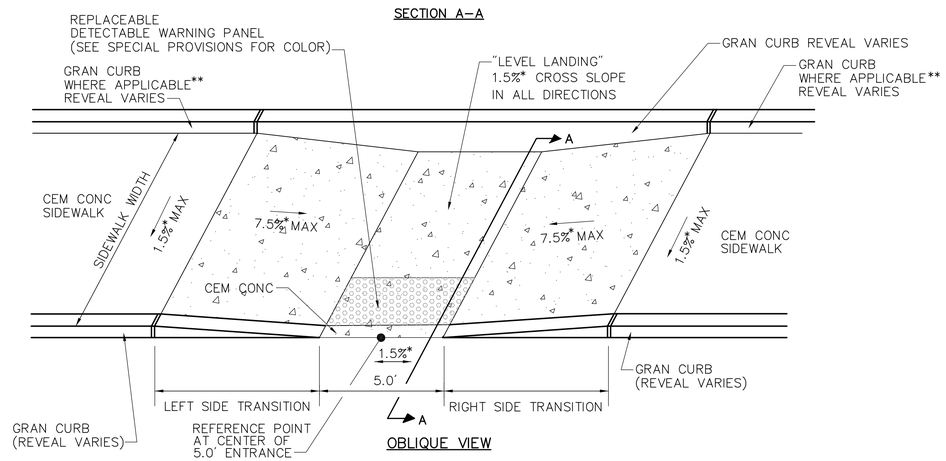
WHEELCHAIR RAMP DATA

NO.	LOCATION (REF. POINT)	SIDEWALK WIDTH	RAMP WIDTH	LEFT SIDE ROADWAY GUTTER	LEFT SIDE REVEAL	LEFT SIDE TRANS	LEFT SIDE OPENING ELEV	RIGHT SIDE ROADWAY GUTTER	RIGHT SIDE REVEAL	RIGHT SIDE TRANS	RIGHT SIDE OPENING ELEV
*** 5	N: 3063375.6405 E: 702687.7741	5.0′	5.0′	0.00%	3″	4.0′	122.74′	0.24%	4″	4.0′	122.99′
*** 9	N: 3063377.5436 E: 702715.6490	5.0′	5.0′	0.00%	4″	5.0′	122.66	0.60%	5″	5.5′	122.65
13	N: 3056624.1726 E: 703257.7987	5.0′	5.0′	1.87%	4″	4.0′	133.03′	1.13%	4″	5.0′	133.15
** 17	N: 3056601.2172 E: 703232.7618	5.0	5.0	2.07%	4	6.5	133.02	2.10%	5	5.0′	132.94
** 21	N: 3058936.0439 E: 708798.1175	6.0′	5.0′	1.87%	5″	7.5′	86.77′	−2.60%	5″	6.0′	86.69′

NOTE: NEGATIVE (−) ROADWAY GUTTER MAX DENOTES A LOW SIDE TRANSITION.
** GRAN CURB TO ACT AS A BUFFER BETWEEN CEM CONC WCR/SIDEWALK AND ADJACENT HMA DRIVEWAY
*** GRAN CURB TO BE PLACED AGAINST BUILDING FLUSH WITH SIDEWALK



SECTION A–A



OBLIQUE VIEW

WHEELCHAIR RAMP
LESS THAN 6.50′ – STRAIGHT

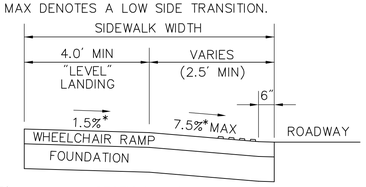
SCALE: NOT TO SCALE

* TOLERANCE FOR CONSTRUCTION ±0.5%

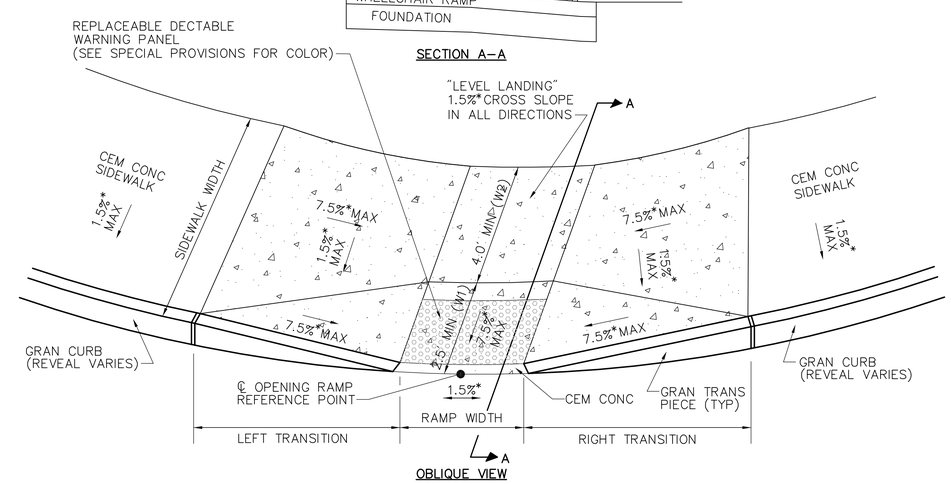
WHEELCHAIR RAMP DATA

NO.	LOCATION (REF. POINT)	SIDEWALK WIDTH	RAMP WIDTH	W1	W2	LEFT SIDE ROADWAY GUTTER	LEFT SIDE REVEAL	LEFT SIDE TRANS	LEFT SIDE OPENING ELEV	RIGHT SIDE ROADWAY GUTTER	RIGHT SIDE REVEAL	RIGHT SIDE TRANS	RIGHT SIDE OPENING ELEV
1	N: 3063354.2035 E: 702743.7802	9.0′– 10.7′	5.0′	5.0′	4.5′	0.10%	4″	5.0′	122.55′	0.60%	6″	6.5′	122.52′
9	N: 3061312.6680 E: 702200.7455	6.9′– 7.9′	5.0′	4.0′	4.4′	−0.02%	7″	6.5′	125.77′	0.07%	4″	13.0′	125.75
12	N: 3061300.7303 E: 702176.7139	6.4′– 6.9′	5.0	2.5	4.0	1.5%	5	4.5	123.00	−1.5%	5.5	5.0	123.00
16	N: 3056670.8862 E: 703260.5136	6.5	5.0	2.5	4.0	0.41%	2	4.0	132.72	1.55%	2	4.0	132.70
22	N: 3058900.2404 E: 708801.7181	7.8′	5.0′	3.0′	4.8′	−2.41%	6″	6.0′	87.04′	2.74%	4″	6.5′	87.11′

NOTE: NEGATIVE (−) ROADWAY GUTTER MAX DENOTES A LOW SIDE TRANSITION.



SECTION A–A



OBLIQUE VIEW

WHEELCHAIR RAMP
6.50′ OR GREATER – CURVED

SCALE: NOT TO SCALE

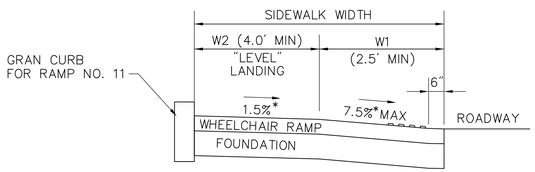
* TOLERANCE FOR CONSTRUCTION ±0.5%

WHEELCHAIR RAMP DATA

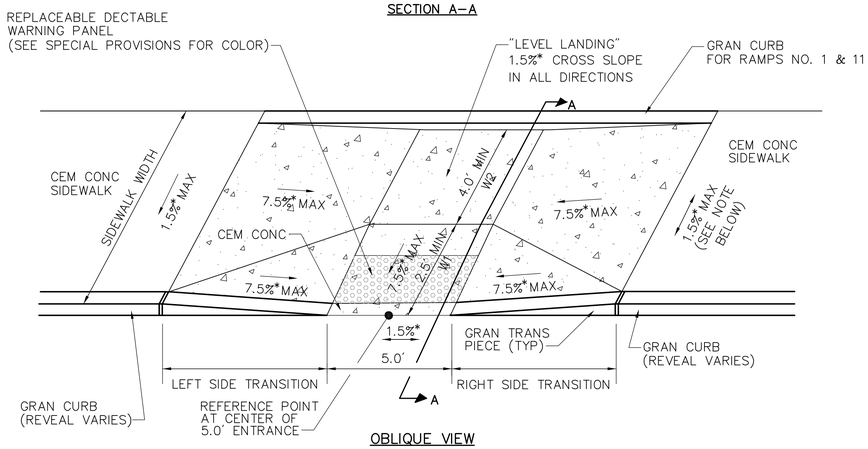
NO.	LOCATION (REF. POINT)	SIDEWALK WIDTH	W1	W2	LEFT SIDE ROADWAY GUTTER	LEFT SIDE REVEAL	LEFT SIDE TRANS	LEFT SIDE OPENING ELEV	RIGHT SIDE ROADWAY GUTTER	RIGHT SIDE REVEAL	RIGHT SIDE TRANS	RIGHT SIDE OPENING ELEV
*** 1	N: [illegible] E: 702664.2706	9.3	5.3	4.0	1.32%	6	8.5	122.88	0.49%	5	6.5	122.91
8	N: 3063319.2616 E: [illegible]	8.9′–11.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	−2.34%	6	6.5	123.34
*** 11	N: [illegible] E: 702198.8720	9.6′ 9.9′	5.3	4.0	1.64%	[illegible]	[illegible]	[illegible]	[illegible]	6″	[illegible]	[illegible]
13	N: 3061339.9166 E: 702172.4358	[illegible]	2.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	N: 3056658.6793 E: 703210.3202	6.5′	2.5′	4.0′	2.25%	4″	6.5′	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	N: 3056640.2366 E: 703191.5680	[illegible]	2.5	4.0	0.41%	4	[illegible]	[illegible]	[illegible]	4	[illegible]	[illegible]
24	N: 3058872.5310 E: 708752.9020	7.6′	3.6′	4.0′	5.46%	2.5″	15.0′	88.53′	−5.45%	4″	2.5′	88.46′

NOTE: NEGATIVE (−) ROADWAY GUTTER MAX DENOTES A LOW SIDE TRANSITION.

***GRAN CURB TO BE PLACED AGAINST BUILDING FLUSH WITH SIDEWALK



SECTION A–A



OBLIQUE VIEW

NOTE:

WHEELCHAIR RAMP 6.50′ OR GREATER – STRAIGHT

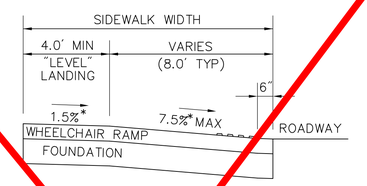
SCALE: NOT TO SCALE

* TOLERANCE FOR CONSTRUCTION ±0.5%

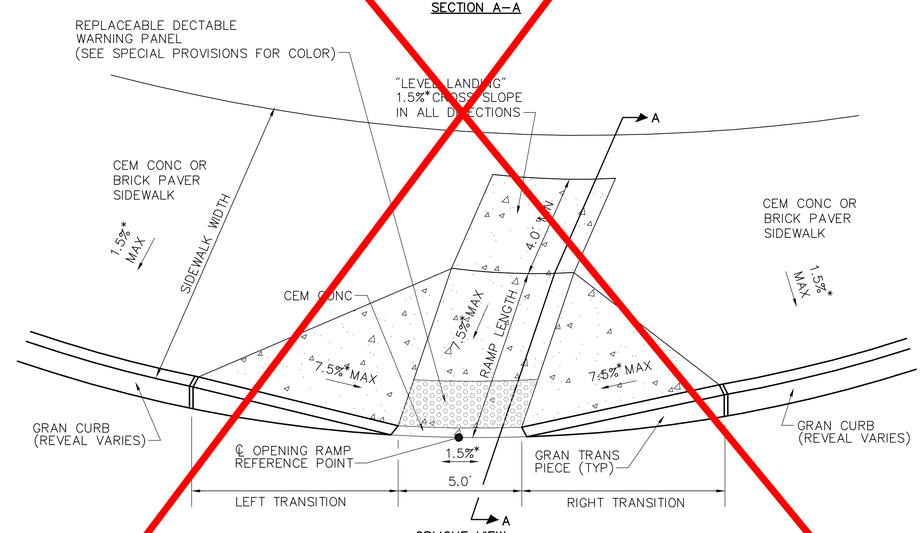
WHEELCHAIR RAMP DATA

NO.	LOCATION (REF. POINT)	SIDEWALK WIDTH	RAMP LENGTH	LEFT SIDE ROADWAY GUTTER	LEFT SIDE REVEAL	LEFT SIDE TRANS	LEFT SIDE OPENING ELEV	RIGHT SIDE ROADWAY GUTTER	RIGHT SIDE REVEAL	RIGHT SIDE TRANS	RIGHT SIDE OPENING ELEV
5	N: 3063327.7044 E: 702742.3306	VARIES	8.0′	0.69%	6″	6.5′	122.25′	−0.60%	4.5″	6.5′	122.20′
10	N: 3062285.5602 E: 702227.6970	VARIES	8.0′	4.75%	4″	15.0′	125.77′	−3.60%	8.0″	6.7′	125.69′

NOTE: NEGATIVE (−) ROADWAY GUTTER MAX DENOTES A LOW SIDE TRANSITION.



SECTION A–A



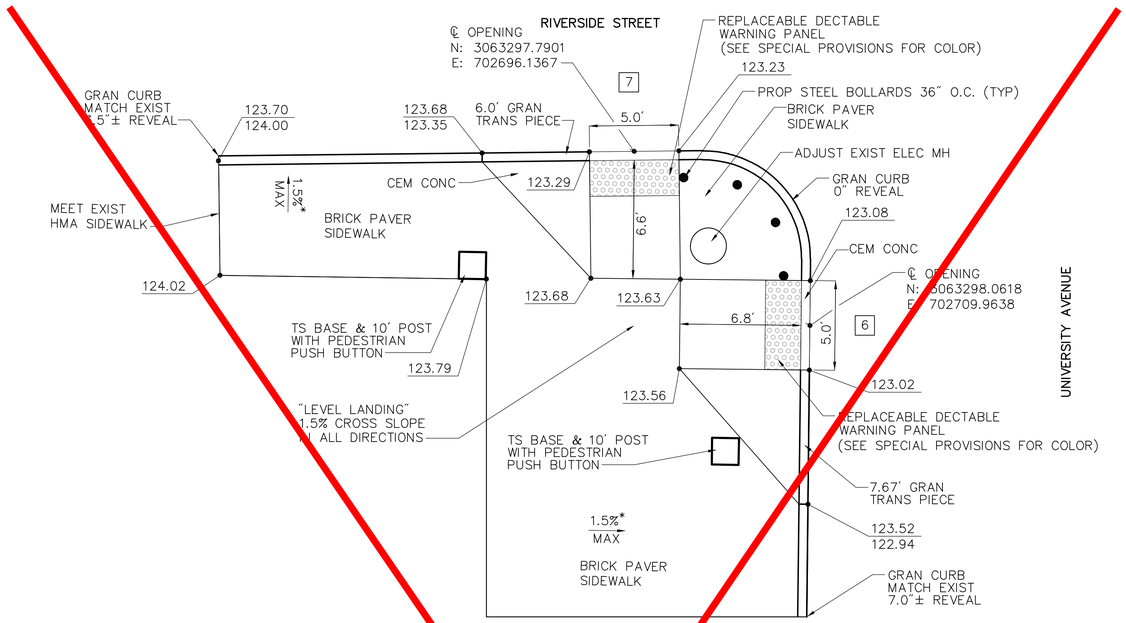
OBLIQUE VIEW

WHEELCHAIR RAMP 12.0′ OR GREATER – CURVED

SCALE: NOT TO SCALE

* TOLERANCE FOR CONSTRUCTION ±0.5%

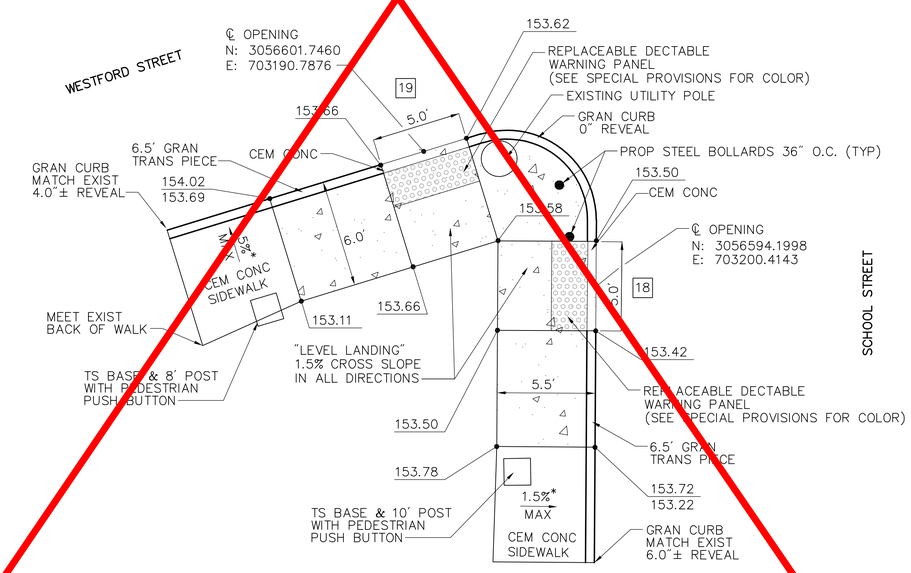
LOWELL
1 LOCATION
CONSTRUCTION DETAILS
SHEET 9 OF 31



WHEELCHAIR RAMP
NUMBER 6 AND 7

SCALE: NOT TO SCALE

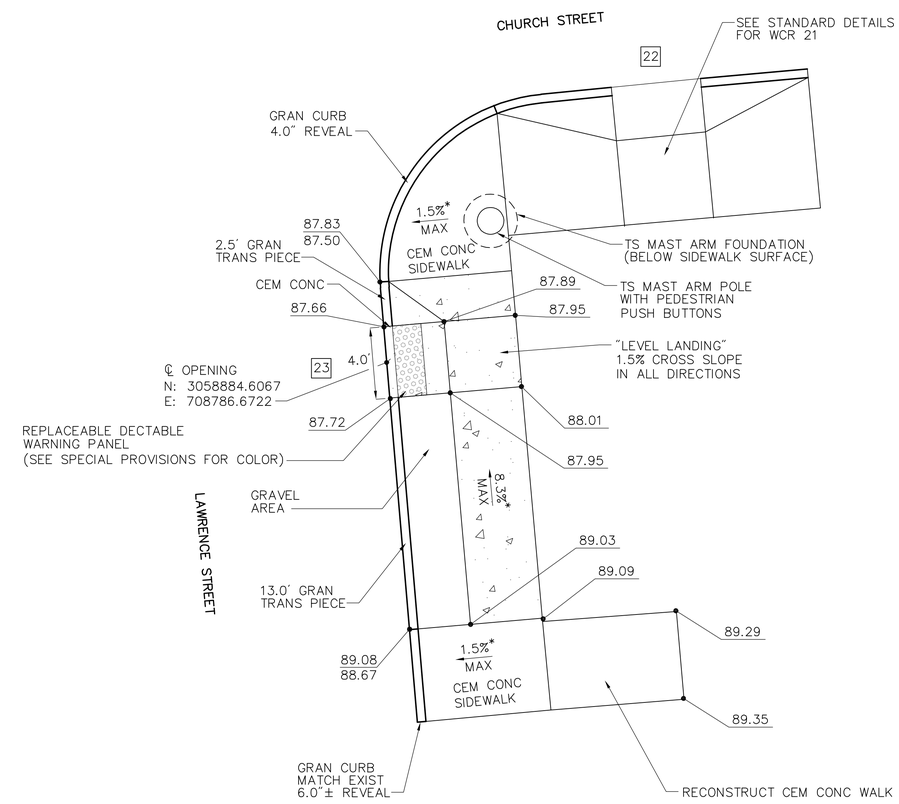
* TOLERANCE FOR CONSTRUCTION ±0.5%



WHEELCHAIR RAMP
NUMBER 17 AND 18

SCALE: NOT TO SCALE

* TOLERANCE FOR CONSTRUCTION ±0.5%



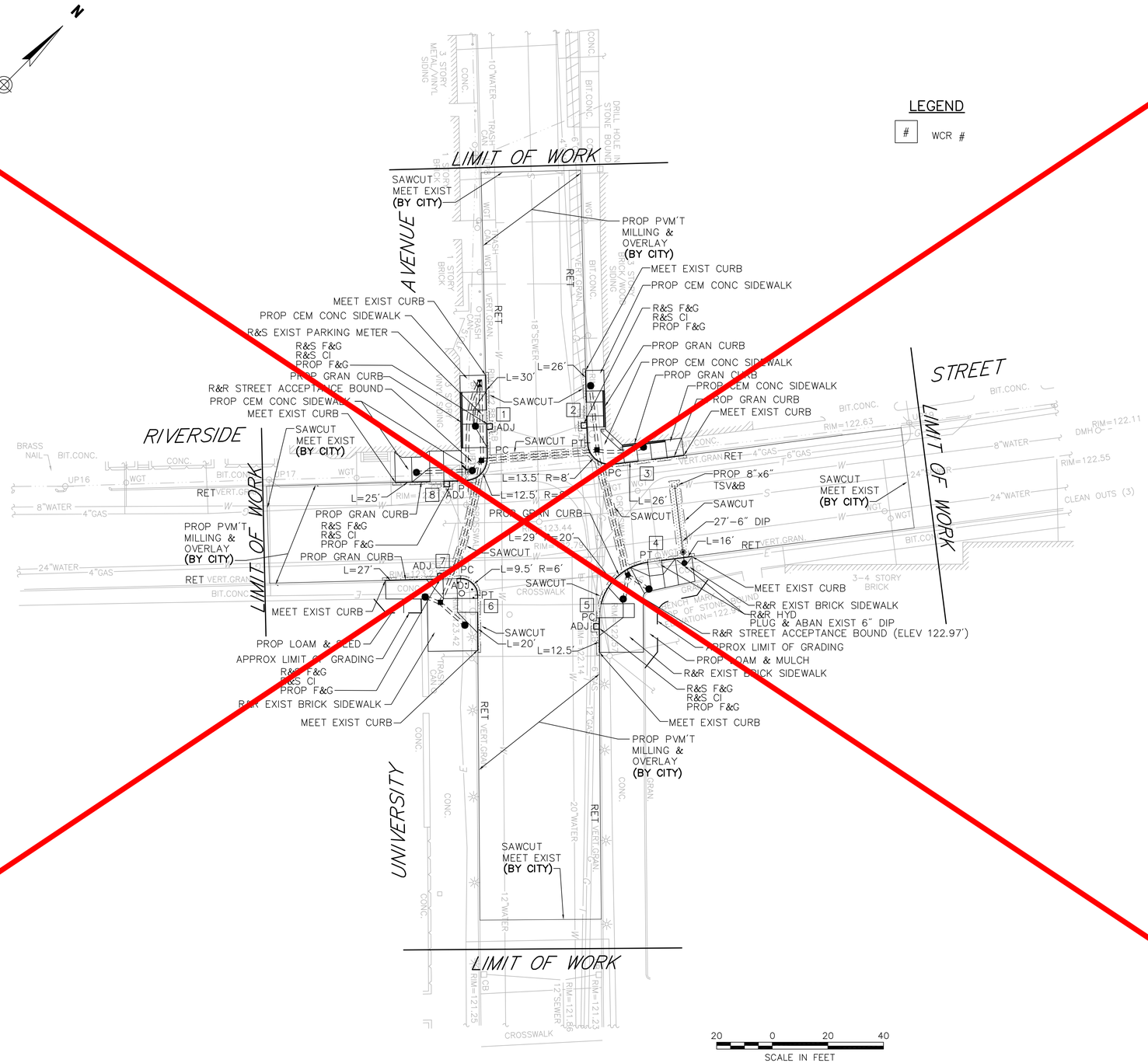
WHEELCHAIR RAMP
NUMBER 22

SCALE: NOT TO SCALE

* TOLERANCE FOR CONSTRUCTION ±0.5%

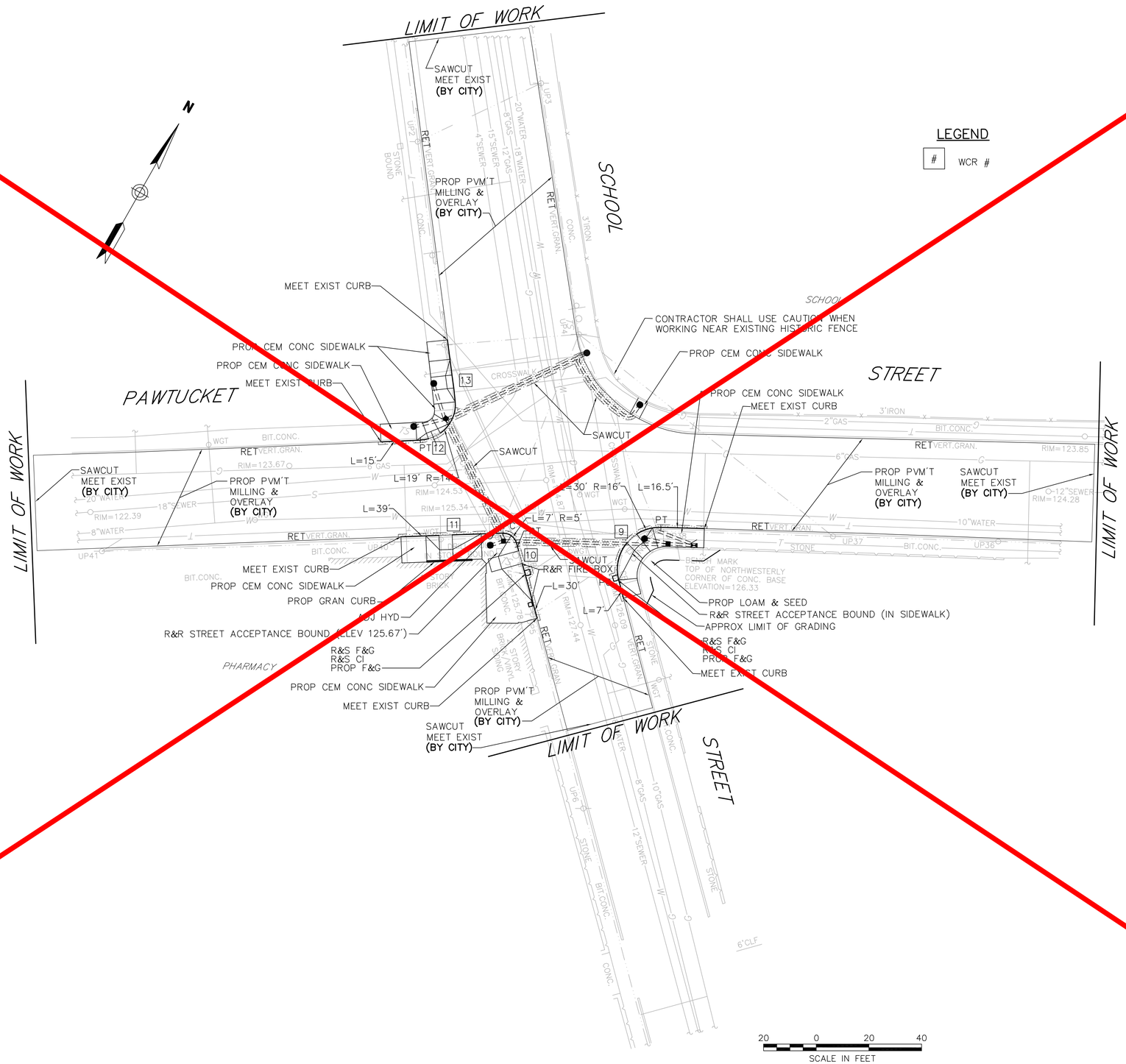
\\vhb\proj\Wat-TS\12274.00\cad\ts\planset\12274-det.dwg

LOWELL
CONSTRUCTION PLANS
RIVERSIDE ST AT UNIVERSITY AVE
SHEET 10 OF 31



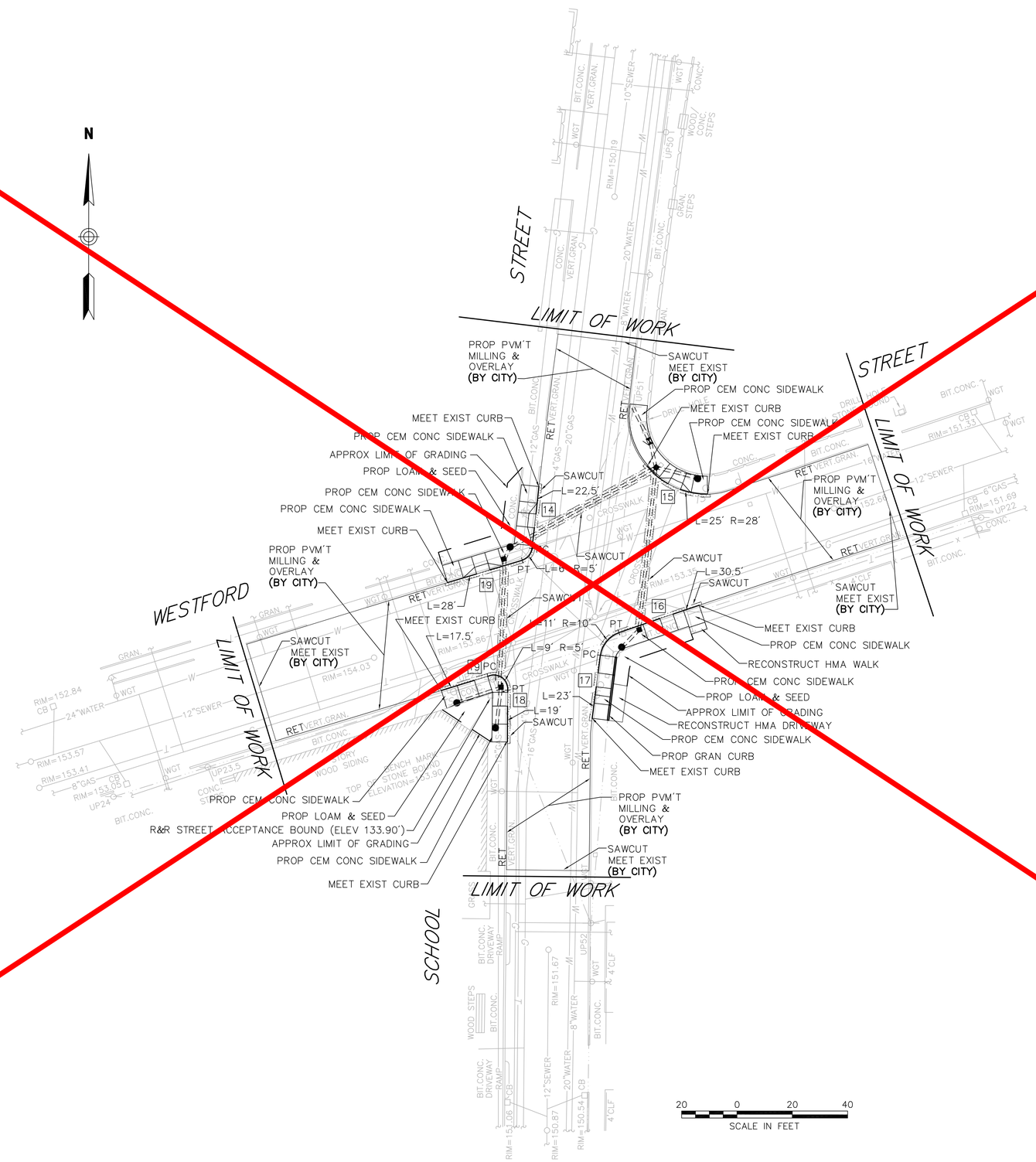
\\vhb\proj\Wat-TS\12274.00\cad\ts\planset\12274-GEN.dwg

LOWELL
CONSTRUCTION PLANS
SCHOOL ST AT PAWTUCKET AVE
SHEET 11 OF 31



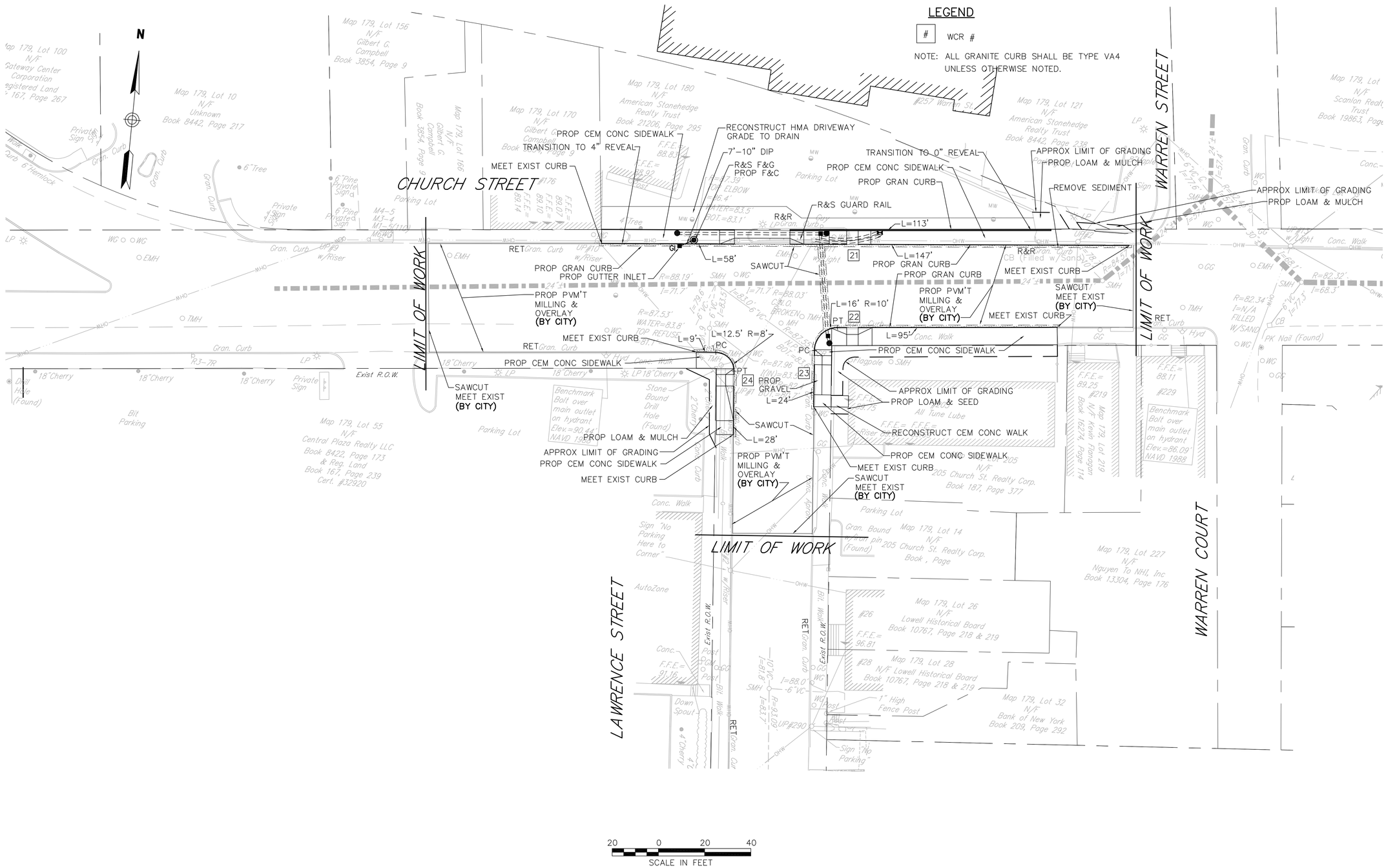
\\vhb\proj\Wat-TS\12274.00\cad\ts\planset\12274-GEN.dwg

LOWELL
CONSTRUCTION PLANS
SCHOOL ST AT WESTFORD ST
SHEET 12 OF 31



\\vhb\proj\Wat-TS\12274.00\cad\ts\planset\12274-GEN.dwg

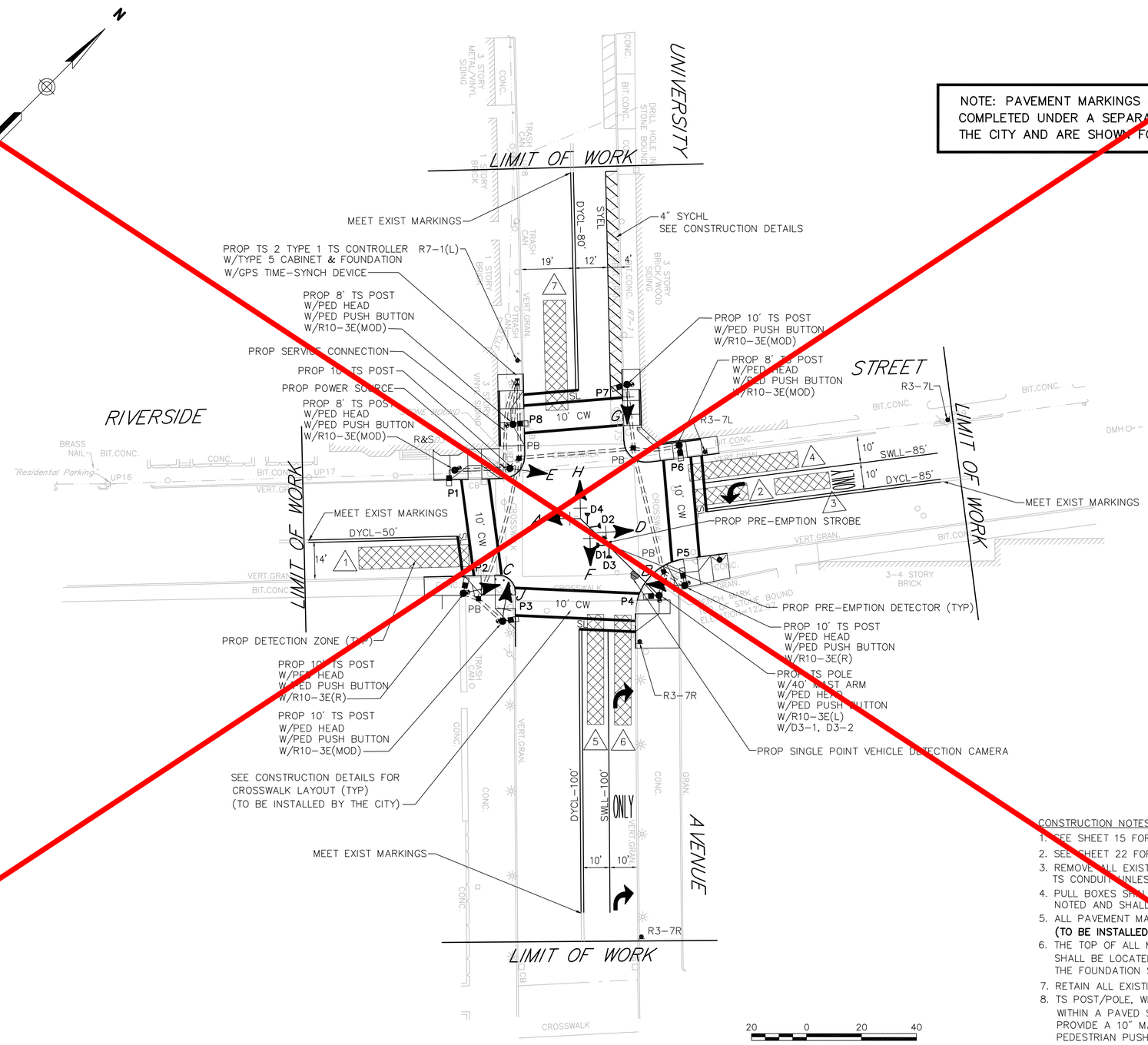
LOWELL
CONSTRUCTION PLANS
CHURCH ST AT LAWRENCE ST
SHEET 13 OF 31



\\vhb\proj\Wat-TS\12274.00\cad\ts\planset\12274-CHURCH - gen.dwg

LOWELL
TRAFFIC PLANS
RIVERSIDE ST AT UNIVERSITY AVE
SHEET 14 OF 31

NOTE: PAVEMENT MARKINGS ARE TO BE COMPLETED UNDER A SEPARATE CONTRACT BY THE CITY AND ARE SHOWN FOR REFRENCE ONLY



CONSTRUCTION NOTES:

1. SEE SHEET 15 FOR TRAFFIC SIGNAL DATA.
2. SEE SHEET 22 FOR TIE PLAN.
3. REMOVE ALL EXISTING TS EQUIPMENT, AND ABANDON ALL TS CONDUIT UNLESS OTHERWISE NOTED.
4. PULL BOXES SHALL BE ADJACENT TO CURB UNLESS OTHERWISE NOTED AND SHALL NOT BE LOCATED IN WHEELCHAIR RAMPS.
5. ALL PAVEMENT MARKINGS SHALL BE REFLECTORIZED THERMOPLASTIC. **(TO BE INSTALLED BY THE CITY)**
6. THE TOP OF ALL MAST ARM FOUNDATIONS IN SIDEWALK AREAS SHALL BE LOCATED 3"± BELOW FINISH GRADE. THE TOP OF THE FOUNDATION SHALL NOT BE EXPOSED TO THE SIDEWALK.
7. RETAIN ALL EXISTING SIGNS UNLESS OTHERWISE NOTED.
8. TS POST/POLE, WITH PEDESTRIAN PUSH BUTTON, NOT LOCATED WITHIN A PAVED SURFACE SHALL BE POSITIONED SO AS TO PROVIDE A 10" MAX CLEAR REACH ZONE BETWEEN THE PEDESTRIAN PUSH BUTTON AND THE PAVED SURFACE PER 521 CMR AND AS SHOWN ON THE CONSTRUCTION DETAILS.

SEQUENCE AND TIMING

APPROACH	DIRECTION	HOUSING	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	FLASHING OPERATION
MINIMUM INTERVAL			6			10			6			10			6						
VEHICLE EXTENSION			2			2			2			2			2						
MAXIMUM			15			30			30			30			30						
MAXIMUM 2			15			30			40			30			40						
YELLOW CLEARANCE				3			4			4			4			4			3		
RED CLEARANCE					1			1			1			1			1			1	
PEDESTRIAN INTERVAL						7/9			7/6			7/6			7/6			7/10			
RIVERSIDE STREET	EB	A,B	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	FY
RIVERSIDE STREET	WB	C	G-R	Y-R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	FY
RIVERSIDE STREET	WB	D,E	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	FY
UNIVERSITY AVENUE	NB	F	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	FR
UNIVERSITY AVENUE	NB	G	R-G	R-Y	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	FR
UNIVERSITY AVENUE	SB	H,J	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	FR
PEDESTRIAN X-ING	N-S	P1-P2	DW	DW	DW	DW	DW	DW	W/FDW	DW	DW	DW	DW	DW	DW	DW	DW	W	FDW	DW	OUT
PEDESTRIAN X-ING	E-W	P3-P4	DW	DW	DW	W/FDW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	W	FDW	DW	OUT
PEDESTRIAN X-ING	N-S	P5-P6	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	W/FDW	DW	DW	W	FDW	DW	OUT
PEDESTRIAN X-ING	E-W	P7-P8	DW	DW	DW	DW	DW	DW	DW	DW	DW	W/FDW	DW	DW	DW	DW	DW	W	FDW	DW	OUT
DETECTOR			NON-LOCK			NON-LOCK			NON-LOCK			NON-LOCK			NON-LOCK			–			
RECALL			OFF			SOFT			OFF			SOFT			OFF			–			
			ø1			ø2			ø4			ø6			ø8			ø9			ø1 & ø7
			OL			PERM, **			PERM, **			**, PERM			**, PERM						NOT USED

NOTES:
1. AUTOMATIC FLASHING OPERATION PER 2009 M.U.T.C.D., AS AMENDED,
2. ** NORMALLY DW, W/FDW UPON PEDESTRIAN PUSH BUTTON ACTUATION
3. OL = OVERLAP
4. PERM = PERMISSIVE
5. ø4 & ø8 DUAL ENTRY
6. MAXIMUM 1 = NORMAL OPERATION
7. MAXIMUM 2 = MON-FRI 7-9 AM; 3-6 PM
8. STOP AND GO OPERATION FOR 24 HOURS PER DAY. FLASHING OPERATION FOR EMERGENCY ONLY.
9. DURING PEDESTRIAN INTERVAL, FDW THROUGH YELLOW OPERATION SHALL BE IN EFFECT.
10. ø2 SHALL OMIT ø1.

FOR FUTURE USE

SEQUENCE & TIMING NOTES:

1. IF THE ASSIGNED RIGHT OF WAY FOR ANY TRAFFIC MOVEMENT IS TO REMAIN IN EFFECT DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATIONS FOR THAT TRAFFIC MOVEMENT WILL NOT CHANGE DURING THE CLEARANCE INTERVAL.
2. THE RIGHT OF WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON-CONFLICTING PHASES.
3. IF CALLS EXIST ON ALL PHASES, THE ASSIGNMENT OF RIGHT OF WAY SHALL BE IN ACCORDANCE WITH THE PREFERENTIAL PHASE SEQUENCE.
4. IF THE ASSIGNED RIGHT-OF-WAY FOR ANY TRAFFIC MOVEMENT IS TO CHANGE DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATION FOR THAT MOVEMENT WILL DISPLAY THE APPROPRIATE CLEARANCE INTERVALS.

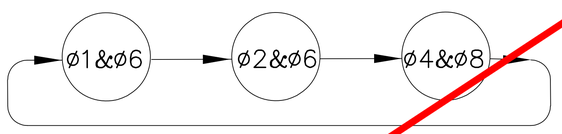
EMERGENCY VEHICLE PRE-EMPTION OPERATION.

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. PRE-EMPTION SIGNALS SHALL BE SERVICED ON A PRIORITY BASIS WITH DETECTORS D1, D2, D3 OR D4 ASSIGNED DESCENDING PRIORITIES AS FOLLOWS: (D1 HIGHEST AND D4 LOWEST)
3. IN RESPONSE TO A PRE-EMPTION SIGNAL RECEIVED AT AN INTERSECTION BY OPTICAL DETECTOR D1 (OR D2, D3, D4) THE CONTROLLER SHALL HOLD OR ADVANCE TO AND HOLD AN EMERGENCY VEHICLE PRE-EMPTION PHASE #1 (OR #2, #3, #4) GREEN FOR A MINIMUM OF TEN (10) SECONDS OR UNTIL PRE-EMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME PRE-EMPTION PHASE CLEARANCES FOR THE ASSOCIATED PHASE(S) AS SHOWN IN THE SEQUENCE AND TIMING CHART AND SERVICE SUBSEQUENT EMERGENCY VEHICLE PRE-EMPTION PHASES AS NECESSARY.
4. MINIMUM GREEN AND NORMAL VEHICLE CLEARANCE SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PRE-EMPTION DEMAND.
5. PRE-EMPTION STROBE SHALL BE ILLUMINATED WHENEVER ANY EMERGENCY VEHICLE PRE-EMPTION GREEN IS ON.

PRE-EMPTION PHASING & PRIORITY

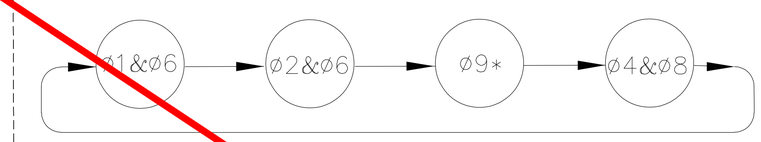
DETECTOR & PRIORITY	PRE-EMPT PHASE ASSIGNMENT	MOVEMENT	VEHICLE PHASE ASSIGNMENT
D1	1		ø2
D2	2		ø1&ø6
D3	3		ø8
D4	4		ø4

PREFERENTIAL PHASE SEQUENCE



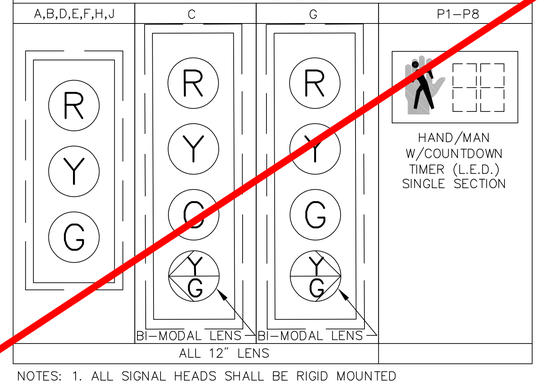
FOR FUTURE USE

PREFERENTIAL PHASE SEQUENCE



* UPON PEDESTRIAN PUSH BUTTON ACTUATION

SIGNAL HEAD DATA



NOTES: 1. ALL SIGNAL HEADS SHALL BE RIGID MOUNTED AND EQUIPPED WITH 5"± LOUVERED BACKPLATES.
2. ALL SIGNAL DISPLAYS SHALL BE EQUIPPED W/L.E.D. MODULES AND TUNNEL VISORS.

DETECTOR DATA

DETECTOR NO.	ZONE SIZE	DELAY /EXT	CALL PHASE
1	TO BE FIELD ADJUSTED	0	ø2
2	TO BE FIELD ADJUSTED	0	ø1
3	TO BE FIELD ADJUSTED	0	ø6
4	TO BE FIELD ADJUSTED	0	ø6
5	TO BE FIELD ADJUSTED	0	ø8
6	TO BE FIELD ADJUSTED	DELAY 5 SEC	ø8
7	TO BE FIELD ADJUSTED	0	ø4

NOTE:
DELAY AND EXTENSION TIMINGS SHALL BE PROGRAMMED IN THE CONTROLLER ONLY

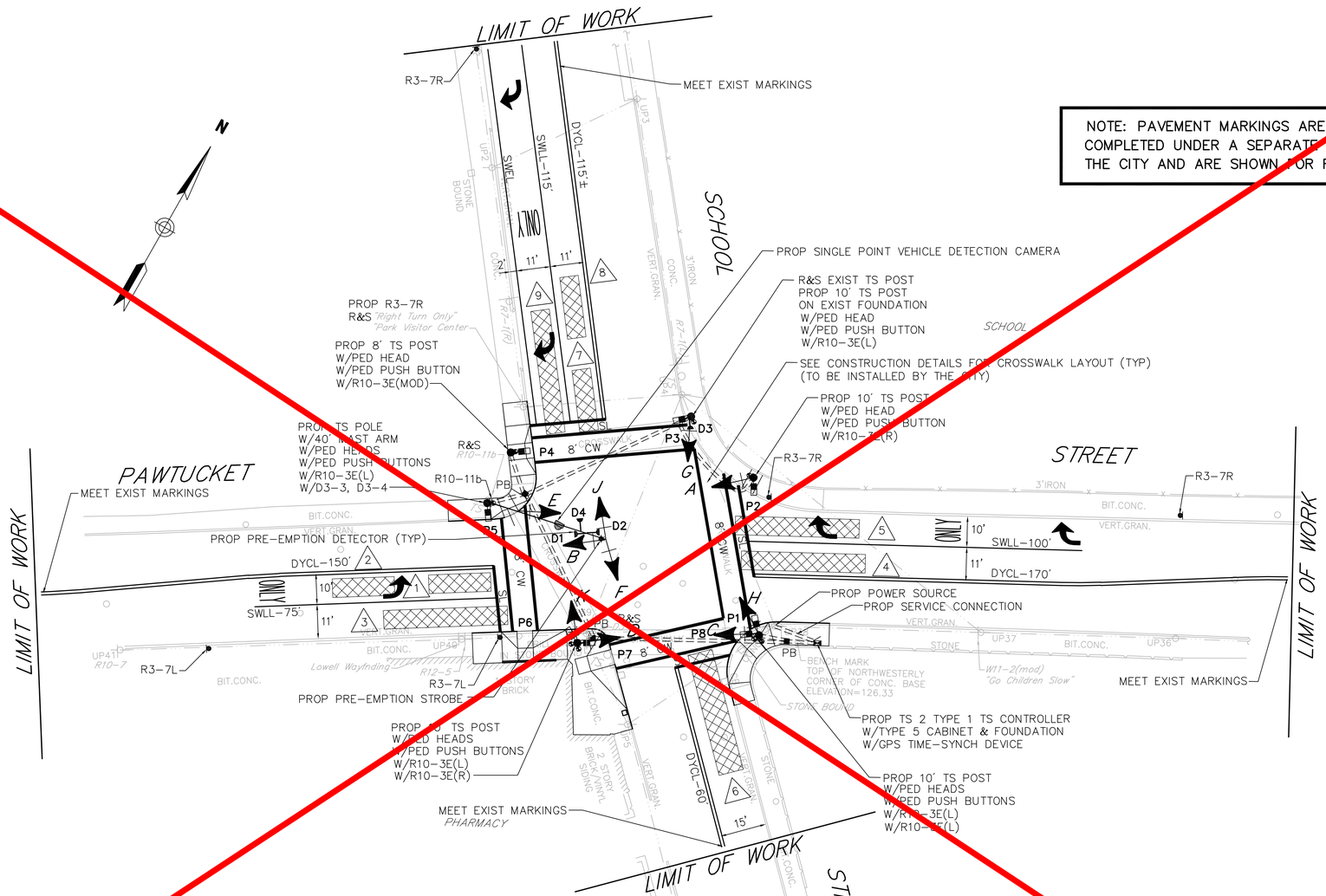
ITEM 816.01
TRAFFIC SIGNAL RECONSTRUCTION
UNIVERSITY AVENUE AT RIVERSIDE STREET
LIST OF MAJOR ITEMS REQUIRED

QUANTITY	DESCRIPTION
1	8ø TS 2 TYPE 1 CONTROLLER IN A TYPE 5 BASE MOUNTED CABINET INCL. FOUNDATION
1	GPS TIME-SYNCH DEVICE
1	TS 40' MAST ARM TYPE 2, STEEL, INCL. FOUNDATION
3	TS POST 8' STANDARD INCL. FOUNDATION
5	TS POST 10' STANDARD INCL. FOUNDATION
7	SIGNAL HEAD, 3-SECTION, 12" LENSES
2	SIGNAL HEAD, 4-SECTION BI-MODAL, 12" LENSES
8	PEDESTRIAN SIGNAL HEAD W/COUNTDOWN TIMER
1	PEDESTRIAN PUSH BUTTON W/R10-3E(L) AND SIGN SADDLE
2	PEDESTRIAN PUSH BUTTON W/R10-3E(R) AND SIGN SADDLE
5	PEDESTRIAN PUSH BUTTON W/R10-3E(MOD) AND SIGN SADDLE
4	PULL BOX-12"x12"
1	SINGLE POINT VIDEO DETECTION (1 CAMERA, VDP AND CABLES)
4	EMERGENCY PRE-EMPTION OPTICAL DETECTORS & DETECTOR CABLE
1	EMERGENCY PRE-EMPTION 4 CHANNEL PHASE SELECTOR
1	EMERGENCY PRE-EMPTION SYSTEM CHASSIS
1	EMERGENCY PRE-EMPTION STROBE (WHITE LENS)
1	SERVICE CONNECTION (OVERHEAD)

PLUS NECESSARY DUCT, CABLE, LABOR, MISCELLANEOUS MATERIAL AND EQUIPMENT TO COMPLETE THE INSTALLATION AND PROVIDE AN OPERATING TRAFFIC CONTROL SIGNAL.

LOWELL
TRAFFIC PLANS
SCHOOL ST AT PAWTUCKET AVE
SHEET 16 OF 31

NOTE: PAVEMENT MARKINGS ARE TO BE COMPLETED UNDER A SEPARATE CONTRACT BY THE CITY AND ARE SHOWN FOR REFRENCE ONLY



CONSTRUCTION NOTES:

1. SEE SHEET 17 FOR TRAFFIC SIGNAL DATA.
2. SEE SHEET 23 FOR TIE PLAN.
3. REMOVE ALL EXISTING TS EQUIPMENT, AND ABANDON ALL TS CONDUIT UNLESS OTHERWISE NOTED.
4. PULL BOXES SHALL BE ADJACENT TO CURB UNLESS OTHERWISE NOTED AND SHALL NOT BE LOCATED IN WHEELCHAIR RAMPS.
5. ALL PAVEMENT MARKINGS SHALL BE REFLECTORIZED THERMOPLASTIC. **(TO BE INSTALLED BY THE CITY)**
6. THE TOP OF ALL MAST ARM FOUNDATIONS IN SIDEWALK AREAS SHALL BE LOCATED 3"± BELOW FINISH GRADE. THE TOP OF THE FOUNDATION SHALL NOT BE EXPOSED TO THE SIDEWALK.
7. RETAIN ALL EXISTING SIGNS UNLESS OTHERWISE NOTED.
8. TS POST/POLE, WITH PEDESTRIAN PUSH BUTTON, NOT LOCATED WITHIN A PAVED SURFACE SHALL BE POSITIONED SO AS TO PROVIDE A 10" MAX CLEAR REACH ZONE BETWEEN THE PEDESTRIAN PUSH BUTTON AND THE PAVED SURFACE PER 521 CMR AND AS SHOWN ON THE CONSTRUCTION DETAILS.

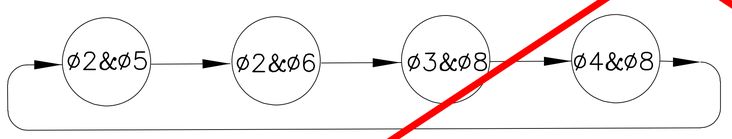
SEQUENCE AND TIMING

APPROACH	DIRECTION	HOUSING	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	FLASHING OPERATION
MINIMUM INTERVAL			10			6			6			6			10			6						
VEHICLE EXTENSION			2			2			2			2			2			2						
MAXIMUM 1			30			15			20			15			20			40						
MAXIMUM 2			45			30			25			20			35			55						
YELLOW CLEARANCE				4			3			5			3			4			5			3		
RED CLEARANCE					1			1			1			1			1			1			1	
PEDESTRIAN INTERVAL			7/6						7/11						7/11			7/6			7/13			
PAWTUCKET STREET	EB	A	G	Y	R	R	R	R	R	R	R	G R	Y R	R	R	R	R	R	R	R	R	R	R	FY
PAWTUCKET STREET	EB	B,C	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	FY
PAWTUCKET STREET	WB	D	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	FY
PAWTUCKET STREET	WB	E	R	R	R	R G	R Y	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	FY
SCHOOL STREET	NB	F,G	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	FR
SCHOOL STREET	SB	H	R	R	R	G G	Y Y	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	FR
SCHOOL STREET	SB	J	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	FR
SCHOOL STREET	SB	K	R	R	R	G	Y	R	R	R	R	R G	R Y	R	R	R	R	G	Y	R	R	R	R	FR
PEDESTRIAN X-ING	N-S	P1-P2	DW	DW	DW	DW	DW	DW	W/FDW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	W	FDW	DW	OUT
PEDESTRIAN X-ING	E-W	P3-P4	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	W/FDW	DW	DW	DW	DW	DW	W	FDW	DW	OUT
PEDESTRIAN X-ING	N-S	P5-P6	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	W/FDW	DW	DW	W	FDW	DW	OUT
PEDESTRIAN X-ING	E-W	P7-P8	W/FDW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	W	FDW	DW	OUT
DETECTOR			NON-LOCK			NON-LOCK			NON-LOCK			NON-LOCK			NON-LOCK			NON-LOCK			–			
RECALL			SOFT			OFF			OFF			OFF			SOFT			OFF			–			
			ø2			ø3			ø4			ø5			ø6			ø8			ø9			ø1 & ø7
			PERM **			OL			** PERM			OL			** PERM			PERM **						NOT USED

NOTES:
1. AUTOMATIC FLASHING OPERATION PER 2009 M.U.T.C.D., AS AMENDED,
2. ** NORMALLY DW, W/FDW UPON PEDESTRIAN PUSH BUTTON ACTUATION
3. OL = OVERLAP
4. PERM = PERMISSIVE
5. ø4 & ø8 DUAL ENTRY
6. MAXIMUM 1 = NORMAL OPERATION
7. MAXIMUM 2 = MON-FRI 7-9 AM; 3-6 PM
8. STOP AND GO OPERATION FOR 24 HOURS PER DAY. FLASHING OPERATION FOR EMERGENCY ONLY.
9. DURING PEDESTRIAN INTERVAL, FDW THROUGH YELLOW OPERATION SHALL BE IN EFFECT.
10. ø6 SHALL OMIT ø5.
11. ø4 SHALL OMIT ø3.

FOR FUTURE USE

PREFERENTIAL PHASE SEQUENCE



SEQUENCE & TIMING NOTES:

1. IF THE ASSIGNED RIGHT OF WAY FOR ANY TRAFFIC MOVEMENT IS TO REMAIN IN EFFECT DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATIONS FOR THAT TRAFFIC MOVEMENT WILL NOT CHANGE DURING THE CLEARANCE INTERVAL.
2. THE RIGHT OF WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON-CONFLICTING PHASES.
3. IF CALLS EXIST ON ALL PHASES, THE ASSIGNMENT OF RIGHT OF WAY SHALL BE IN ACCORDANCE WITH THE PREFERENTIAL PHASE SEQUENCE.
4. IF THE ASSIGNED RIGHT-OF-WAY FOR ANY TRAFFIC MOVEMENT IS TO CHANGE DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATION FOR THAT MOVEMENT WILL DISPLAY THE APPROPRIATE CLEARANCE INTERVALS.

EMERGENCY VEHICLE PRE-EMPTION OPERATION.

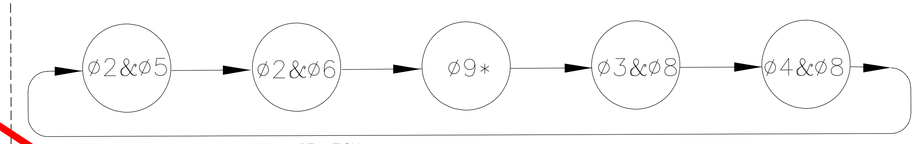
1. EMERGENCY VEHICLE PRE-EMPTION SIGNALS SHALL BE OPTICALLY TRANSMITTED BY OPTICAL EMITTERS MOUNTED IN EMERGENCY VEHICLES AND RECEIVED BY OPTICAL DETECTORS LOCATED AT EACH INTERSECTION.
2. PRE-EMPTION SIGNALS SHALL BE SERVICED ON A PRIORITY BASIS WITH DETECTORS D1, D2, D3 OR D4 ASSIGNED DESCENDING PRIORITIES AS FOLLOWS: (D1 HIGHEST AND D4 LOWEST)
3. IN RESPONSE TO A PRE-EMPTION SIGNAL RECEIVED AT AN INTERSECTION BY OPTICAL DETECTOR D1 (OR D2, D3, D4) THE CONTROLLER SHALL HOLD OR ADVANCE TO AND HOLD IN EMERGENCY VEHICLE PRE-EMPTION PHASE #1 (OR #2, #3, #4) GREEN FOR A MINIMUM OF TEN (10) SECONDS OR UNTIL PRE-EMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME PRE-EMPTION PHASE CLEARANCES FOR THE ASSOCIATED PHASE(S) AS SHOWN IN THE SEQUENCE AND TIMING CHART AND SERVICE SUBSEQUENT EMERGENCY VEHICLE PRE-EMPTION PHASES AS NECESSARY.
4. MINIMUM GREEN AND NORMAL VEHICLE CLEARANCE SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PRE-EMPTION DEMAND.
5. PRE-EMPTION STROBE SHALL BE ILLUMINATED WHENEVER ANY EMERGENCY VEHICLE PRE-EMPTION GREEN IS ON.

PRE-EMPTION PHASING & PRIORITY

DETECTOR & PRIORITY	PRE-EMPT PHASE ASSIGNMENT	MOVEMENT	VEHICLE PHASE ASSIGNMENT
D1	1		ø2&ø5
D2	2		ø6
D3	3		ø4
D4	4		ø3&ø8

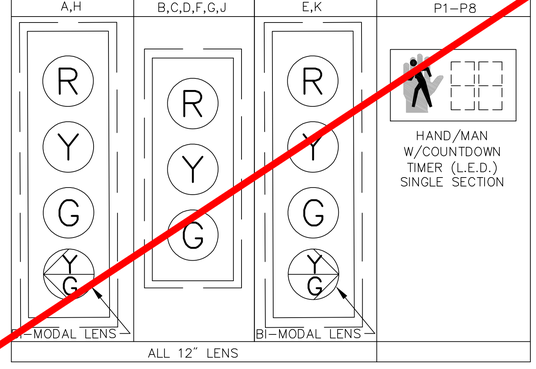
FOR FUTURE USE

PREFERENTIAL PHASE SEQUENCE



* UPON PEDESTRIAN PUSH BUTTON ACTUATION

SIGNAL HEAD DATA



NOTES: 1. ALL SIGNAL HEADS SHALL BE RIGID MOUNTED AND EQUIPPED WITH 5"± LOUVERED BACKPLATES.
2. ALL SIGNAL DISPLAYS SHALL BE EQUIPPED W/L.E.D. MODULES AND TUNNEL VISORS.

DETECTOR DATA

DETECTOR NO.	ZONE SIZE	DELAY /EXT	CALL PHASE
1	TO BE FIELD ADJUSTED	0	ø5
2	TO BE FIELD ADJUSTED	0	ø2
3	TO BE FIELD ADJUSTED	0	ø2
4	TO BE FIELD ADJUSTED	0	ø6
5	TO BE FIELD ADJUSTED	DELAY 5 SEC	ø6
6	TO BE FIELD ADJUSTED	0	ø4
7	TO BE FIELD ADJUSTED	0	ø3
8	TO BE FIELD ADJUSTED	0	ø8
9	TO BE FIELD ADJUSTED	DELAY 5 SEC	ø8

NOTE:
DELAY AND EXTENSION TIMINGS SHALL BE PROGRAMMED IN THE CONTROLLER ONLY

ITEM 816.02
TRAFFIC SIGNAL RECONSTRUCTION
PAWTUCKET STREET AT SCHOOL STREET
LIST OF MAJOR ITEMS REQUIRED

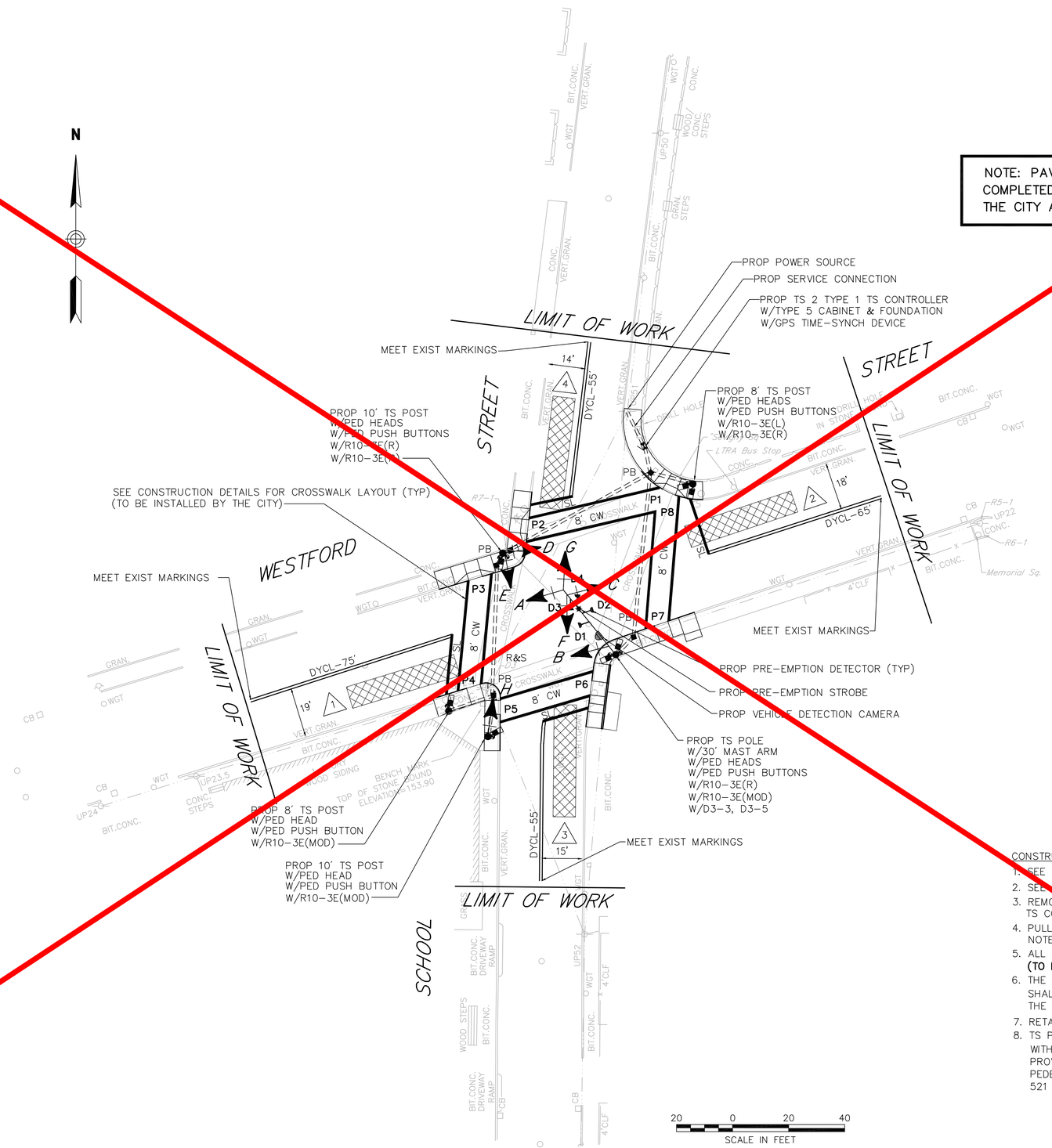
QUANTITY	DESCRIPTION
1	8ø TS 2 TYPE 1 CONTROLLER IN A TYPE 5 BASE MOUNTED CABINET INCL. FOUNDATION
1	GPS TIME-SYNCH DEVICE
1	TS 40' MAST ARM TYPE 2, STEEL, INCL. FOUNDATION
1	TS POST 8' STANDARD INCL. FOUNDATION
3	TS POST 10' STANDARD INCL. FOUNDATION
1	TS POST 10' STANDARD ON EXIST FOUNDATION
6	SIGNAL HEAD, 3-SECTION, 12" LENSES
4	SIGNAL HEAD, 4-SECTION BI-MODAL, 12" LENSES
8	PEDESTRIAN SIGNAL HEAD W/COUNTDOWN TIMER
5	PEDESTRIAN PUSH BUTTON W/R10-3E(L) AND SIGN SADDLE
2	PEDESTRIAN PUSH BUTTON W/R10-3E(R) AND SIGN SADDLE
1	PEDESTRIAN PUSH BUTTON W/R10-3E(WOOD) AND SIGN SADDLE
3	PULL BOX-12"x12"
1	SINGLE POINT VIDEO DETECTION (1 CAMERA, VDU AND CABLES)
4	EMERGENCY PRE-EMPTION OPTICAL DETECTORS & DETECTOR CABLE
1	EMERGENCY PRE-EMPTION 4 CHANNEL PHASE SELECTOR
1	EMERGENCY PRE-EMPTION SYSTEM CHASSIS
1	EMERGENCY PRE-EMPTION STROBE (WHITE LENS)
1	SERVICE CONNECTION (OVERHEAD)
2	12" GEOMETRICALLY PROGRAMMABLE LOUVERS (SEE NOTE 1 BELOW)

PLUS NECESSARY DUCT, CABLE, LABOR, MISCELLANEOUS MATERIAL AND EQUIPMENT TO COMPLETE THE INSTALLATION AND PROVIDE AN OPERATING TRAFFIC CONTROL SIGNAL.

NOTE:
1. GEOMETRICALLY PROGRAMMABLE LOUVERS SHALL BE INSTALLED AT THE PEDESTRIAN CROSSING SIGNAL ON SCHOOL STREET, JUST NORTH OF PAWTUCKET STREET. LOUVERS SHALL BE INSTALLED ON THE GREEN SIGNAL DISPLAYS FOR THE SCHOOL STREET NORTHBOUND APPROACH AND POSITIONED TO BLOCK THE VIEW OF THE GREEN DISPLAY, WHEN ILLUMINATED, FROM NORTHBOUND VEHICLES TRAVELING ON SCHOOL STREET, SOUTH OF PAWTUCKET STREET.

LOWELL
TRAFFIC PLANS
SCHOOL ST AT WESTFORD ST
SHEET 18 OF 31

NOTE: PAVEMENT MARKINGS ARE TO BE COMPLETED UNDER A SEPARATE CONTRACT BY THE CITY AND ARE SHOWN FOR REFRENCE ONLY



CONSTRUCTION NOTES:

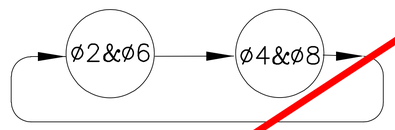
1. SEE SHEET 19 FOR TRAFFIC SIGNAL DATA.
2. SEE SHEET 24 FOR TIE PLAN.
3. REMOVE ALL EXISTING TS EQUIPMENT, AND ABANDON ALL TS CONDUIT UNLESS OTHERWISE NOTED.
4. PULL BOXES SHALL BE ADJACENT TO CURB UNLESS OTHERWISE NOTED AND SHALL NOT BE LOCATED IN WHEELCHAIR RAMPS.
5. ALL PAVEMENT MARKINGS SHALL BE REFLECTORIZED THERMOPLASTIC. **(TO BE INSTALLED BY THE CITY)**
6. THE TOP OF ALL MAST ARM FOUNDATIONS IN SIDEWALK AREAS SHALL BE LOCATED 3"± BELOW FINISH GRADE. THE TOP OF THE FOUNDATION SHALL NOT BE EXPOSED TO THE SIDEWALK.
7. RETAIN ALL EXISTING SIGNS UNLESS OTHERWISE NOTED.
8. TS POST/POLE, WITH PEDESTRIAN PUSH BUTTON, NOT LOCATED WITHIN A PAVED SURFACE SHALL BE POSITIONED SO AS TO PROVIDE A 10" MAX CLEAR REACH ZONE BETWEEN THE PEDESTRIAN PUSH BUTTON AND THE PAVED SURFACE PER 521 CMR AND AS SHOWN ON THE CONSTRUCTION DETAILS.

SEQUENCE AND TIMING																		
APPROACH	DIRECTION	HOUSING	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	FLASHING OPERATION
MINIMUM INTERVAL			10			6			10			6						
VEHICLE EXTENSION			2			2			2			2						
MAXIMUM 1			30			30			30			30						
MAXIMUM 2			40			30			40			30						
YELLOW CLEARANCE				4			3			4			3			3		
RED CLEARANCE					1			1			1			1			1	
PEDESTRIAN INTERVAL			7/5			7/10			7/11			7/8			7/12			
WESTFORD STREET	EB	A,B	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	FY
WESTFORD STREET	WB	C,D	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	FY
SCHOOL STREET	NB	E,F	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	FR
SCHOOL STREET	SB	G,H	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	FR
PEDESTRIAN X-ING	E-W	P5-P6	W/FDW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	OUT
PEDESTRIAN X-ING	N-S	P7-P8	DW	DW	DW	W/FDW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	OUT
PEDESTRIAN X-ING	E-W	P1-P2	DW	DW	DW	DW	DW	DW	W/FDW	DW	DW	DW	DW	DW	DW	DW	DW	OUT
PEDESTRIAN X-ING	N-S	P3-P4	DW	DW	DW	DW	DW	DW	DW	DW	DW	W/FDW	DW	DW	DW	DW	DW	OUT
DETECTOR			NON-LOCK			NON-LOCK			NON-LOCK			NON-LOCK			–			
RECALL			SOFT			OFF			SOFT			OFF			–			
			ø2			ø4			ø6			ø8			ø9			ø1,ø3,ø5&ø7
																		NOT USED

NOTES:
1. AUTOMATIC FLASHING OPERATION PER 2009 M.U.T.C.D., AS AMENDED,
2. ** NORMALLY DW, W/FDW UPON PEDESTRIAN PUSH BUTTON ACTUATION
3. PERM = PERMISSIVE
4. ø4 & ø8 DUAL ENTRY
5. MAXIMUM 1 = NORMAL OPERATION
6. MAXIMUM 2 = MON-FRI 7-9 AM; 3-6 PM
7. STOP AND GO OPERATION FOR 24 HOURS PER DAY. FLASHING OPERATION FOR EMERGENCY ONLY.
8. DURING PEDESTRIAN INTERVAL, FDW THROUGH YELLOW OPERATION SHALL BE IN EFFECT.

FOR FUTURE USE

PREFERENTIAL PHASE SEQUENCE



SEQUENCE & TIMING NOTES:

1. IF THE ASSIGNED RIGHT OF WAY FOR ANY TRAFFIC MOVEMENT IS TO REMAIN IN EFFECT DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATIONS FOR THAT TRAFFIC MOVEMENT WILL NOT CHANGE DURING THE CLEARANCE INTERVAL.
2. THE RIGHT OF WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON-CONFLICTING PHASES.
3. IF CALLS EXIST ON ALL PHASES, THE ASSIGNMENT OF RIGHT OF WAY SHALL BE IN ACCORDANCE WITH THE PREFERENTIAL PHASE SEQUENCE.
4. IF THE ASSIGNED RIGHT-OF-WAY FOR ANY TRAFFIC MOVEMENT IS TO CHANGE DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATION FOR THAT MOVEMENT WILL DISPLAY THE APPROPRIATE CLEARANCE INTERVALS.

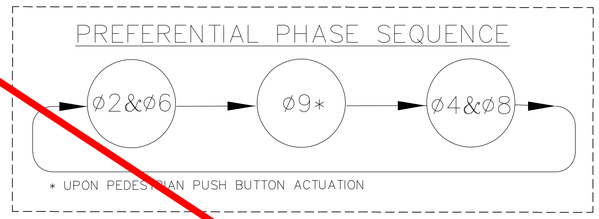
EMERGENCY VEHICLE PRE-EMPTION OPERATION.

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. PRE-EMPTION SIGNALS SHALL BE SERVICED ON A PRIORITY BASIS WITH DETECTORS D1, D2, D3 OR D4 ASSIGNED DESCENDING PRIORITIES AS FOLLOWS: (D1 HIGHEST AND D4 LOWEST)
3. IN RESPONSE TO A PRE-EMPTION SIGNAL RECEIVED AT AN INTERSECTION BY OPTICAL DETECTOR D1 (OR D2, D3, D4) THE CONTROLLER SHALL HOLD OR ADVANCE TO AND HOLD IN EMERGENCY VEHICLE PRE-EMPTION PHASE #1 (OR #2, #3, #4) GREEN FOR A MINIMUM OF TEN (10) SECONDS OR UNTIL PRE-EMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME PRE-EMPTION PHASE CLEARANCES FOR THE ASSOCIATED PHASE(S) AS SHOWN IN THE SEQUENCE AND TIMING CHART AND SERVICE SUBSEQUENT EMERGENCY VEHICLE PRE-EMPTION PHASES AS NECESSARY.
4. MINIMUM GREEN AND NORMAL VEHICLE CLEARANCE SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PRE-EMPTION DEMAND.
5. PRE-EMPTION STROBE SHALL BE ILLUMINATED WHENEVER ANY EMERGENCY VEHICLE PRE-EMPTION GREEN IS ON.

PRE-EMPTION PHASING & PRIORITY			
DETECTOR & PRIORITY	PRE-EMPT PHASE ASSIGNMENT	MOVEMENT	VEHICLE PHASE ASSIGNMENT
D1	1		ø2
D2	2		ø6
D3	3		ø4
D4	4		ø8

FOR FUTURE USE

PREFERENTIAL PHASE SEQUENCE



SIGNAL HEAD DATA

A,B,C,D,E,F,G,H	P1-P8
R Y G	HAND/MAN W/COUNTDOWN TIMER (L.E.D.) SINGLE SECTION
ALL 12" LENS	

NOTES:
1. ALL SIGNAL HEADS SHALL BE RIGID MOUNTED AND EQUIPPED WITH 5"± LOUVERED BACKPLATES.
2. ALL SIGNAL DISPLAYS SHALL BE EQUIPPED W/L.E.D. MODULES. AND TUNNEL VISORS.

DETECTOR DATA			
DETECTOR NO.	ZONE SIZE	DELAY /EXT	CALL PHASE
1	TO BE FIELD ADJUSTED	0	ø2
2	TO BE FIELD ADJUSTED	0	ø6
3	TO BE FIELD ADJUSTED	0	ø4
4	TO BE FIELD ADJUSTED	0	ø8

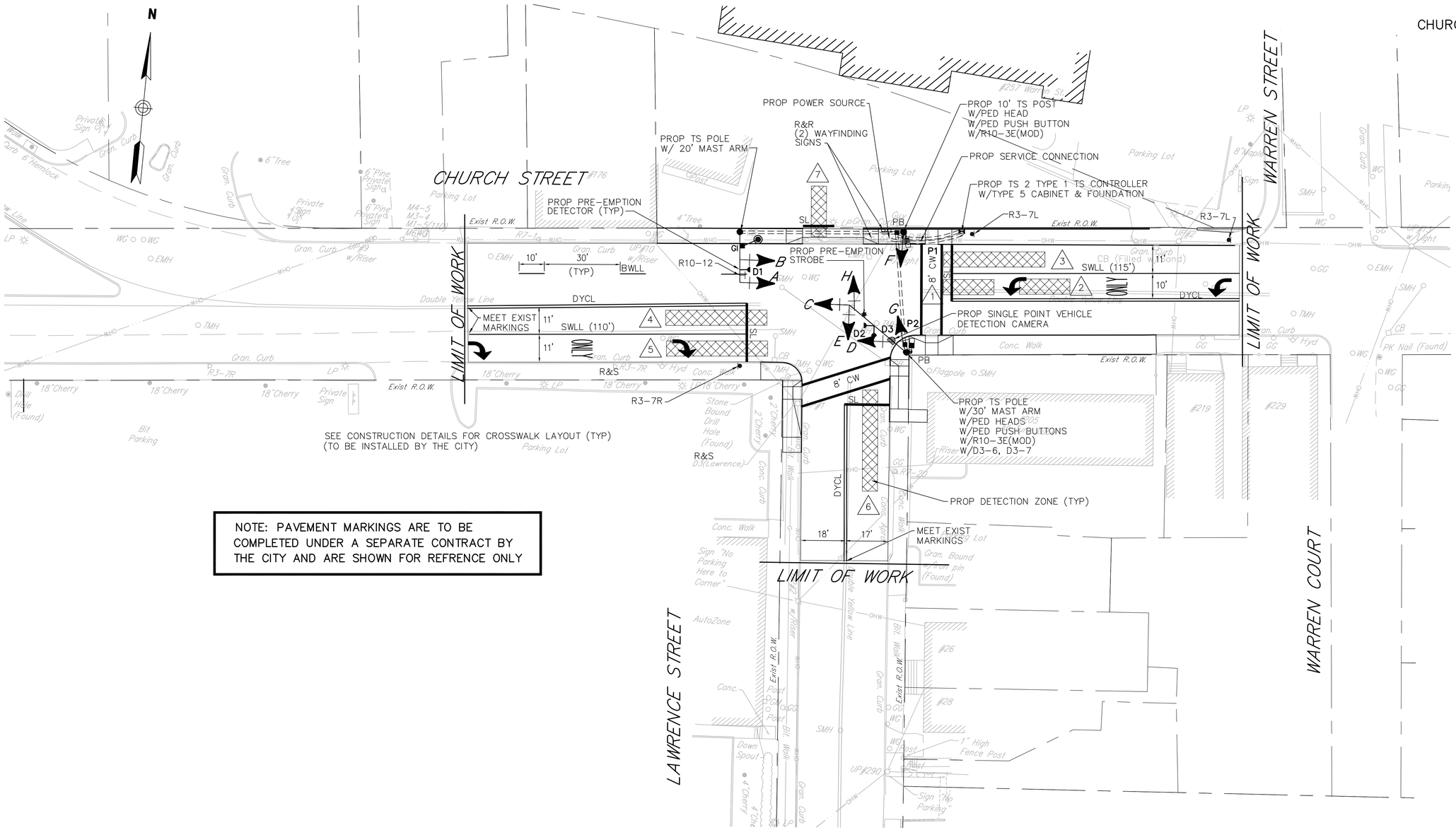
NOTE:
DELAY AND EXTENSION TIMINGS SHALL BE PROGRAMMED IN THE CONTROLLER ONLY

ITEM 816.03
TRAFFIC SIGNAL RECONSTRUCTION
WESTFORD STREET AT SCHOOL STREET
LIST OF MAJOR ITEMS REQUIRED

QUANTITY	DESCRIPTION
1	8ø TS 2 TYPE 1 CONTROLLER IN A TYPE 5 BASE MOUNTED CABINET INCL. FOUNDATION
1	GPS TIME-SYNCH DEVICE
1	TS 30' MAST ARM TYPE 2, STEEL, INCL. FOUNDATION
2	TS POST 8' STANDARD INCL. FOUNDATION
2	TS POST 10' STANDARD INCL. FOUNDATION
8	SIGNAL HEAD, 3-SECTION, 12" LENSES
8	PEDESTRIAN SIGNAL HEAD W/COUNTDOWN TIMER
1	PEDESTRIAN PUSH BUTTON W/R10-3E(L) AND SIGN SADDLE
4	PEDESTRIAN PUSH BUTTON W/R10-3E(R) AND SIGN SADDLE
3	PEDESTRIAN PUSH BUTTON W/R10-3E(MOD) AND SIGN SADDLE
4	PULL BOX-12"x12"
1	SINGLE POINT VIDEO DETECTION (1 CAMERA, VDP AND CABLES)
4	EMERGENCY PRE-EMPTION OPTICAL DETECTORS & DETECTOR CABLE
1	EMERGENCY PRE-EMPTION 4 CHANNEL PHASE SELECTOR
1	EMERGENCY PRE-EMPTION SYSTEM CHASSIS
1	EMERGENCY PRE-EMPTION STROBE (WHITE LENS)
1	SERVICE CONNECTION (OVERHEAD)

PLUS NECESSARY DUCT, CABLE, LABOR, MISCELLANEOUS MATERIAL AND EQUIPMENT TO COMPLETE THE INSTALLATION AND PROVIDE AN OPERATING TRAFFIC CONTROL SIGNAL.

LOWELL
TRAFFIC PLANS
CHURCH ST AT LAWRENCE ST
SHEET 20 OF 31



NOTE: PAVEMENT MARKINGS ARE TO BE COMPLETED UNDER A SEPARATE CONTRACT BY THE CITY AND ARE SHOWN FOR REFRENCE ONLY

CONSTRUCTION NOTES:

1. SEE SHEET 21 FOR TRAFFIC SIGNAL DATA.
2. SEE SHEET 25 FOR TIE PLAN.
3. PULL BOXES SHALL BE ADJACENT TO CURB UNLESS OTHERWISE NOTED AND SHALL NOT BE LOCATED IN WHEELCHAIR RAMPS.
4. ALL PAVEMENT MARKINGS SHALL BE REFLECTORIZED THERMOPLASTIC. **(TO BE INSTALLED BY THE CITY)**
5. THE TOP OF ALL MAST ARM FOUNDATIONS IN SIDEWALK AREAS SHALL BE LOCATED 3"± BELOW FINISH GRADE. THE TOP OF THE FOUNDATION SHALL NOT BE EXPOSED TO THE SIDEWALK.
6. RETAIN ALL EXISTING SIGNS UNLESS OTHERWISE NOTED.
7. TS POST/POLE, WITH PEDESTRIAN PUSH BUTTON, NOT LOCATED WITHIN A PAVED SURFACE SHALL BE POSITIONED SO AS TO PROVIDE A 10" MAX CLEAR REACH ZONE BETWEEN THE PEDESTRIAN PUSH BUTTON AND THE PAVED SURFACE PER 521 CMR AND AS SHOWN ON THE CONSTRUCTION DETAILS.

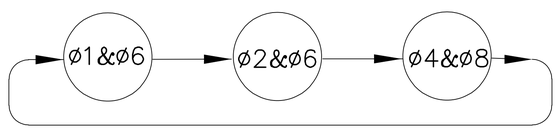
SEQUENCE AND TIMING																		
APPROACH	DIRECTION	HOUSING	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	FLASHING OPERATION
MINIMUM INTERVAL			6			10			6			10			6			
VEHICLE EXTENSION			2			2			2			2			2			
MAXIMUM 1			15			35			25			35			25			
MAXIMUM 2			20			50			25			50			25			
YELLOW CLEARANCE				4			4			4			4			4		
RED CLEARANCE					1			1			2			1			2	
PEDESTRIAN INTERVAL															7/6			
CHURCH STREET	WB	A	G	R	Y	R	R	R	R	R	R	G	Y	R	R	R	R	FY
CHURCH STREET	WB	B	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	FY
CHURCH STREET	EB	C,D	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	FY
LAWRENCE STREET	NB	E,F	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	FR
DRIVEWAY	SB	G,H	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	FR
PEDESTRIAN X-ING	N-S	P1-P2	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	W/FDW	DW	DW	OUT
DETECTOR			NON-LOCK			NON-LOCK			NON-LOCK			NON-LOCK			NON-LOCK			
RECALL			OFF			SOFT			OFF			SOFT			OFF			
			ø1			ø2			ø4			ø6			ø8			ø3,ø5 & ø7
						PERM			PERM			PERM			** PERM			NOT USED

NOTES:
1. AUTOMATIC FLASHING OPERATION PER 2009 M.U.T.C.D., AS AMEMDED
2. ** NORMALLY DW, W/FDW UPON PEDESTRIAN PUSH BUTTON ACTUATION
3. PERM = PERMISSIVE
4. ø4 & ø8 DUAL ENTRY
5. MAXIMUM 1 = NORMAL OPERATION
6. MAXIMUM 2 = MON-FRI 7-9 AM; 3-6 PM
7. STOP AND GO OPERATION FOR 24 HOURS PER DAY. FLASHING OPERATION FOR EMERGENCY ONLY.
8. DURING PEDESTRIAN INTERVAL, FDW THROUGH YELLOW OPERATION SHALL BE IN EFFECT.
9. ø2 SHALL OMIT ø1.

SEQUENCE & TIMING NOTES:

1. IF THE ASSIGNED RIGHT OF WAY FOR ANY TRAFFIC MOVEMENT IS TO REMAIN IN EFFECT DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATIONS FOR THAT TRAFFIC MOVEMENT WILL NOT CHANGE DURING THE CLEARANCE INTERVAL.
2. THE RIGHT OF WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON-CONFLICTING PHASES.
3. IF CALLS EXIST ON ALL PHASES, THE ASSIGNMENT OF RIGHT OF WAY SHALL BE IN ACCORDANCE WITH THE PREFERENTIAL PHASE SEQUENCE.
4. IF THE ASSIGNED RIGHT OF WAY FOR ANY TRAFFIC MOVEMENT IS TO CHANGE DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATION FOR THAT MOVEMENT WILL DISPLAY THE APPROPRIATE CLEARANCE INTERVALS.

PREFERENTIAL PHASE SEQUENCE

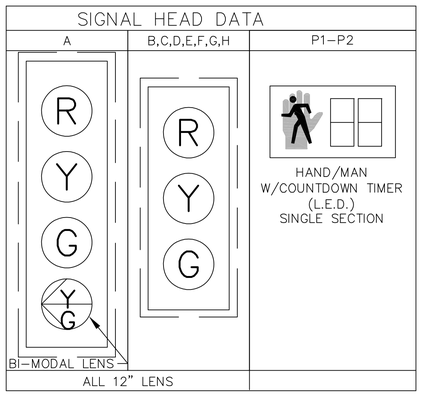


PRE-EMPTION PHASING & PRIORITY			
DETECTOR & PRIORITY	PRE-EMPT PHASE ASSIGNMENT	MOVEMENT	VEHICLE PHASE ASSIGNMENT
D1	1		ø1&ø6
D2	2		ø2
D3	3		ø8

EMERGENCY VEHICLE PRE-EMPTION OPERATION.

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. PRE-EMPTION SIGNALS SHALL BE SERVICED ON A PRIORITY BASIS WITH DETECTORS D1, D2 OR D3 ASSIGNED DESCENDING PRIORITIES AS FOLLOWS: (D1 HIGHEST AND D3 LOWEST)
3. IN RESPONSE TO A PRE-EMPTION SIGNAL RECEIVED AT AN INTERSECTION BY OPTICAL DETECTOR D1 (OR D2, D3) THE CONTROLLER SHALL HOLD OR ADVANCE TO AND HOLD IN EMERGENCY VEHICLE PRE-EMPTION PHASE #1 (OR #2, #3) GREEN FOR A MINIMUM OF TEN (10) SECONDS OR UNTIL PRE-EMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME PRE-EMPTION PHASE CLEARANCES FOR THE ASSOCIATED PHASE(S) AS SHOWN IN THE SEQUENCE AND TIMING CHART AND SERVICE SUBSEQUENT EMERGENCY VEHICLE PRE-EMPTION PHASES AS NECESSARY.
4. MINIMUM GREEN AND NORMAL VEHICLE AND PEDESTRIAN CLEARANCE TIMES SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PRE-EMPTION DEMAND.
5. PRE-EMPTION STROBE SHALL BE ILLUMINATED WHENEVER ANY EMERGENCY VEHICLE PRE-EMPTION GREEN IS ON.

SIGNAL HEAD DATA



NOTES:
1. ALL SIGNAL HEADS SHALL BE RIGID MOUNTED AND EQUIPPED WITH 5"± LOUVERED BACKPLATES.
2. ALL SIGNAL DISPLAYS SHALL BE EQUIPPED W/L.E.D. MODULES AND TUNNEL VISORS.

DETECTOR DATA			
DETECTOR NO.	ZONE SIZE	DELAY /EXT	CALL PHASE
1	TO BE FIELD ADJUSTED	0	ø1
2	TO BE FIELD ADJUSTED	0	ø6
3	TO BE FIELD ADJUSTED	0	ø6
4	TO BE FIELD ADJUSTED	0	ø2
5	TO BE FIELD ADJUSTED	DELAY 5 SEC	ø2
6	TO BE FIELD ADJUSTED	0	ø8
7	TO BE FIELD ADJUSTED	0	ø4

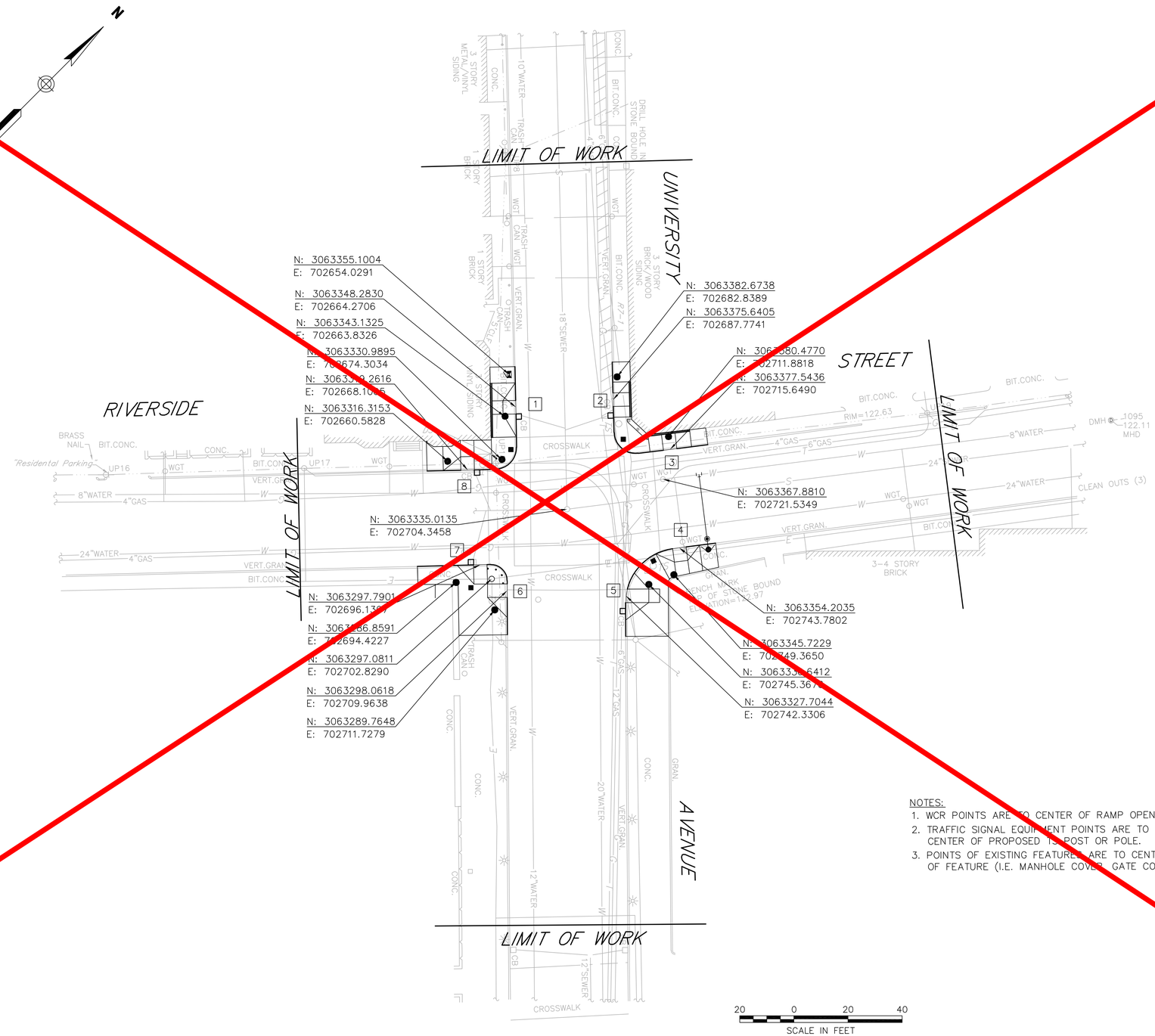
NOTE:
DELAY AND EXTENSION TIMINGS SHALL BE PROGRAMMED IN THE CONTROLLER ONLY

ITEM 815.1
TRAFFIC SIGNAL
CHURCH STREET AT LAWRENCE STREET
LIST OF MAJOR ITEMS REQUIRED

QUANTITY	DESCRIPTION
1	8ø TS 2 TYPE 1 CONTROLLER IN A TYPE 5 BASE MOUNTED CABINET INCL. FOUNDATION AND CONCRETE PAD
1	TS 20' MAST ARM TYPE 2, STEEL, INCL. FOUNDATION
1	TS 30' MAST ARM TYPE 2, STEEL, INCL. FOUNDATION
1	TS POST 10' STANDARD INCL. FOUNDATION
7	SIGNAL HEAD, 3-SECTION, 12" LENSES
1	SIGNAL HEAD, 4-SECTION BI-MODAL, 12" LENSES
2	PEDESTRIAN SIGNAL HEAD W/COUNTDOWN TIMER
2	PEDESTRIAN PUSH BUTTON W/R10-3e(MOD)
2	PULL BOX-12"x12"
1	SINGLE POINT VIDEO DETECTION (1 CAMERA, VDP AND CABLES)
3	EMERGENCY PRE-EMPTION OPTICAL DETECTORS & DETECTOR CABLE
1	EMERGENCY PRE-EMPTION 4 CHANNEL PHASE SELECTOR
1	EMERGENCY PRE-EMPTION SYSTEM CHASSIS
1	EMERGENCY PRE-EMPTION STROBE (WHITE LENS)
1	SERVICE CONNECTION (OVERHEAD)

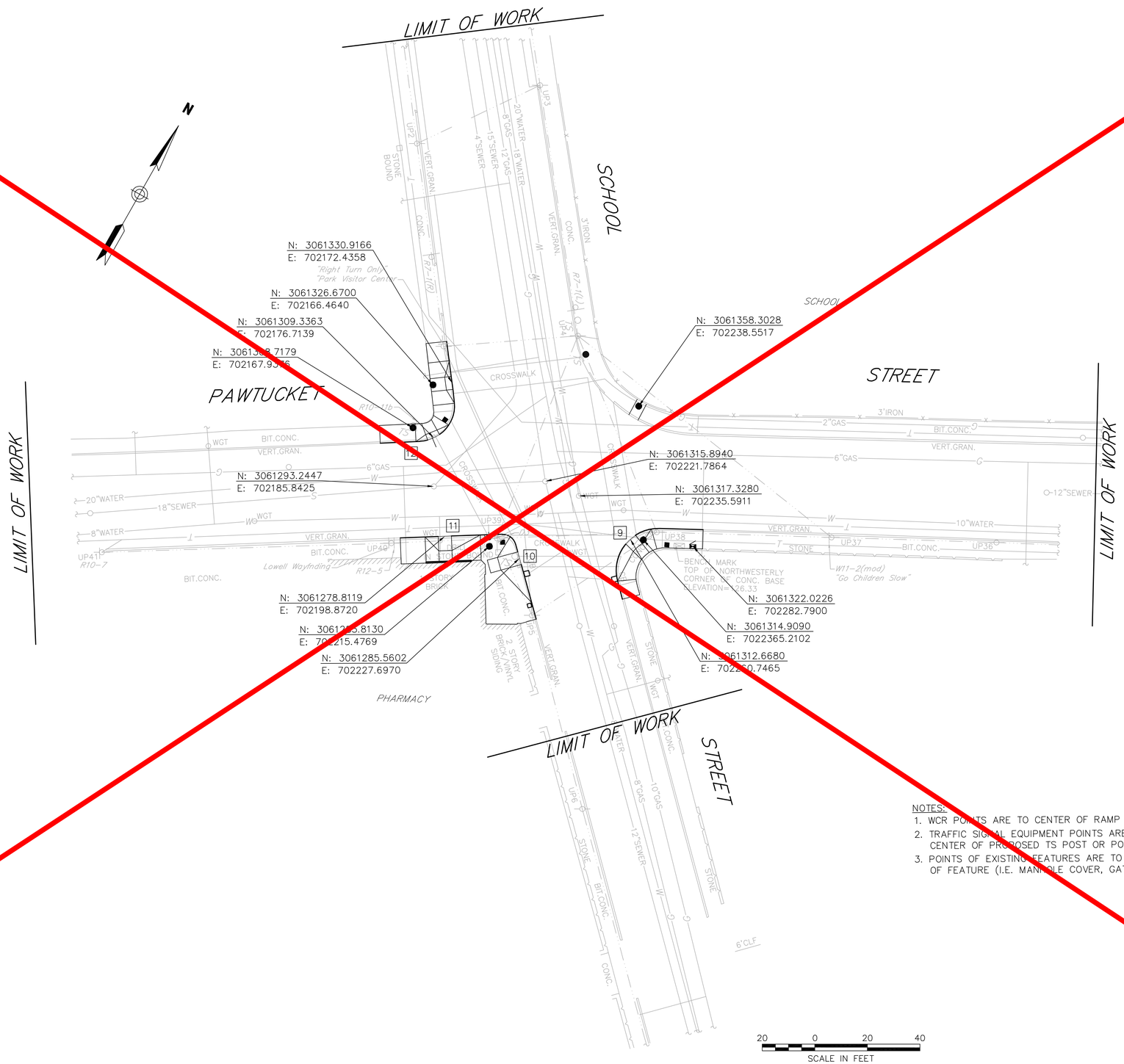
PLUS NECESSARY DUCT, CABLE, LABOR, MISCELLANEOUS MATERIAL AND EQUIPMENT TO COMPLETE THE INSTALLATION AND PROVIDE AN OPERATING TRAFFIC CONTROL SIGNAL.

LOWELL
TIE PLANS
RIVERSIDE ST AT UNIVERSITY AVE
SHEET 23 OF 31



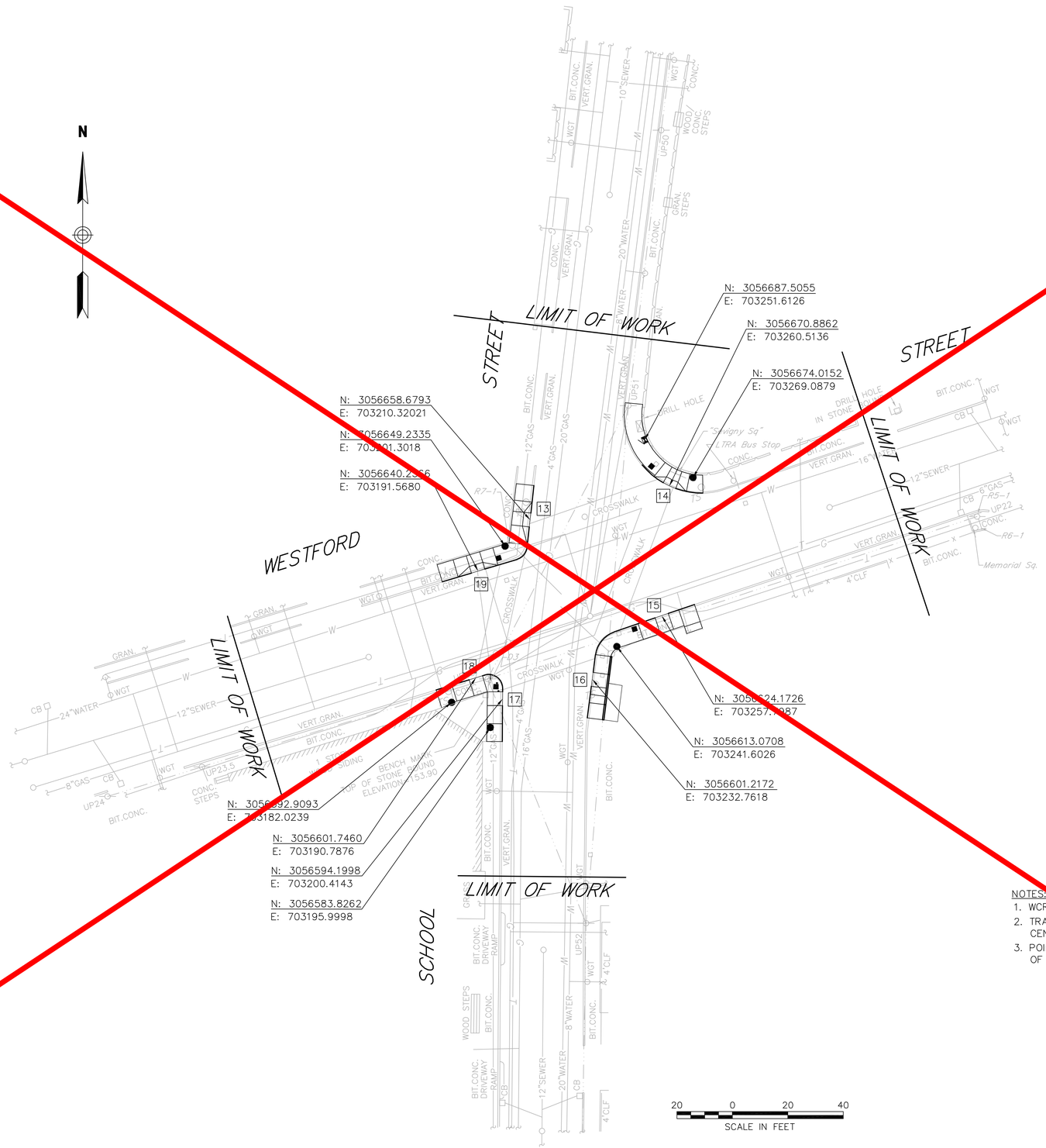
NOTES:
1. WCR POINTS ARE TO CENTER OF RAMP OPENING.
2. TRAFFIC SIGNAL EQUIPMENT POINTS ARE TO CENTER OF PROPOSED TS POST OR POLE.
3. POINTS OF EXISTING FEATURES ARE TO CENTER OF FEATURE (I.E. MANHOLE COVER, GATE COVER).

LOWELL
TIE PLANS
SCHOOL ST AT PAWTUCKET AVE
SHEET 23 OF 31



NOTES:
1. WCR POINTS ARE TO CENTER OF RAMP OPENING.
2. TRAFFIC SIGNAL EQUIPMENT POINTS ARE TO CENTER OF PROPOSED TS POST OR POLE.
3. POINTS OF EXISTING FEATURES ARE TO CENTER OF FEATURE (I.E. MANHOLE COVER, GATE COVER).

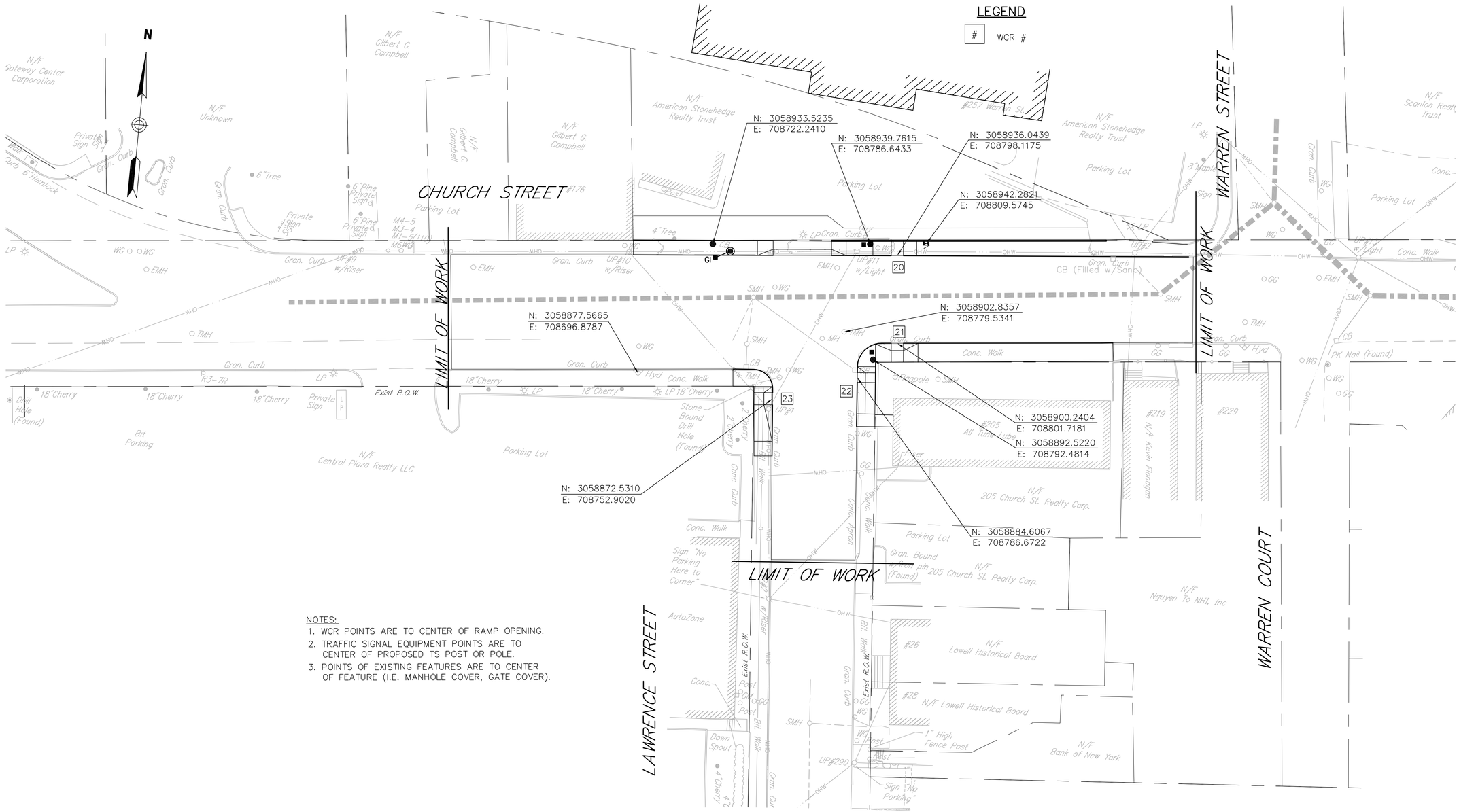
LOWELL
TIE PLANS
SCHOOL ST AT WESTFORD ST
SHEET 24 OF 31



NOTES:
1. WCR POINTS ARE TO CENTER OF RAMP OPENING.
2. TRAFFIC SIGNAL EQUIPMENT POINTS ARE TO CENTER OF PROPOSED TS POST OR POLE.
3. POINTS OF EXISTING FEATURES ARE TO CENTER OF FEATURE (I.E. MANHOLE COVER, GATE COVER).

\\vhb\proj\Wat-TS\12274.00\cad\ts\planset\12274-TIE.dwg

LOWELL
TIE PLANS
CHURCH ST AT LAWRENCE ST
SHEET 25 OF 31



NOTES:

1. WCR POINTS ARE TO CENTER OF RAMP OPENING.
2. TRAFFIC SIGNAL EQUIPMENT POINTS ARE TO CENTER OF PROPOSED TS POST OR POLE.
3. POINTS OF EXISTING FEATURES ARE TO CENTER OF FEATURE (I.E. MANHOLE COVER, GATE COVER).

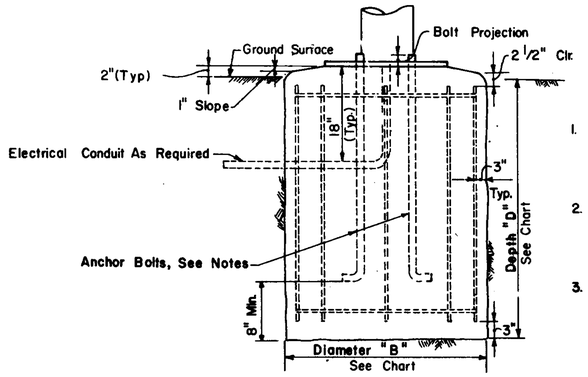
20 0 20 40
SCALE IN FEET

TRAFFIC SIGN SUMMARY

LOWELL
1 ~~8~~ LOCATION~~S~~
SIGN SUMMARY
SHEET 26 OF 31

IDENTIFI-CATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (INCHES)			NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND NUMBER REQUIRED	UNIT AREA (S.F.)	AREA IN SQUARE FEET
	WIDTH	HEIGHT		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACK-GROUND	LEGEND	BORDER			
R3-7L	30"	30"	LEFT LANE MUST TURN LEFT	SEE FHWA "STANDARD HIGHWAY SIGNS, 2004 EDITION"; AS AMENDED			2 ~~6~~	WHITE	BLACK	BLACK	P5-~~6~~ 2	6.25	~~37.50~~ 12.50
R3-7R	30"	30"	RIGHT LANE MUST TURN RIGHT				1 ~~4~~	WHITE	BLACK	BLACK	P5-~~6~~ 1 ~~1 MTD ON UP~~	6.25	~~43.75~~ 6.25
~~R7-1L~~	~~12"~~	~~18"~~	NO PARKING ~~TIME~~ TIME				~~1~~	~~WHITE~~	~~RED~~	~~RED~~	~~P5-1~~	~~1.50~~	~~1.50~~
~~R10-3e(L)~~	~~9~~	~~15~~	START CROSSING Watch For Vehicles / DON'T START Finish Crossing If Started / To Finish Crossing / DON'T CROSS / PUSH BUTTON TO CROSS				~~8~~	~~WHITE~~	WHITE/ BLACK/ ORANGE	~~BLACK~~	9 MTD ON TS POLE/ POST	INCLUDED UNDER ~~ITEMS 816.01-~~ 816.03 & 815.1	
~~R10-3e(R)~~	~~9~~	~~15~~	START CROSSING Watch For Vehicles / DON'T START Finish Crossing If Started / To Finish Crossing / DON'T CROSS / PUSH BUTTON TO CROSS				~~8~~	~~WHITE~~	WHITE/ ~~BLACK/~~ ORANGE	~~BLACK~~	8 MTD ON TS POLE/ POST	INCLUDED UNDER ~~ITEMS 816.01-~~ 816.03 & 815.1	
R10-3e(MOD)	9"	15"	START CROSSING Watch For Vehicles / DON'T START Finish Crossing If Started / TIME REMAINING To Finish Crossing / DON'T CROSS / PUSH BUTTON TO CROSS				~~11~~ 2	WHITE	WHITE/ BLACK/ ORANGE	BLACK	2 ~~11~~ MTD ON TS POLE/ POST	INCLUDED UNDER ITEMS 816.01-816.03 & 815.1	
~~R10-11b~~	~~24"~~	~~24"~~	NO TURN ON RED				~~1~~	~~WHITE~~	~~BLACK~~	~~BLACK~~	1 MTD ON TS POLE	~~4.00~~	~~4.00~~
R10-12	30"	36"	LEFT TURN YIELD ON GREEN				1	WHITE	BLACK/ GREEN	BLACK	1 MTD ON TS MAST ARM	7.50	7.50
~~D3-1~~	~~VARIES~~	~~12"~~	~~University Ave~~	~~6"~~	~~3 3~~	~~N/A~~	~~1~~	~~GREEN~~	~~WHITE~~	~~WHITE~~	1 MTD ON TS POLE	INCLUDED UNDER ITEM 874	
~~D3-2~~	~~VARIES~~	~~12"~~	~~Riverside St~~	~~6"~~	~~3 3~~	~~N/A~~	~~1~~	~~GREEN~~	~~WHITE~~	~~WHITE~~	1 MTD ON TS POLE	INCLUDED UNDER ITEM 874	
~~D3-3~~	~~VARIES~~	~~12"~~	~~School St~~	~~6"~~	~~3 3~~	~~N/A~~	~~2~~	~~GREEN~~	~~WHITE~~	~~WHITE~~	2 MTD ON TS POLE	INCLUDED UNDER ITEM 874	
~~D3-4~~	~~VARIES~~	~~12~~	~~Pawtucket St~~	~~6"~~	~~3 3~~	~~N/A~~	~~1~~	~~GREEN~~	~~WHITE~~	~~WHITE~~	1 MTD ON TS POLE	INCLUDED UNDER ITEM 874	
~~D3-5~~	~~VARIES~~	~~12"~~	~~Westford St~~	~~6"~~	~~3 3~~	~~N/A~~	~~1~~	~~GREEN~~	~~WHITE~~	~~WHITE~~	1 MTD ON TS POLE	INCLUDED UNDER ITEM 874	
D3-6	VARIES	12"	Church St	6"	3 3	N/A	1	BLACK	WHITE	WHITE	1 MTD ON TS POLE	INCLUDED UNDER ITEM 874	
D3-7	VARIES	12"	Lawrence St	6"	3 3	N/A	1	BLACK	WHITE	WHITE	1 MTD ON TS POLE	INCLUDED UNDER ITEM 874	

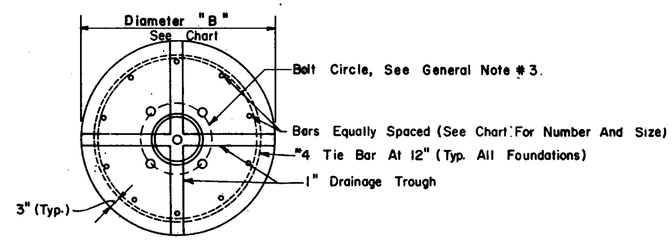
NOTES: 1. HIGH INTENSITY REFLECTIVE SHEETING SHALL BE USED FOR ALL SIGNS. SEE FHWA "STANDARD HIGHWAY SIGNS, 2004 EDITION" FOR TEXT DIMENSIONS, AS AMENDED; THE 1977 MASSHIGHWAY DEPARTMENT CONSTRUCTION AND TRAFFIC STANDARD DETAILS, AS AMENDED, FOR SIGNS AND SUPPORTS; AND THE MASSHIGHWAY DEPARTMENT SIGN LISTINGS 1993 EDITION, AS AMENDED.



ELEVATION
NOT TO SCALE

NOTES:

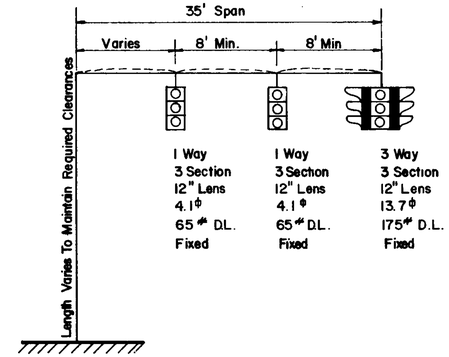
1. Pole, Base Plate And Anchor Bolts Shall Be Designed By The Pole Manufacturer
2. Minimum Foundation Depth Shall Be Checked To Insure Adequate Anchor Bolt Embedment, Clearance, And Projection
3. Optional End Anchorage For Anchor Bolts Can Be A Steel Plate With Threaded Holes Designed By The Pole Manufacturer



PLAN
NOT TO SCALE

SOIL TYPE (SEE GENERAL NOTE NO. 7)	DIA. (B) = 2'-6"		DIA. (B) = 3'-0"		DIA. (B) = 3'-6"	
	DEPTH (D)	VERTICAL BARS	DEPTH (D)	VERTICAL BARS	DEPTH (D)	VERTICAL BARS
DRY SANDY SOIL	5'-9"	10#5	5'-0"	10#6	4'-9"	10#7
WET SANDY SOIL	6'-9"	10#5	6'-0"	10#6	5'-6"	10#7
CLAYEY SOIL (MEDIUM STIFF)	9'-9"	10#5	8'-9"	10#6	8'-0"	10#7
ALLUVIAL SOIL	14'-3"	10#5	12'-9"	10#6	11'-9"	10#7

FOUNDATION DESIGN CHART



LOWELL
1 LOCATION
35' OR LESS MAST ARM DETAILS
SHEET 27 OF 31

GENERAL NOTES:

1. Foundations Shall Be Class "A" Cement Concrete Masonry.
2. Reinforcement Shall Be A.S.T.M. A615-Gr. 60.
3. Bolt Circle And Anchor Bolts To Be Provided By The Contractor. The Anchor Bolts Shall Be Supplied With A Template For Setting The Bolts And Necessary Bolt Projections.
4. Provide For Electrical Conduit As Required.
5. Excavation Shall Be By The Auger Method To The Neat Lines Of The Outside Dimension Of The Foundation Without Disturbing The Soil Around And Below The Proposed Foundation Bottom. Alternate Methods Of Excavation May Be Submitted For Approval If They Meet The Requirements Listed In The General Notes Of Sheets 3 & 4 Of The Span Wire Assembly Foundation Details & Design Charts.
6. If The Soil Is Disturbed Or Removed Beyond The Neat Lines Of The Outside Dimension Of The Foundation As Specified, It Shall Be Replaced With Concrete. Any Additional Cost For The Concrete Shall Be Paid For By The Contractor.
7. Determination Of Existing Soil Conditions Shall Be Made By The Design Engineer.
8. Vertical Reinforcement Bars Are To Be Evenly Spaced In The Foundation As Shown.
9. The Smallest Diameter Foundation Shall Be Used That Will Meet The Moment Requirement And Be At Least 16" Greater In Diameter Than The Bolt Circle Diameter.
10. If A Poor Soil Or Ledge Is Encountered, (i.e., One Which Does Not Apply To The Design Charts Shown On This Sheet), An Alternative Design Shall Be Developed By The Design Engineer. Decisions Made In Notes #7 & #10, Shall Be Submitted To The M.D.P.W. For Approval. If Utilities Or Other Underground Obstructions Are Encountered, The Contractor Shall Backfill The Area To Its Original Conditio- Until An Alternate Design Has Been Provided By The Design Engineer.
11. The Foundations Shown On This Drawing Are For A 35-Foot Cantilevered Type II Mast Arm Carrying A Three Way, Three Section, Twelve Inch (12") Lens Traffic Signal Housing Fixed At The End Of The Arm, And A One-Way, Three-Section, Twelve Inch (12") Lens Traffic Signal Fixed Twelve Feet (12') Away, And Another One-Way, Three-Section Twelve Inch (12") Lens Traffic Signal Fixed Twelve Feet (12') Away From That.

BY: J. BELCASTRO - B.T.P.&D. & G.N. TSAKOS - BRIDGE SECTION

THIS PLAN NOT DESIGNED BY VANASSE HANGEN BRUSTLIN, INC. IT WAS PROVIDED BY THE MASSACHUSETTS HIGHWAY DEPARTMENT AND ALL INFORMATION CONTAINED HEREIN IS ASSUMED TO BE CORRECT.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

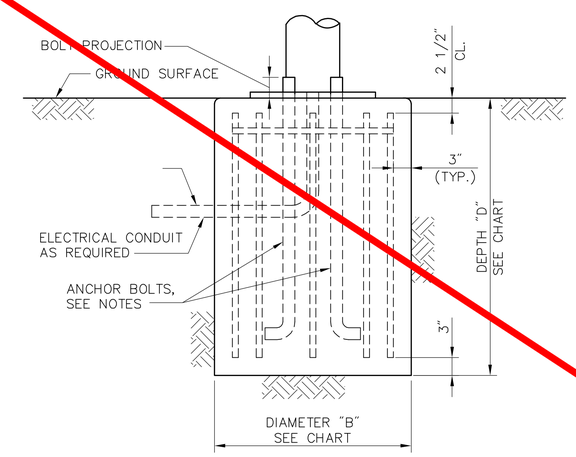
STANDARD DRAWINGS
35' FOOT-TYPE II MAST ARM
CORED PIER FOUNDATIONS

Revised Date January 2, 1985

TRAFFIC ENGINEER — BRIDGE ENGINEER P.E.
DIRECTOR B.T.P.&D. — CHIEF ENGINEER P.E.

\\vhb\proj\Wat-TS\12274.00\cad\ts\planset\12274-MADTL.dwg

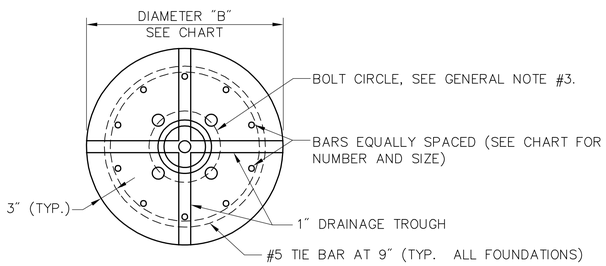
LOWELL
4 LOCATIONS
40 FOOT MAST ARM DETAILS
SHEET 28 OF 31



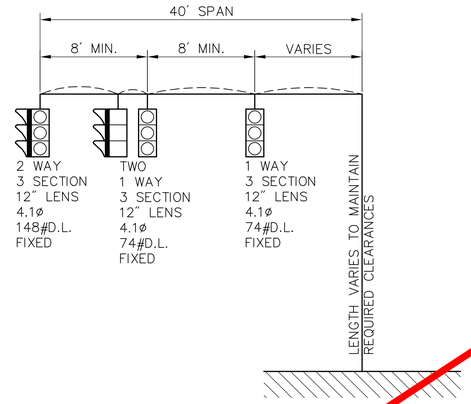
ELEVATION
NOT TO SCALE

NOTES:

1. POLE, BASE PLATE AND ANCHOR BOLTS SHALL BE DESIGNED BY THE POLE MANUFACTURER.
2. MINIMUM FOUNDATION DEPTH SHALL BE CHECKED TO INSURE ADEQUATE ANCHOR BOLT EMBEDMENT CLEARNACE, AND PROJECTION.
3. OPTIONAL END ANCHORAGE FOR ANCHOR BOLTS CAN BE A STEEL PLATE WITH THREADED HOLES DESIGNED BY THE POLE MANUFACTURER



PLAN
NOT TO SCALE



SIGNAL
NOT TO SCALE

GENERAL NOTES:

1. FOUNDATIONS SHALL BE CLASS 4000–1½–565 CEMENT CONCRETE MASONRY.
2. REINFORCEMENT SHALL BE A.S.T.M. A615–GR. 60.
3. BOLT CIRCLE AND ANCHOR BOLTS TO BE PROVIDED BY THE CONTRACTOR. THE ANCHOR BOLTS SHALL BE SUPPLIED WITH A TEMPLATE FOR SETTING THE BOLTS AND NECESSARY BOLT PROJECTIONS.
4. PROVIDE FOR ELECTRICAL CONDUIT AS REQUIRED.
5. EXCAVATION SHALL BE BY THE AUGER METHOD TO THE NEAT LINES OF THE OUTSIDE DIMENSION OF THE FOUNDATION WITHOUT DISTURBING THE SOIL AROUND AND BELOW THE PROPOSED FOUNDATION BOTTOM.
6. IF THE SOIL IS DISTURBED OR REMOVED BEYOND THE NEAT LINES OF THE OUTSIDE DIMENSION OF THE FOUNDATION AS SPECIFIED, IT SHALL BE REPLACED WITH CONCRETE. ANY ADDITIONAL COST FOR THE CONCRETE SHALL BE PAID FOR BY THE CONTRACTOR.
7. DETERMINATION OF EXISTING SOIL CONDITIONS SHALL BE MADE BY THE ENGINEER.
8. VERTICAL REINFORCEMENT BARS ARE TO BE EVENLY SPACED IN THE FOUNDATION AS SHOWN.
9. IF UTILITIES OR OTHER UNDERGROUND OBSTRUCTIONS ARE ENCOUNTERED, THE CONTRACTOR SHALL BACKFILL THE AREA TO ITS ORIGINAL CONDITION UNTIL AN ALTERNATE DESIGN HAS BEEN PROVIDED BY THE DESIGN ENGINEER.
10. THE FOUNDATIONS SHOWN ON THIS DRAWING ARE FOR A 40–FOOT CANTILEVERED TYPE II MAST ARM CARRYING TRAFFIC SIGNALS AS SHOWN.
11. ALL SIGNALS SHALL BE ATTACHED TO THE MAST ARM WITH FIXED LOUVERED BACKPLATES.

SOIL TYPE	DIA. (B)=3'–6"		DIA. (B)=4'–0"		DIA. (B)=4'–6"	
(SEE GENERAL NOTE NO. 7)	DEPTH (D)	VERTICAL BARS	DEPTH (D)	VERTICAL BARS	DEPTH (D)	VERTICAL BARS
DRY SANDY SOIL	15'–3"	10#7	11'–6"	12#7	10'–0"	16#7
WET SANDY SOIL	20'–3"	10#7	14'–9"	12#7	13'–0"	16#7
CLAY SOIL (MEDIUM STIFF)	23'–0"	10#7	16'–3"	12#7	15'–0"	16#7

FOUNDATION DESIGN CHART
NOT TO SCALE

VANASSE HANGEN BRUSTLIN, INC.
101 WALNUT STREET
WATERTOWN, MASSACHUSETTS 02471

40' FOOT–TYPE II MAST ARM
CORED PIER FOUNDATIONS

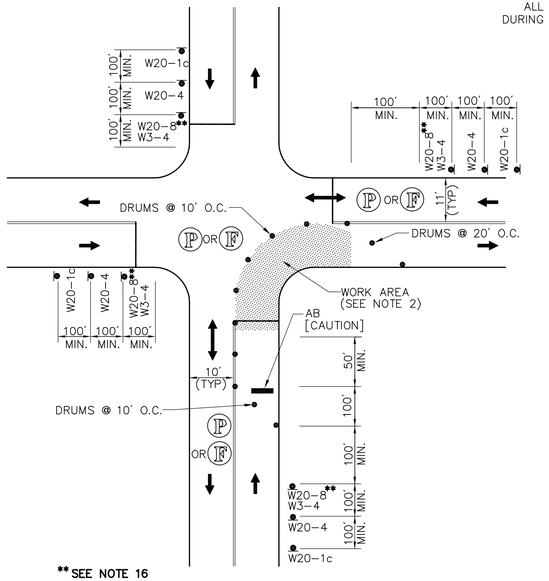
DATE _____

TRAFFIC ENGINEER

STRUCTURAL ENGINEER

OPERATIONAL SIGNING

LANE CLOSURES SHOWN ARE FOR TEMPORARY CONSTRUCTION.
ALL DRUMS AND SIGNS ARE SHOWN AS THEY SHOULD APPEAR
DURING THE WORKING DAY, OR WHILE OPERATING IN THE WORK ZONE.



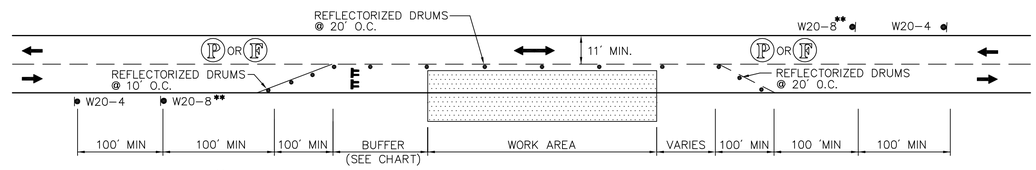
** SEE NOTE 16

ONE LANE BI-DIRECTIONAL TRAFFIC AT INTERSECTIONS

NOT TO SCALE

NOTE:

1. ADVANCE WARNING SIGN PLACEMENT TO BE ADJUSTED AS NECESSARY
2. ANY EXCAVATION GREATER THAN 3' DEEP ADJACENT TO TRAFFIC SHALL BE PROTECTED BY TEMPORARY CONCRETE BARRIER



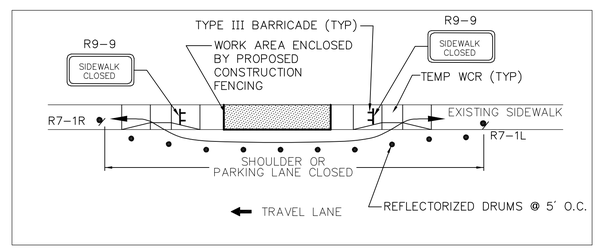
** SEE NOTE 16

TYPICAL TWO WAY STREET LANE CLOSURE

NOT TO SCALE

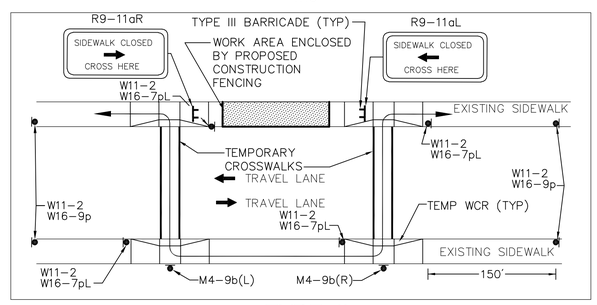
PEDESTRIAN BYPASS

TO BE USED IN CONJUNCTION WITH THE PROPOSED LANE
CLOSURE DETAILS AND DURING CONSTRUCTION STAGING
AND AS DIRECTED BY THE ENGINEER.



TYPE I

NTS

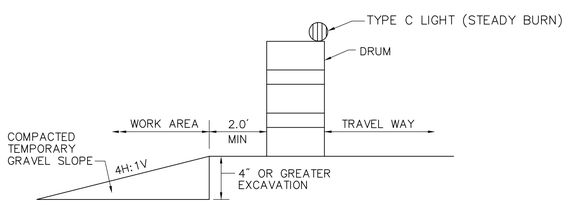


TYPE II

NOT TO SCALE

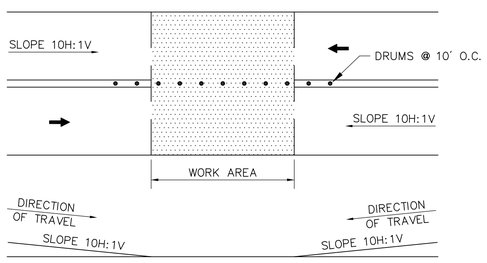
NOTES:

1. ADDITIONAL ADVANCE WARNING SIGNS MAY BE NECESSARY AS DETERMINED BY THE ENGINEER.
2. CONTROLS FOR PEDESTRIAN TRAFFIC ONLY, ARE SHOWN. VEHICULAR TRAFFIC SHALL BE MAINTAINED AS SHOWN ELSEWHERE.
3. STREET LIGHTING SHOULD BE CONSIDERED WHEN LOCATING CONTROL DEVICES.
4. ←——→ DIRECTION OF PEDESTRIAN TRAVEL.
5. PROPOSED TEMPORARY CROSSWALKS SHALL BE 12" WIDE SURFACE APPLIED TAPE OR REFLECTORIZED PAINT AS DIRECTED BY THE ENGINEER.
6. ALL TEMPORARY PEDESTRIAN PATHWAYS SHALL COMPLY FULLY WITH ALL REQUIREMENTS OF THE MUTCD AND ALL APPLICABLE MAAB AND ADAAG REQUIREMENTS.
7. CONTRACTOR SHALL MAINTAIN AS WIDE OF A PEDESTRIAN ACCESS AS POSSIBLE AT ALL TIMES. EXCEPT WHERE NECESSARY, THE CONTRACTOR MAY TEMPORARILY REDUCE PEDESTRIAN PATHWAYS TO 4 FEET IN WIDTH (EXCLUDING CURB) FOR NO MORE THAN 200 LINEAR FEET AT A TIME IN ACCORDANCE WITH ALL STANDARDS.
8. TEMPORARY WHEELCHAIR RAMPS SHALL BE CONSTRUCTED IN ACCORDANCE WITH MASSDOT, MAAB, AND ADAAG REQUIREMENTS.
9. W16-7pR SIGNS SHALL BE USED IN COMBINATION WITH W11-2 SIGNS AS DIRECTED BY THE ENGINEER.



ROADWAY SLOPE PROTECTION

NOT TO SCALE



SQUARE OFF THE FULL WIDTH OF THE ROADWAY AT THE END OF WORK DAY

TEMPORARY PAVEMENT TRANSITION DETAIL

NOT TO SCALE

TEMPORARY TRAFFIC CONTROL PLAN GENERAL NOTES

1. ALL CONSTRUCTION SIGNING, TEMPORARY TRAFFIC CONTROL DEVICES, AND ROADSIDE ELEMENTS SHALL CONFORM WITH THE 2009 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), WITH MASSACHUSETTS STATE AMENDMENTS, AS AMENDED, THE LATEST REVISIONS OF THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, (AASHTO) ROADSIDE DESIGN GUIDE, AASHTO POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS, AND NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM (NCHRP) REPORT 350 OR THE AASHTO MANUAL FOR ASSESSING SAFETY HARDWIRE (MASH).
2. ALL TEMPORARY PEDESTRIAN PATHWAYS SHALL COMPLY FULLY WITH ALL REQUIREMENTS OF THE MUTCD AND ALL APPLICABLE MASSACHUSETTS ARCHITECTURAL ACCESS BOARD (MAAB) AND AMERICANS WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES (ADAAG) REQUIREMENTS.
3. WORK HOURS SHALL BE 9:30AM TO 3:00PM MONDAY THRU FRIDAY UNLESS OTHERWISE APPROVED BY THE ENGINEER. WORK SHALL NOT AFFECT TRAFFIC PATTERNS DURING PEAK TRAFFIC PERIODS. PEAK TRAFFIC PERIODS ARE DEFINED AS MONDAY THRU FRIDAY 7:00AM–9:00AM AND 3:00PM–6:00PM.
4. ALL DRUMS SHALL BE SET AT 20' ON CENTER MAX. UNLESS OTHERWISE NOTED OR ADJUSTED BY THE ENGINEER.
5. 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.
6. THE CONTRACTOR SHALL NOTIFY EACH ABUTTER AT LEAST 24 HOURS IN ADVANCE OF THE START OF ANY WORK THAT WILL REQUIRE THE TEMPORARY CLOSURE OF ACCESS.
7. FOR RESTORATIVE WORK ON LOCAL ROADWAYS, A MINIMUM OF ONE LANE OF TRAFFIC IN EACH DIRECTION ON TWO WAY STREETS SHALL BE MAINTAINED AT ALL TIMES, EXCEPT THAT DURING WORKING HOURS, TRAFFIC MAY BE REDUCED TO ONE LANE UNDER POLICE CONTROL FOR SHORT TIME PERIODS WHEN REQUIRED FOR THE WORK, AS SHOWN UNLESS OTHERWISE APPROVED BY THE ENGINEER.
8. GRADE SEPARATIONS IN EXCESS OF 2" DURING NON–WORKING HOURS WILL REQUIRE DELINEATION BY USE OF DRUMS.
9. EXCAVATION EDGES IN EXCESS OF 4 INCHES DEEP SHALL BE PROTECTED DURING NON–WORKING HOURS BY BACKFILLING WITH A WEDGE OF COMPACTED GRAVEL BORROW AT A 4:1 SLOPE PER THE DETAIL SHOWN.
10. 11' MINIMUM LANE WIDTHS SHALL BE MAINTAINED UNLESS OTHERWISE NOTED.
11. TRAFFIC CONTROL DEVICES AND SIGNS SHALL BE COVERED OR REMOVED DURING NON–WORKING HOURS WHEN NOT IN USE.
12. ADVISORY SPEED PLATES (W13–1) SHALL BE USED IF APPROPRIATE AND AS DIRECTED BY THE ENGINEER.
13. SIGNS INSTALLED ON PORTABLE STANDS REQUIRE 12 INCH MINIMUM MOUNTING HEIGHT FROM THE ROADWAY SURFACE TO THE BOTTOM OF THE SIGN.
14. SIGNS INSTALLED ON PORTABLE STANDS PLACED AMONG CHANNELIZATION DEVICES REQUIRE A 36 INCH MINIMUM MOUNTING HEIGHT FROM THE ROADWAY SURFACE TO THE BOTTOM OF THE SIGN.
15. SIGNS MOUNTED ON POSTS REQUIRE A MINIMUM 84 INCH MOUNTING HEIGHT FROM THE ROADWAY OR SIDEWALK SURFACE TO THE BOTTOM OF THE SIGN.
16. W20–8 SIGNS SHALL BE REPLACED BY W20–7a SIGNS WHEN FLAGGERS ARE USED IN LIEU OF POLICE OFFICER DETAILS.
17. REFLECTORIZED CONES SHALL BE A MINIMUM OF 36 INCHES IN HEIGHT.
18. CONES MAY BE USED IN LIEU OF DRUMS OUTSIDE OF TAPER AREAS.
19. W20–8a SIGNS SHALL BE INSTALLED IN ADVANCE (100' MIN) OF AREAS WHERE UTILITY CASTINGS HAVE BEEN RAISED IN ADVANCE OF PAVING OPERATIONS OR AS REQUESTED BY THE ENGINEER.
20. W20–8b SIGNS SHALL BE INSTALLED IN ADVANCE (100' MIN) OF PAVEMENT MILLING AREAS OR AS REQUESTED BY THE ENGINEER.
21. THERE IS NO DESIGNATED BICYCLE LANE ON THE ROADWAY WITHIN THE PROJECT LIMITS. BICYCLES ARE EXPECTED TO SHARE THE ROAD WITH GENERAL VEHICULAR TRAFFIC.

BUFFER SPACING

SPEED (MPH)	DISTANCE (FEET)
15	80
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645

LEGEND

- ● REFLECTORIZED DRUM
- ▲ REFLECTORIZED TRAFFIC CONE
- TEMPORARY TRAFFIC CONTROL SIGN
- TYPE III BARRICADES
- WORK AREA PUBLIC ACCESS RESTRICTED
- PROPOSED TRAFFIC FLOW
- ARROW BOARD (AB) [MODE]

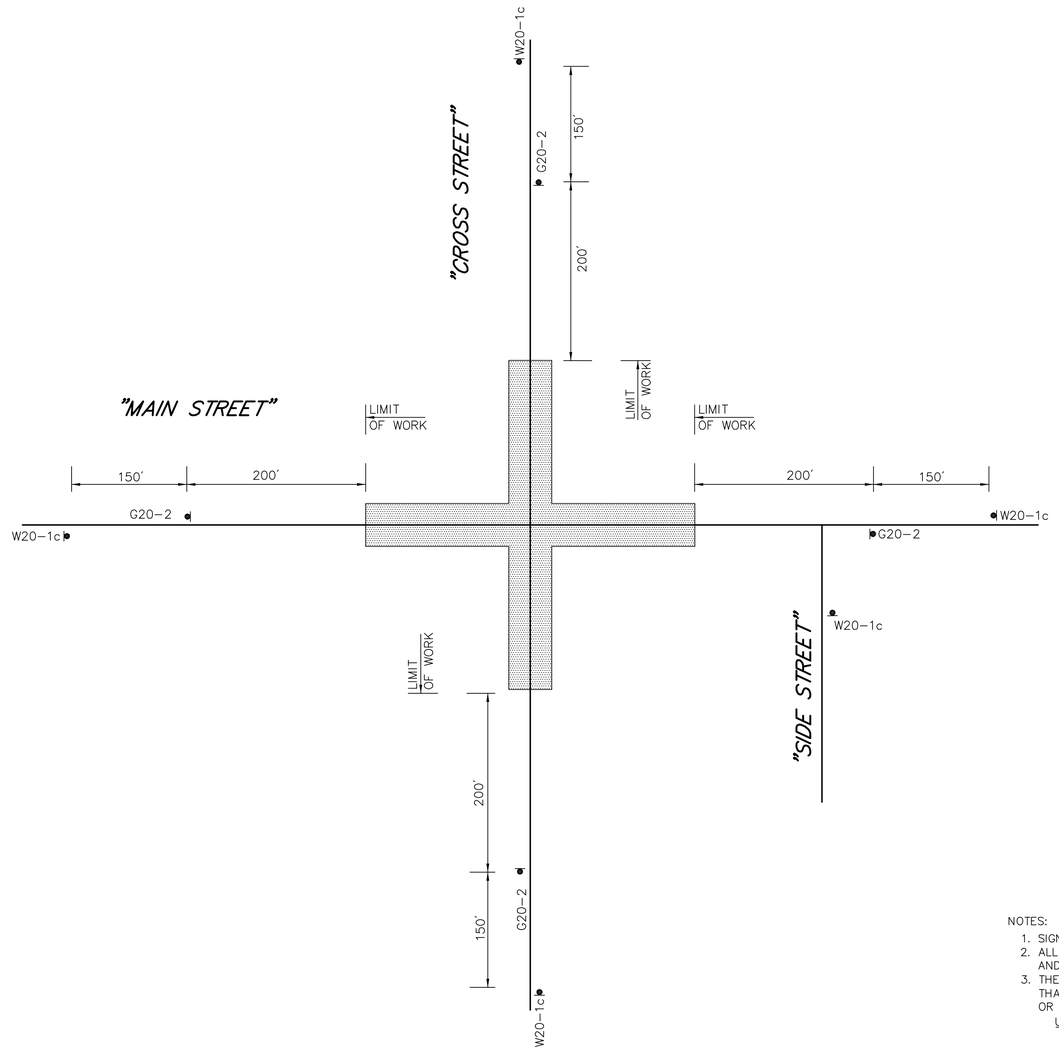
TAPER LENGTH CALCULATION

$*L = \frac{WS^2}{60}$ L=TAPER LENGTH
W=WIDTH OF ROADWAY TO BE SHIFTED OR REDIRECTED
S=30 MPH

TEMPORARY SIGNS

IDENTIFI-CATION NUMBER	SIZE OF SIGN		TEXT	COLOR		
	WIDTH	HEIGHT		BACK-GROUND	LEGEND	BORDER
G20-2	36"	18"	END ROAD WORK	ORANGE	BLACK	BLACK
M4-9b(R)	30"	24"	DETOUR →	ORANGE	BLACK	BLACK
M4-9b(L)	30"	24"	DETOUR ←	ORANGE	BLACK	BLACK
R7-1R	12"	18"	NO PARKING ANY TIME →	WHITE	RED	RED
R7-1L	12"	18"	NO PARKING ANY TIME ←	WHITE	RED	RED
R9-9	30"	18"	SIDEWALK CLOSED	WHITE	BLACK	BLACK
R9-11aL	48"	24"	SIDEWALK CLOSED ← CROSS HERE	WHITE	BLACK	BLACK
R9-11aR	48"	24"	SIDEWALK CLOSED → CROSS HERE	WHITE	BLACK	BLACK
W3-4	36"	36"	BE PREPARED TO STOP	ORANGE	BLACK	BLACK
W11-2	30"	30"		ORANGE	BLACK	BLACK

IDENTIFI-CATION NUMBER	SIZE OF SIGN		TEXT	COLOR		
	WIDTH	HEIGHT		BACK-GROUND	LEGEND	BORDER
W13-1(XX)	24"	30"	XX MPH	ORANGE	BLACK	BLACK
W16-7pR	24"	12"	↘	ORANGE	BLACK	BLACK
W16-7pL	24"	12"	↙	ORANGE	BLACK	BLACK
W16-9p	24"	12"	AHEAD	ORANGE	BLACK	BLACK
W20-1c	36"	36"	ROAD WORK AHEAD	ORANGE	BLACK	BLACK
W20-4	36"	36"	ONE LANE ROAD	ORANGE	BLACK	BLACK
W20-7a	36"	36"		ORANGE	BLACK	BLACK
W20-8	36"	36"	POLICE OFFICER AHEAD	ORANGE	BLACK	BLACK
W20-8a	36"	36"	CAUTION RAISED CASTINGS AHEAD	ORANGE	BLACK	BLACK
W20-8b	36"	36"	CAUTION GROOVED PAVEMENT AHEAD	ORANGE	BLACK	BLACK



TYPICAL ADVANCE SIGN SCHEMATIC

NTS

PROJECT LIMITS

NOTES:

1. SIGNS TO BE INSTALLED FROM THE LIMIT OF WORK AS SHOWN
2. ALL ADVANCE SIGNS TO BE IN PLACE FOR THE DURATION OF THE PROJECT. AND REMOVED UPON COMPLETION OF THE WORK.
3. THE CONTRACTOR SHALL INSTALL W20-1c SIGNS ON ALL "SIDE STREETS" THAT FALL WITHIN 350' FROM THE LIMIT OF WORK ON THE "MAIN STREET" OR "CROSS STREET." THESE "SIDE STREETS" INCLUDE:
   - UNIVERSITY AVENUE AT RIVERSIDE STREET
     - GERSHOM AVENUE
     - STANDISH STREET
   - SCHOOL STREET AT PAWTUCKET STREET
     - WANNALANCIT STREET
     - FANNING STREET
     - ARLINGTON STREET
   - SCHOOL STREET AT WESTFORD STREET
     - CORAL STREET
     - OSGOOD STREET
     - LANE STREET
     - QUEEN STREET
     - FERNALD STREET
     - LAWSON STREET
   - CHURCH STREET AT LAWRENCE STREET
     - WARREN STREET