BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	121	240
PROJ. FILE NO. 604688			

DRAINAGE & UTILITY PLAN

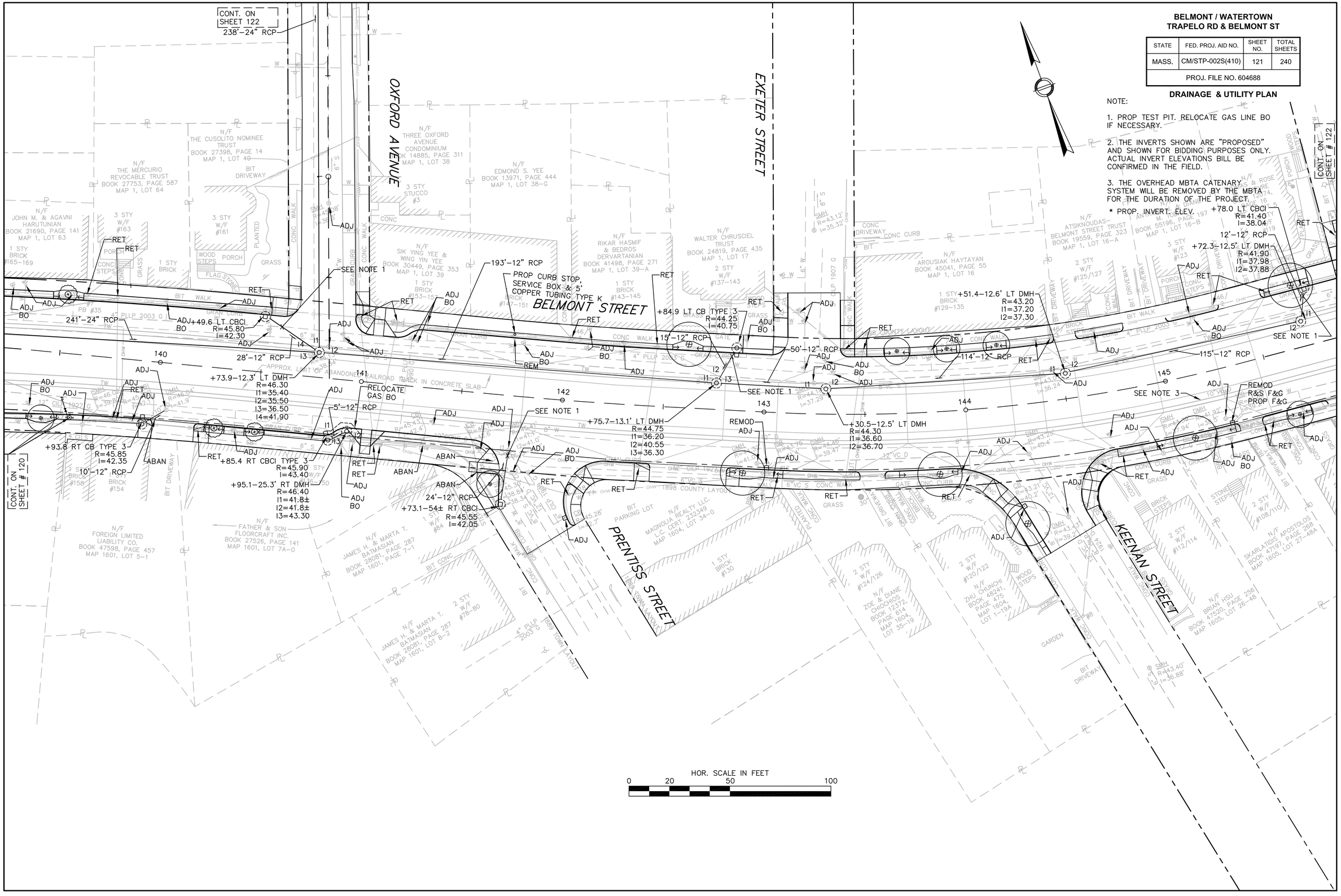
NOTE:

1. PROP TEST PIT. RELOCATE GAS LINE BO IF NECESSARY.

2. THE INVERTS SHOWN ARE "PROPOSED" AND SHOWN FOR BIDDING PURPOSES ONLY. ACTUAL INVERT ELEVATIONS BILL BE CONFIRMED IN THE FIELD.

3. THE OVERHEAD MBTA CATENARY SYSTEM WILL BE REMOVED BY THE MBTA FOR THE DURATION OF THE PROJECT.

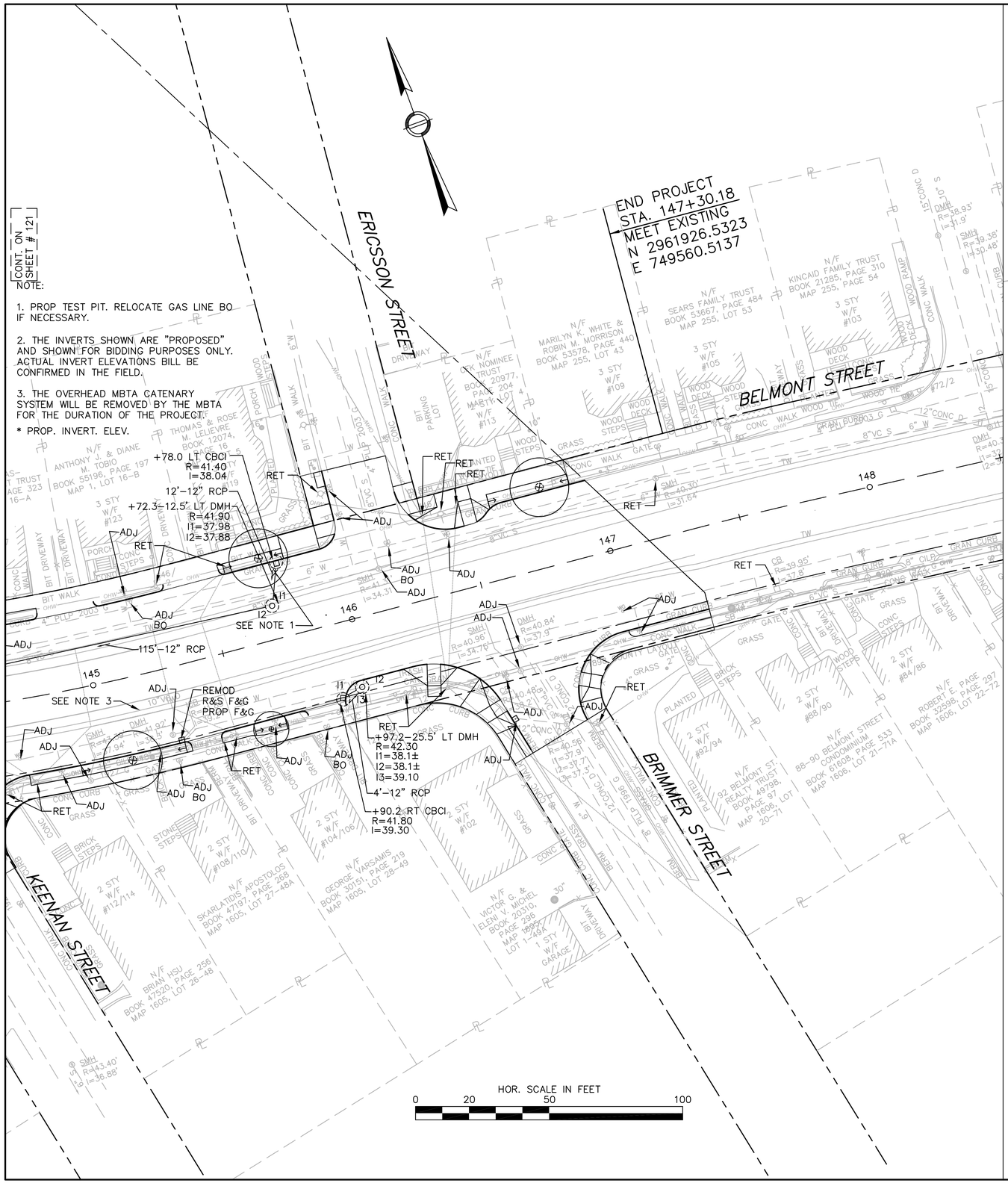
* PROP. INVERT. ELEV.

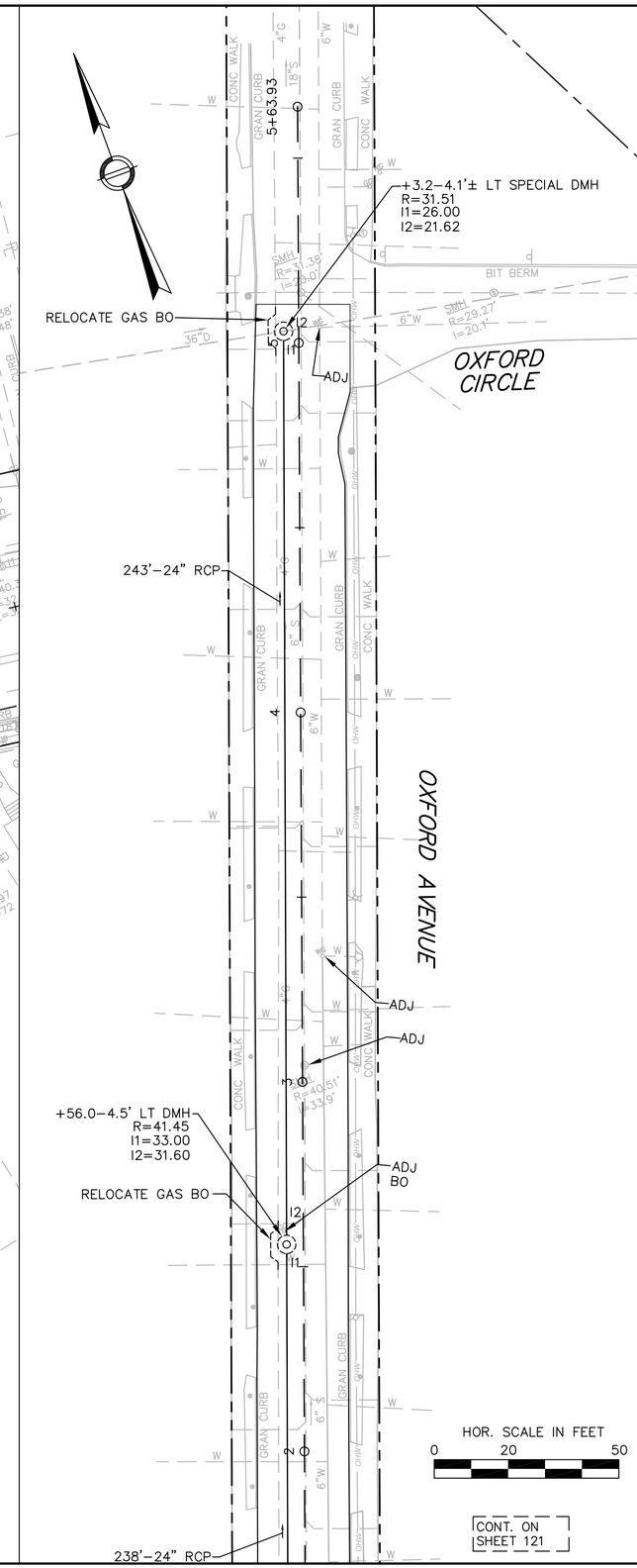


BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	122	240
PROJ. FILE NO. 604688			

DRAINAGE & UTILITY PLAN

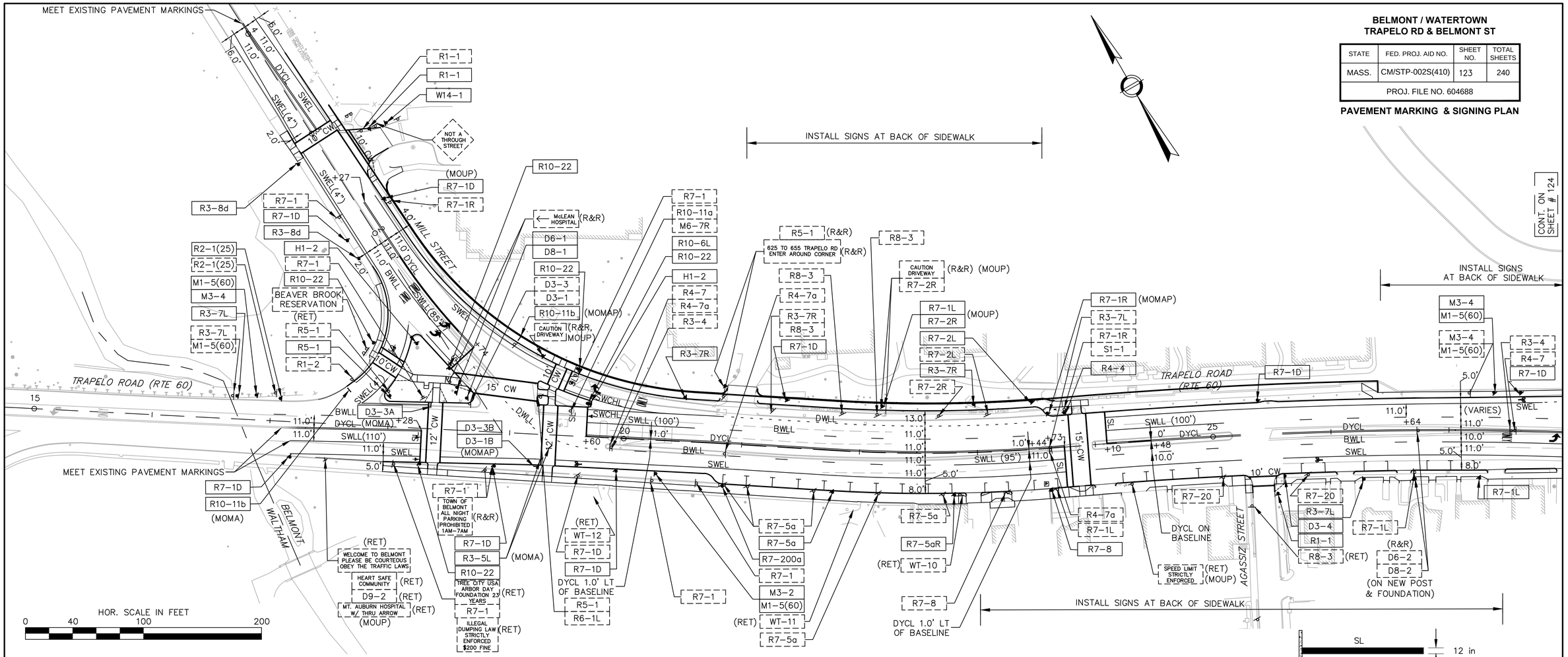


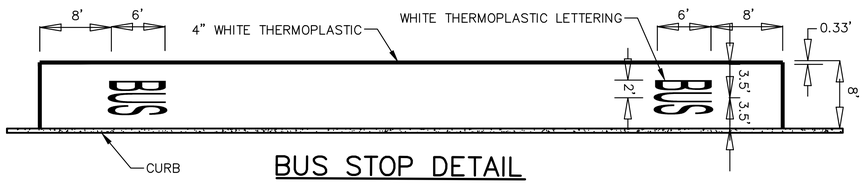


BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	123	240
PROJ. FILE NO. 604688			

PAVEMENT MARKING & SIGNING PLAN





BUS STOP DETAIL

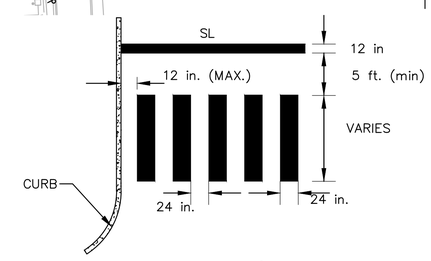
N.T.S

NOTES:

1. ALL EXISTING SIGNS ARE TO BE REMOVED AND STACKED UNLESS NOTED OTHERWISE.
2. ALL CROSSWALKS SHALL CONFORM TO DETAIL SHOWN THIS ON SHEET UNLESS OTHERWISE NOTED.
3. STREET NAME SIGNS MOUNTED ON TRAFFIC SIGNAL MAST ARMS SHALL BE MOUNTED BELOW THE ARM, NOT AGANIST THE ARM.

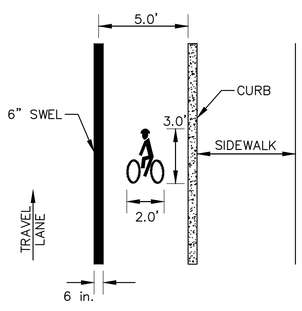
LEGEND:

R1–1	EXISTING SIGN
R1–1	PROPOSED SIGN
(R&R)	REMOVE AND RESET
(RET)	RETAIN
(REM)	REMOVE
(MOUP)	MOUNTED ON UTILITY POLE
(MOP)	MOUNTED ON POLE
(MOLP)	MOUNTED ON LIGHT POLE
(MOTSP)	MOUNTED ON TRAFFIC SIGNAL POST
(MOMA)	MOUNTED ON MAST ARM
(MOMAP)	MOUNTED ON MAST ARM POST
WT–X	EXIST. WAVERLEY TRAIL SIGN OR KIOSK



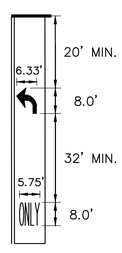
CROSSWALK DETAIL (PERPENDICULAR)

N.T.S



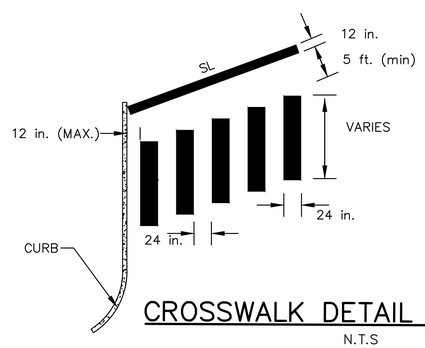
BICYCLE LANE DETAIL

N.T.S



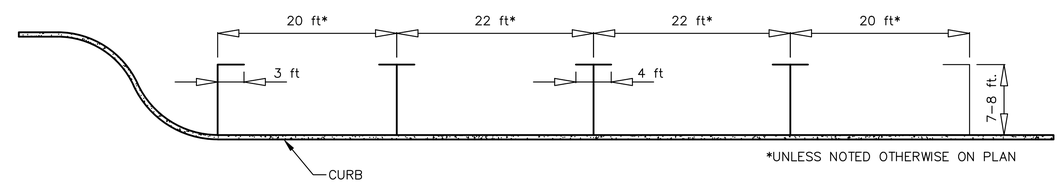
ARROW AND ONLY DETAIL

N.T.S



CROSSWALK DETAIL (ANGULAR)

N.T.S



*UNLESS NOTED OTHERWISE ON PLAN

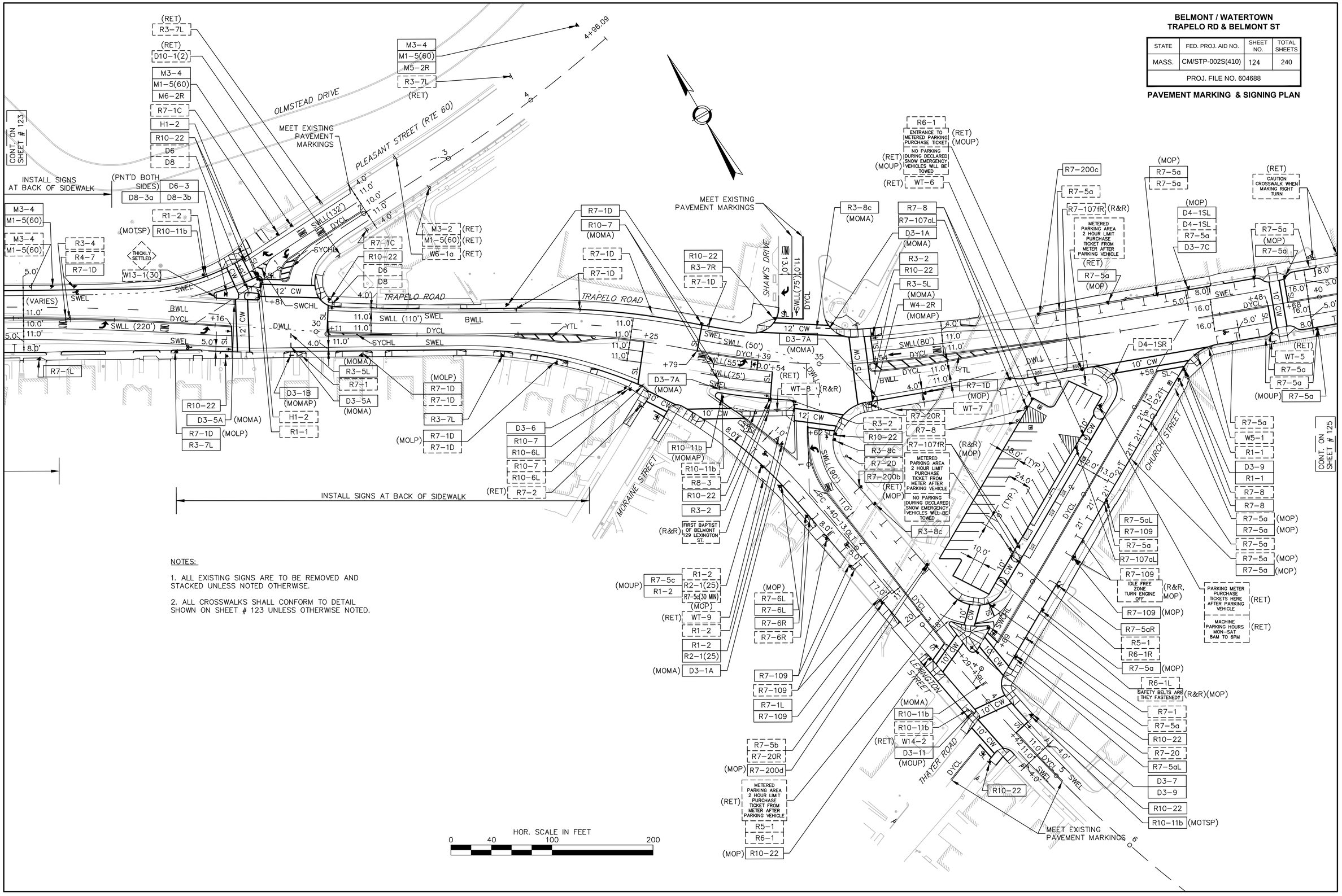
TYPICAL PARKING STALL LAYOUT

N.T.S

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	124	240
PROJ. FILE NO. 604688			

PAVEMENT MARKING & SIGNING PLAN



NOTES:

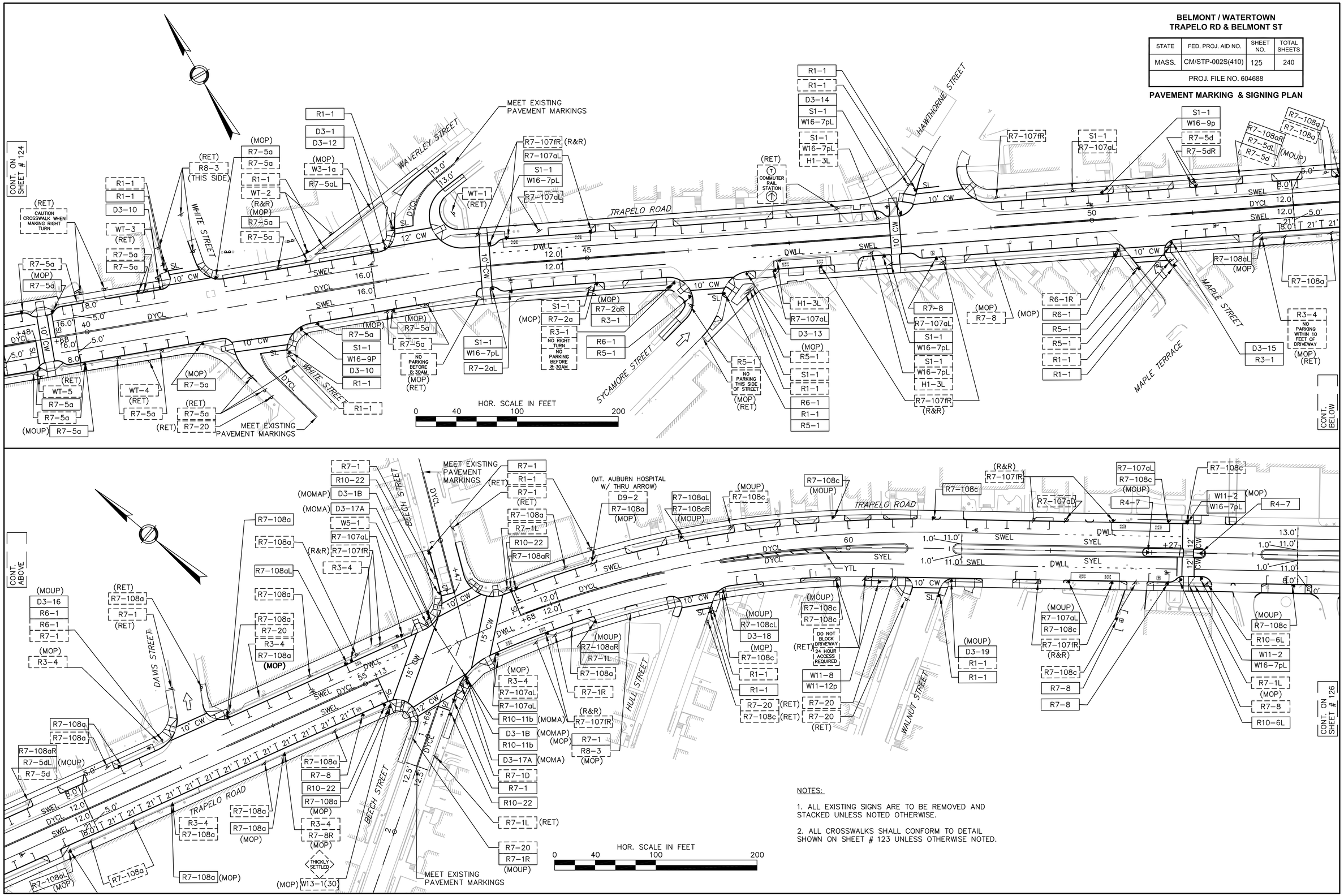
1. ALL EXISTING SIGNS ARE TO BE REMOVED AND STACKED UNLESS NOTED OTHERWISE.

2. ALL CROSSWALKS SHALL CONFORM TO DETAIL SHOWN ON SHEET # 123 UNLESS OTHERWISE NOTED.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	125	240
PROJ. FILE NO. 604688			

PAVEMENT MARKING & SIGNING PLAN



NOTES:

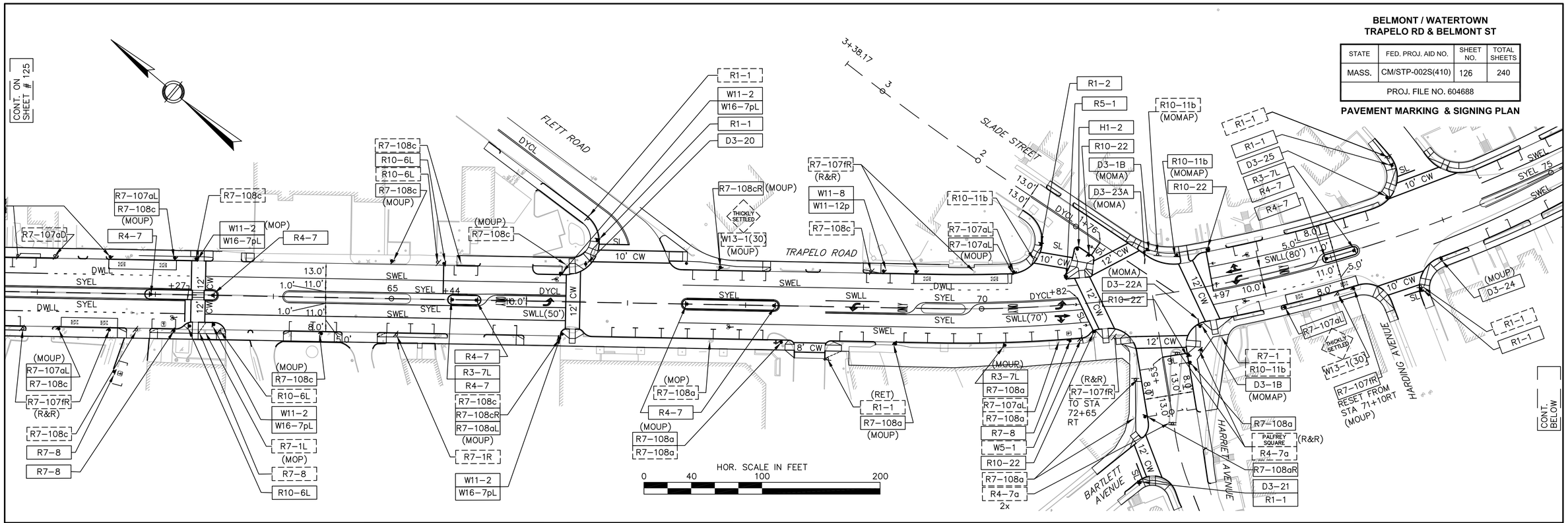
1. ALL EXISTING SIGNS ARE TO BE REMOVED AND STACKED UNLESS NOTED OTHERWISE.

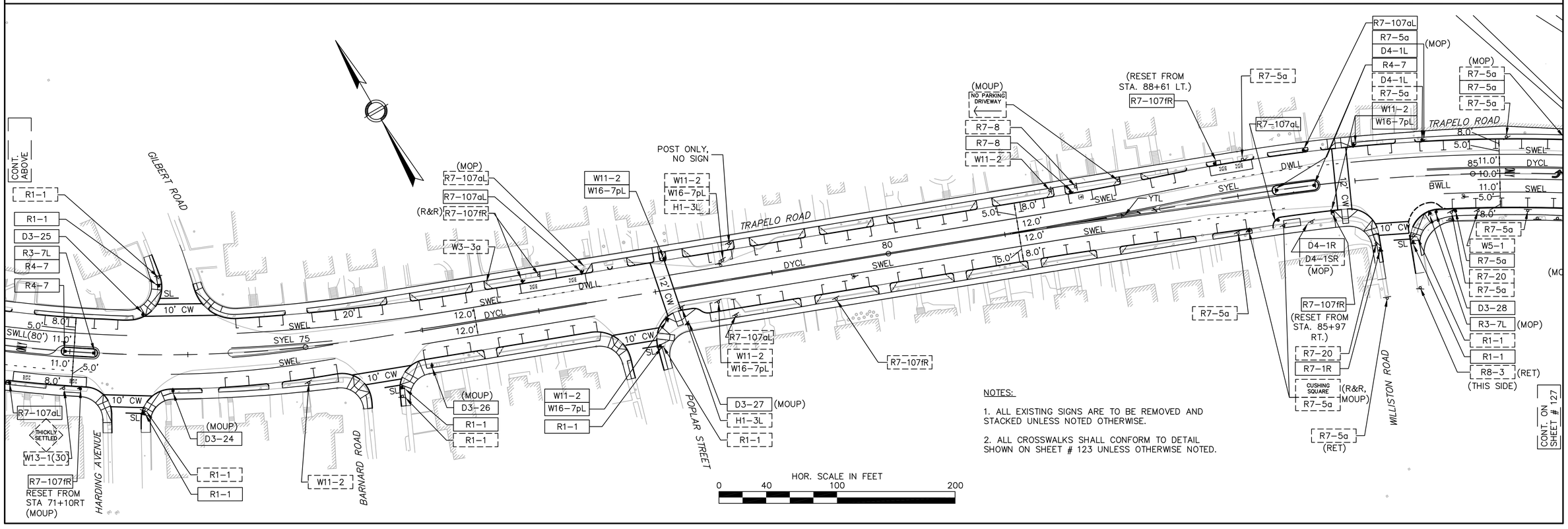
2. ALL CROSSWALKS SHALL CONFORM TO DETAIL SHOWN ON SHEET # 123 UNLESS OTHERWISE NOTED.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	126	240
PROJ. FILE NO. 604688			

PAVEMENT MARKING & SIGNING PLAN





NOTES:

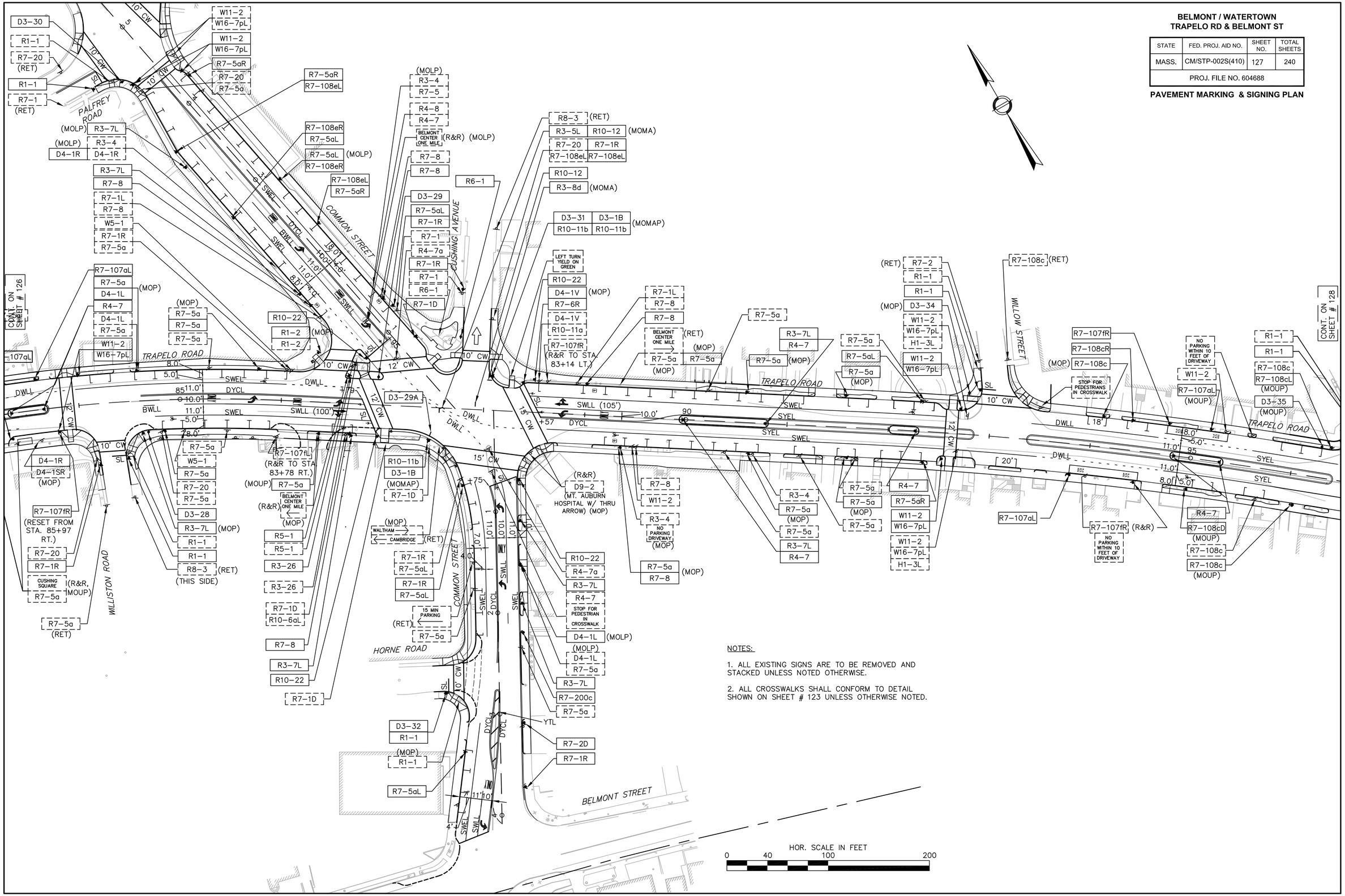
1. ALL EXISTING SIGNS ARE TO BE REMOVED AND STACKED UNLESS NOTED OTHERWISE.

2. ALL CROSSWALKS SHALL CONFORM TO DETAIL SHOWN ON SHEET # 123 UNLESS OTHERWISE NOTED.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	127	240
PROJ. FILE NO. 604688			

PAVEMENT MARKING & SIGNING PLAN



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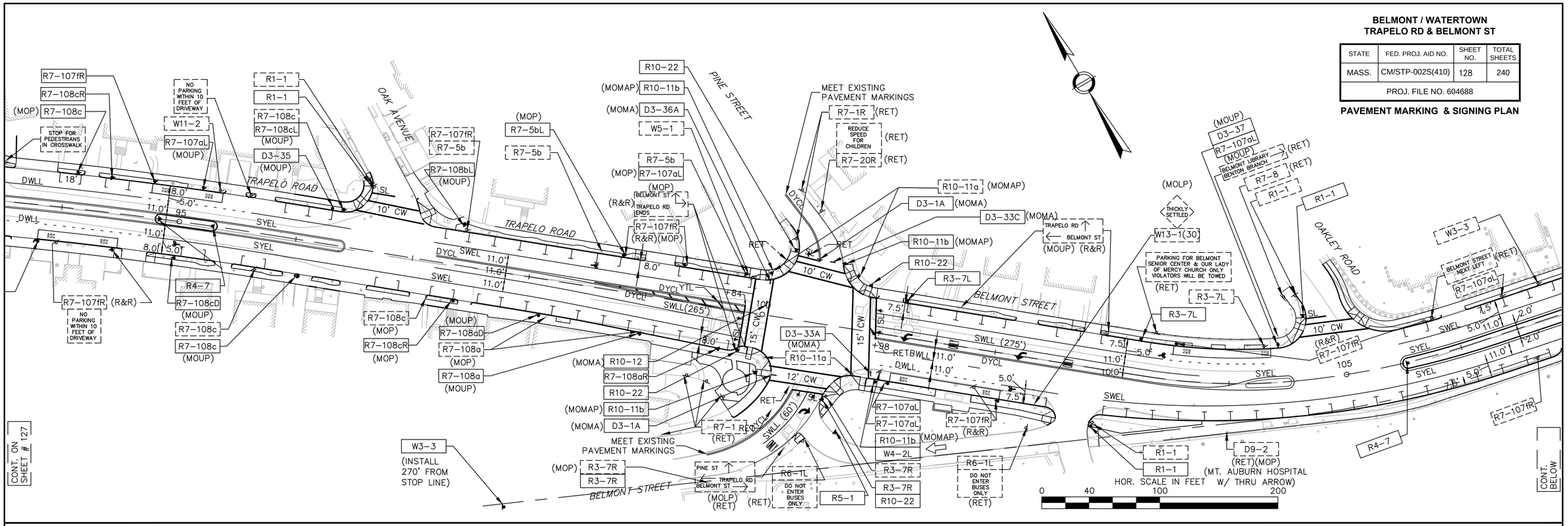
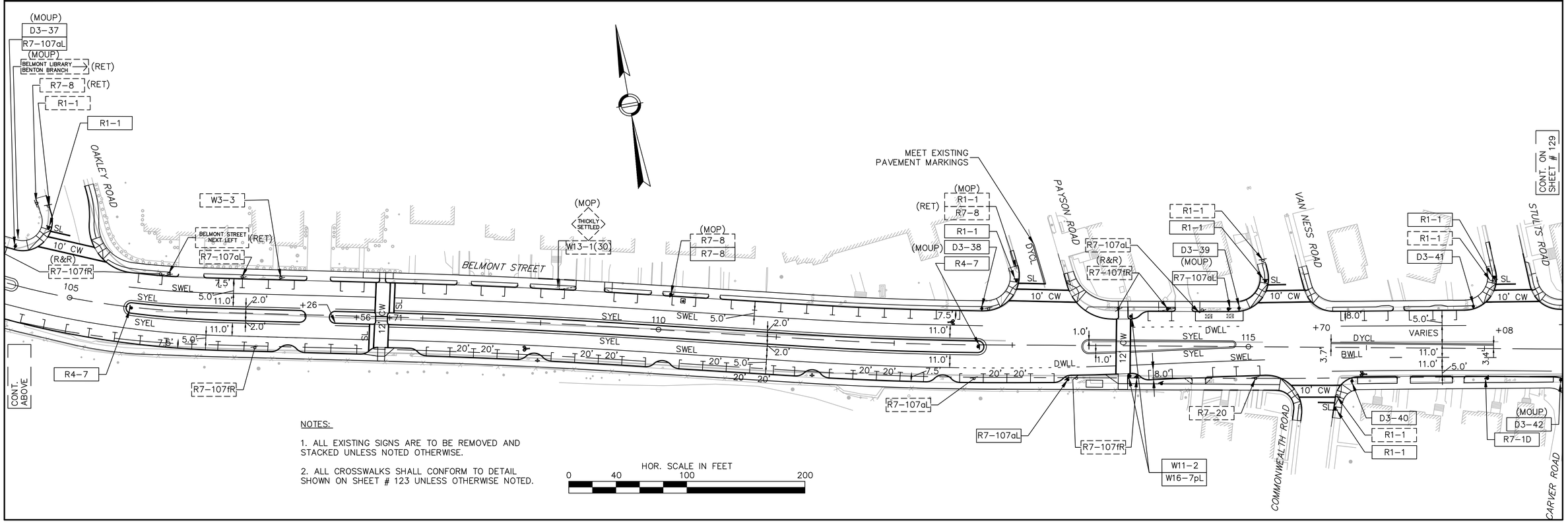
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	128	240
PROJ. FILE NO. 604688			

PAVEMENT MARKING & SIGNING PLAN





NOTES:

1. ALL EXISTING SIGNS ARE TO BE REMOVED AND STACKED UNLESS NOTED OTHERWISE.

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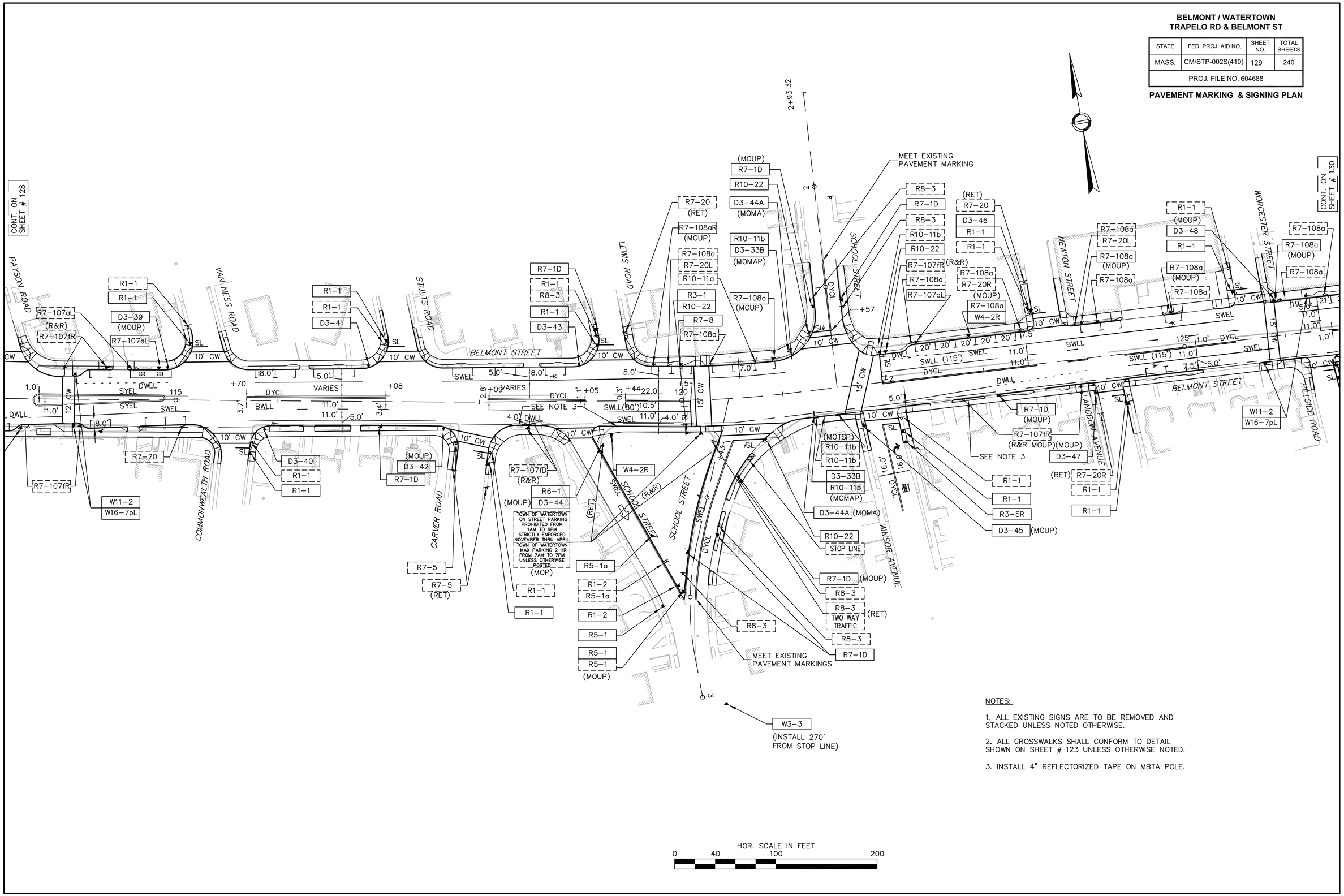
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	129	240
PROJ. FILE NO. 604688			

PAVEMENT MARKING & SIGNING PLAN



NOTES:

1. ALL EXISTING SIGNS ARE TO BE REMOVED AND STACKED UNLESS NOTED OTHERWISE.

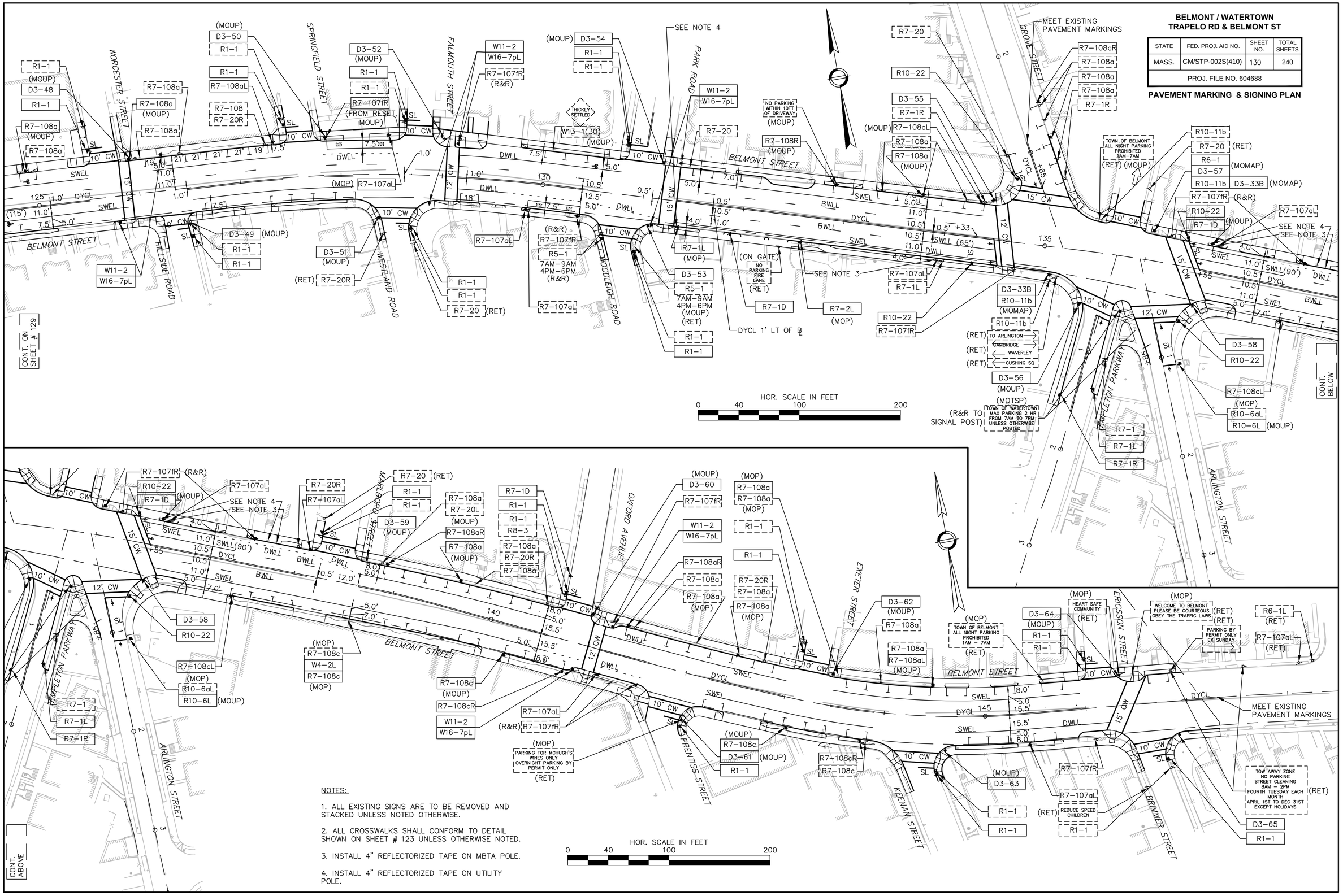
2. ALL CROSSWALKS SHALL CONFORM TO DETAIL SHOWN ON SHEET # 123 UNLESS OTHERWISE NOTED.

3. INSTALL 4" REFLECTORIZED TAPE ON MBTA POLE.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	130	240
PROJ. FILE NO. 604688			

PAVEMENT MARKING & SIGNING PLAN



NOTES:

1. ALL EXISTING SIGNS ARE TO BE REMOVED AND STACKED UNLESS NOTED OTHERWISE.

2. ALL CROSSWALKS SHALL CONFORM TO DETAIL SHOWN ON SHEET # 123 UNLESS OTHERWISE NOTED.

3. INSTALL 4" REFLECTORIZED TAPE ON MBTA POLE.

4. INSTALL 4" REFLECTORIZED TAPE ON UTILITY POLE.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	131	240
PROJ. FILE NO. 604688			

SIGN SUMMARY SHEET

TRAFFIC SIGN SUMMARY

IDENTIFI-CATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (in)			NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND NUMBER REQUIRED	UNIT AREA (S.F.)	AREA (S.F.)
	WIDTH (in)	HEIGHT (in)		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACK-GROUND	LEGEND	BORDER			
M1-5 (60)	24	24	60	SEE MASSDOT STANDARDS			5	SEE MASSDOT STANDARDS			P-5 (1)	4.00	20.00
M3-2	24	12	EAST	SEE 2009 M.U.T.C.D.			1	SEE 2009 M.U.T.C.D.			P-5 (1)	2.00	2.00
M3-4	24	12	WEST				4				P-5 (3)	2.00	8.00
M5-2R	21	15					1				P-5 (0)	2.19	2.19
M6-2R	21	15					1				P-5 (0)	2.19	2.19
R1-1	30	30	STOP				47				P-5 (43)	5.19	243.80
R1-2	36	36	YIELD				5				P-5 (3)	4.50	22.50
R2-1(25)	24	30	SPEED LIMIT 25				2				P-5 (1)	5.00	10.00
R3-1	24	24					4				P-5 (0)	4.00	16.00
R3-2	24	24					1				P-5 (0)	4.00	4.00
R3-5L	30	36	ONLY				3				P-5 (0)	7.50	22.50
R3-5R	30	36	ONLY				1				P-5 (1)	7.50	7.50
R3-7L	30	30	LEFT LANE MUST TURN LEFT				17				P-5 (12)	6.25	106.25
R3-7R	30	30	RIGHT LANE MUST TURN RIGHT				5				P-5 (3)	6.25	31.25
R3-8c	36	30	ONLY				2				P-5 (2)	7.50	15.0
R3-8d	36	30	ONLY				1				P-5 (0)	7.50	7.50
R3-26	24	30	RIGHT TURN ONLY	SEE MASSDOT STANDARDS			1	SEE MASSDOT STANDARDS			P-5 (1)	5.00	5.00
R4-4	36	30	BEGIN RIGHT TURN LANE YIELD TO BIKES	SEE 2009 M.U.T.C.D.			1	SEE 2009 M.U.T.C.D.			P-5 (1)	7.50	7.50
R4-7	24	30					17				P-5 (16)	5.00	85.00
R5-1	30	30	DO NOT ENTER				9				P-5 (8)	6.25	56.25

TRAFFIC SIGN SUMMARY

IDENTIFI-CATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (in)			NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND NUMBER REQUIRED	UNIT AREA (S.F.)	AREA (S.F.)
	WIDTH (in)	HEIGHT (in)		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACK-GROUND	LEGEND	BORDER			
R5-1a	36	24	WRONG WAY	SEE 2009 M.U.T.C.D.			1	SEE 2009 M.U.T.C.D.			P-5 (1)	3.75	3.75
R6-1 PBS	36	12	ONE WAY				7				P-5 (4)	3.00	21.00
R7-1	12	18	NO PARKING ANY TIME				3				P-5 (2)	1.50	4.50
R7-1L	12	18	NO PARKING ANY TIME				6				P-5 (3)	1.50	9.00
R7-1R	12	18	NO PARKING ANY TIME				10				P-5 (6)	1.50	15.00
R7-1D	12	18	NO PARKING ANY TIME				25				P-5 (16)	1.50	37.50
R7-2a	12	18	NO PARKING BEFORE 8:30 AM				1				P-5 (0)	1.50	1.50
R7-2aL	12	18	NO PARKING BEFORE 8:30 AM				1				P-5 (1)	1.50	1.50
R7-2aR	12	18	NO PARKING BEFORE 8:30 AM				1				P-5 (0)	1.50	1.50
R7-2D	12	18	NO PARKING 4:00 PM TO 6:00 PM				1				P-5 (1)	1.50	1.50
R7-2L	12	18	NO PARKING 4:00 PM TO 6:00 PM				1				P-5 (0)	1.50	1.50
R7-2R	12	18	NO PARKING 4:00 PM TO 6:00 PM				1				P-5 (1)	1.50	1.50
R7-2aL	12	18	NO PARKING 7-9 AM 4-6 PM MON-FRI				1				P-5 (1)	1.50	1.50
R7-5a	12	18	ONE HOUR PARKING				25				P-5 (4)	1.50	37.50
R7-5aL	12	18	ONE HOUR PARKING				8				P-5 (5)	1.50	12.00
R7-5aR	12	18	ONE HOUR PARKING				5				P-5 (4)	1.50	7.50
R7-5bL	12	18	TWO HOUR PARKING				1				P-5 (0)	1.50	1.50
R7-5c	12	18	30 MINUTE PARKING				1				P-5 (0)	1.50	1.50
R7-5dL	12	18	15 MIN PARKING				1				P-5 (0)	1.50	1.50
R7-5dR	12	18	15 MIN PARKING				1				P-5 (1)	1.50	1.50

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	132	240
PROJ. FILE NO. 604688			

SIGN SUMMARY SHEET

TRAFFIC SIGN SUMMARY

IDENTIFI-CATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (in)			NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND NUMBER REQUIRED	UNIT AREA (S.F.)	AREA (S.F.)
	WIDTH (in)	HEIGHT (in)		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACK-GROUND	LEGEND	BORDER			
R7-6L	12	18	NO PARKING LOADING ZONE	SEE 2009 M.U.T.C.D.			1	SEE 2009 M.U.T.C.D.			P-5 (1)	1.50	1.50
R7-6R	12	18	NO PARKING LOADING ZONE				2				P-5 (1)	1.50	3.00
R7-8	12	18	RESERVED PARKING				16				P-5 (14)	1.50	22.50
R7-107aL	12	30					26				P-5 (19)	2.50	75.00
R7-107fR	12	30					(1) PROVIDED BY MBTA				P-5 (1)	--	--
R7-108a	12	18	1 HR PARKING 8:00 AM TO 6:00 PM MON-SAT				21				P-5 (4)	1.50	31.50
R7-108aD	12	18	1 HR PARKING 8:00 AM TO 6:00 PM MON-SAT				1				P-5 (0)	1.50	1.50
R7-108aL	12	18	1 HR PARKING 8:00 AM TO 6:00 PM MON-SAT				7				P-5 (2)	1.50	10.50
R7-108aR	12	18	1 HR PARKING 8:00 AM TO 6:00 PM MON-SAT				9				P-5 (5)	1.50	13.50
R7-108bL	12	18	2 HR PARKING 8:00 AM TO 6:00 PM MON-SAT				1				P-5 (0)	1.50	1.50
R7-108c	12	18	2 HR PARKING 8:00 AM TO 6:00 PM EXCEPT SUNDAYS & HOLIDAYS				12				P-5 (2)	1.50	18.0
R7-108cL	12	18	2 HR PARKING 8:00 AM TO 6:00 PM EXCEPT SUNDAYS & HOLIDAYS				3				P-5 (1)	1.50	4.50
R7-108cR	12	18	2 HR PARKING 8:00 AM TO 6:00 PM EXCEPT SUNDAYS & HOLIDAYS				7				P-5 (3)	1.50	10.50
R7-108cD	12	18	2 HR PARKING 8:00 AM TO 6:00 PM EXCEPT SUNDAYS & HOLIDAYS				1				P-5 (0)	1.50	1.50
R7-108eL	12	18	15 MIN PARKING 8:00 AM TO 6:00 PM MONDAY-SAT				3				P-5 (1)	1.50	4.50
R7-108eR	12	18	15 MIN PARKING 8:00 AM TO 6:00 PM MONDAY-SAT				2				P-5 (1)	1.50	3.00
R7-108R	12	18	2 HR PARKING X:00 AM TO X:00 PM				1				P-5 (0)	1.50	1.50
R7-2aL	12	18	NO PARKING 7:00 AM 4:6 PM MON-FRI				1				P-5 (1)	1.50	1.50
R7-109	12	18	NO PARKING TAXI STAND				5				P-5 (2)	1.50	7.50

TRAFFIC SIGN SUMMARY

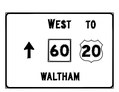
IDENTIFI-CATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (in)			NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND NUMBER REQUIRED	UNIT AREA (S.F.)	AREA (S.F.)
	WIDTH (in)	HEIGHT (in)		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACK-GROUND	LEGEND	BORDER			
R7-200a	24	18	ONE HOUR PARKING / NO PARKING ANY TIME	SEE 2009 M.U.T.C.D.			1	SEE 2009 M.U.T.C.D.			P-5 (1)	3.00	3.00
R7-200b	24	18	NO PARKING ANY TIME / TWO HOUR PARKING				1				P-5 (0)	3.00	3.00
R7-200c	24	18	NO PARKING ANY TIME / ONE HOUR PARKING				2				P-5 (2)	3.00	6.00
R7-200d	24	18	TWO HOUR PARKING / NO PARKING ANY TIME				1				P-5 (0)	3.00	3.00
R10-6L	24	36	$TOP HERE ON RED				5				P-5 (2)	6.00	30.00
R10-7	24	30	DO NOT BLOCK INTERSECTION				3				P-5 (1)	5.00	15.00
R10-11b	36	36	NO TURN ON RED				21				P-5 (8)	9.00	180.00
R10-12	30	36	LEFT TURN YIELD ON GREEN				3				P-5 (0)	7.50	22.50
R10-22	12	18	TO REQUEST GREEN WAIT ON				40				P-5 (41)	1.50	63.00
S1-1	36	36					6				P-5 (4)	8.25	37.50
W3-3	30	30					2				P-5 (2)	6.25	12.50
W4-2L	36	36					3				P-5 (1)	9.00	27.00
W4-2R	36	36					2				P-5 (1)	9.00	18.00
W11-2	30	30					32				P-5 (22)	6.25	137.50
W11-8	30	30					2				P-5 (2)	6.25	12.50
W11-12P	36	30	EMERGENCY SIGNAL AHEAD				2				P-5 (0)	7.50	15.00
W14-1	24	24	DEAD END				1				P-5 (1)	4.00	4.00
W16-7pL	24	12					20				P-5 (0)	2.00	52.00
W16-9p	24	12	AHEAD				2				P-5 (0)	2.00	4.00

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	133	240
PROJ. FILE NO. 604688			

SIGN SUMMARY SHEET

TRAFFIC SIGN SUMMARY

IDENTIFI-CATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (in)			NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND NUMBER REQUIRED	UNIT AREA (S.F.)	AREA (S.F.)
	WIDTH (in)	HEIGHT (in)		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACK-GROUND	LEGEND	BORDER			
D4-1L	30	24		SEE 2009 M.U.T.C.D.			2	SEE 2009 M.U.T.C.D.			P-5 (0)	5.00	10.00
D4-1R	30	24					2				P-5 (0)	5.00	5.00
D4-1SL	30	24					1				P-5 (0)	5.00	5.00
D4-1SR	30	24					0				P-5 (0)	5.00	5.00
D4-1V	30	24					1				P-5 (0)	5.00	5.00
D6-1	60	60		7C/6C 6C 6C 6C	4.5 4.5 4.5 4.5 6	18x18	1	GREEN	WHITE	WHITE	5in NOM. STEEL PIPE 4.89 lb/ft 11 ft (1)	25.00	25.00
D8-1	48	36		6C	6 6	18x18 8x20 @ 90°	1	GREEN	WHITE	WHITE	MOUNTED WITH D6-1	10.00	10.00
D6-3 (PBS)	60	60		7C/6C 6C 6C	6 4 4 4 6	18x18 36x8 @ 0°	1	GREEN	WHITE	WHITE	5in NOM. STEEL PIPE 4.89 lb/ft 11 ft (1)	25.00	25.00
D8-3a	60	42		6C 6C	11 8 11	8x20 @ 90°	1	GREEN	WHITE	WHITE	MOUNTED WITH D6-3	17.50	17.50
D8-3b	60	42		7C/6C 6C	2.5 3 3 2.5	18X18 8x20 @ 90°	1	GREEN	WHITE	WHITE	MOUNTED WITH D6-3	17.50	17.50
H1-2	24	24		SEE MASSDOT STANDARDS			4	SEE MASSDOT STANDARDS			P-5 (4)	--	EACH

TRAFFIC SIGN SUMMARY

IDENTIFI-CATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (in)			NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND NUMBER REQUIRED	UNIT AREA (S.F.)	AREA (S.F.)
	WIDTH (in)	HEIGHT (in)		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACK-GROUND	LEGEND	BORDER			

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	134	240
PROJ. FILE NO. 604688			

SIGN SUMMARY SHEET

TRAFFIC SIGN SUMMARY

IDENTIFI–CATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (in)			NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND NUMBER REQUIRED	UNIT AREA (S.F.)	AREA (S.F.)
	WIDTH (in)	HEIGHT (in)		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACK–GROUND	LEGEND	BORDER			
D3–1 (PBS)	VARIES	12	Trapelo Rd	SEE 2009 M.U.T.C.D.			1	SEE 2009 M.U.T.C.D.			P–5 (1)	––	EACH
D3–4 (PBS)	VARIES	12	Agassiz St				1				P–5 (1)	––	EACH
D3–6 (PBS)	VARIES	12	Moraine St				1				P–5 (0)	––	EACH
D3–7 (PBS)	VARIES	12	Lexington St				1				P–5 (1)	––	EACH
D3–9 (PBS)	VARIES	12	Church St				2				P–5 (1)	––	EACH
D3–10 (PBS)	VARIES	12	White St				2				P–5 (1)	––	EACH
D3–11 (PBS)	VARIES	12	Thayer Rd				1				P–5 (0)	––	EACH
D3–12 (PBS)	VARIES	12	Waverley St				1				P–5 (0)	––	EACH
D3–13 (PBS)	VARIES	12	Sycamore St				1				P–5 (1)	––	EACH
D3–14 (PBS)	VARIES	12	Hawthorne St				1				P–5 (1)	––	EACH
D3–15 (PBS)	VARIES	12	Maple St				1				P–5 (1)	––	EACH
D3–16 (PBS)	VARIES	12	Davis Rd				1				P–5 (0)	––	EACH
D3–18 (PBS)	VARIES	12	Hull St				1				P–5 (0)	––	EACH
D3–19 (PBS)	VARIES	12	Walnut St				1				P–5 (0)	––	EACH
D3–20 (PBS)	VARIES	12	Flett Rd				1				P–5 (1)	––	EACH
D3–21 (PBS)	VARIES	12	Bartlett Ave				1				P–5 (1)	––	EACH
D3–23 (PBS)	VARIES	12	Slade St				1				P–5 (0)	––	EACH
D3–24 (PBS)	VARIES	12	Harding Ave				1				P–5 (0)	––	EACH
D3–25 (PBS)	VARIES	12	Gilbert Rd				1				P–5 (1)	––	EACH
D3–26 (PBS)	VARIES	12	Barnard Rd				1				P–5 (0)	––	EACH

TRAFFIC SIGN SUMMARY

IDENTIFI–CATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (in)			NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND NUMBER REQUIRED	UNIT AREA (S.F.)	AREA (S.F.)
	WIDTH (in)	HEIGHT (in)		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACK–GROUND	LEGEND	BORDER			
D3–27 (PBS)	VARIES	12	Poplar St	SEE 2009 M.U.T.C.D.			1	SEE 2009 M.U.T.C.D.			P–5 (0)	––	EACH
D3–28 (PBS)	VARIES	12	Williston Rd				1				P–5 (1)	––	EACH
D3–29 (PBS)	VARIES	12	Common St				1				P–5 (1)	––	EACH
D3–30 (PBS)	VARIES	12	Palfrey Rd				1				P–5 (0)	––	EACH
D3–31 (PBS)	VARIES	12	Cushing Ave				1				P–5 (0)	––	EACH
D3–32 (PBS)	VARIES	12	Horne Rd				1				P–5 (1)	––	EACH
D3–34 (PBS)	VARIES	12	Willow St				1				P–5 (0)	––	EACH
D3–35 (PBS)	VARIES	12	Oak St				1				P–5 (0)	––	EACH
D3–37 (PBS)	VARIES	12	Oakley Rd				1				P–5 (0)	––	EACH
D3–38 (PBS)	VARIES	12	Payson Rd				1				P–5 (0)	––	EACH
D3–39 (PBS)	VARIES	12	Van Ness Rd				1				P–5 (0)	––	EACH
D3–40 (PBS)	VARIES	12	Commonwealth Rd				1				P–5 (1)	––	EACH
D3–41 (PBS)	VARIES	12	Stults Rd				1				P–5 (1)	––	EACH
D3–42 (PBS)	VARIES	12	Carver Rd				1				P–5 (0)	––	EACH
D3–43 (PBS)	VARIES	12	Lewis Rd				1				P–5 (1)	––	EACH
D3–44 (PBS)	VARIES	12	School St				1				P–5 (1)	––	EACH
D3–45 (PBS)	VARIES	12	Winsor Ave				1				P–5 (0)	––	EACH
D3–46 (PBS)	VARIES	12	Newton St				1				P–5 (1)	––	EACH
D3–47 (PBS)	VARIES	12	Langdon Ave				1				P–5 (0)	––	EACH
D3–48 (PBS)	VARIES	12	Worcester St				1				P–5 (0)	––	EACH

BELMONT / WATERTOWN
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MASS.	CM/STP-002S(410)	135	240
PROJ. FILE NO. 604688			

SIGN SUMMARY SHEET

TRAFFIC SIGN SUMMARY

IDENTIFI-CATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (in)			NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND NUMBER REQUIRED	UNIT AREA (S.F.)	AREA (S.F.)
	WIDTH (in)	HEIGHT (in)		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACK-GROUND	LEGEND	BORDER			
D3-49 (PBS)	VARIES	12	Hillside Rd	SEE 2009 M.U.T.C.D.			1	SEE 2009 M.U.T.C.D.			P-5 (0)	--	EACH
D3-50 (PBS)	VARIES	12	Springfield St				1				P-5 (0)	--	EACH
D3-51 (PBS)	VARIES	12	Westland Rd				1				P-5 (0)	--	EACH
D3-52 (PBS)	VARIES	12	Falmouth St				1				P-5 (0)	--	EACH
D3-53 (PBS)	VARIES	12	Woodleigh Rd				1				P-5 (1)	--	EACH
D3-54 (PBS)	VARIES	12	Park Rd				1				P-5 (0)	--	EACH
D3-55 (PBS)	VARIES	12	Grove St				1				P-5 (0)	--	EACH
D3-56 (PBS)	VARIES	12	Templeton Pkwy				1				P-5 (0)	--	EACH
D3-57 (PBS)	VARIES	12	Marion Rd				1				P-5 (0)	--	EACH
D3-58 (PBS)	VARIES	12	Arlington St				1				P-5 (0)	--	EACH
D3-59 (PBS)	VARIES	12	Marlbobo St				1				P-5 (0)	--	EACH
D3-60 (PBS)	VARIES	12	Oxford Ave				1				P-5 (0)	--	EACH
D3-61 (PBS)	VARIES	12	Prentiss St				1				P-5 (0)	--	EACH
D3-62 (PBS)	VARIES	12	Exeter St				1				P-5 (0)	--	EACH
D3-63 (PBS)	VARIES	12	Keenan St				1				P-5 (0)	--	EACH
D3-64 (PBS)	VARIES	12	Ericsson St				1				P-5 (0)	--	EACH
D3-65 (PBS)	VARIES	12	Brimmer St				1				P-5 (0)	--	EACH

TRAFFIC SIGN SUMMARY

IDENTIFI-CATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (in)			NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND NUMBER REQUIRED	UNIT AREA (S.F.)	AREA (S.F.)
	WIDTH (in)	HEIGHT (in)		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACK-GROUND	LEGEND	BORDER			
D3-1A (PBS)	VARIES	24	Trapelo Rd	SEE 2009 M.U.T.C.D.			4	SEE 2009 M.U.T.C.D.			P-5 (0)	--	EACH
D3-3A (PBS)	VARIES	24	Mill St				1				P-5 (0)	--	EACH
D3-5A (PBS)	VARIES	24	Pleasant St				2				P-5 (0)	--	EACH
D3-7A (PBS)	VARIES	24	Lexington St				2				P-5 (0)	--	EACH
D3-17A (PBS)	VARIES	24	Beech St				2				P-5 (0)	--	EACH
D3-22A (PBS)	VARIES	24	Harriet Ave				1				P-5 (0)	--	EACH
D3-23A (PBS)	VARIES	24	Slade St				1				P-5 (0)	--	EACH
D3-29A (PBS)	VARIES	24	Common St				1				P-5 (0)	--	EACH
D3-33A (PBS)	VARIES	24	Belmont St				1				P-5 (0)	--	EACH
D3-36A (PBS)	VARIES	24	Pine St				1				P-5 (0)	--	EACH
D3-44A (PBS)	VARIES	24	School St				2				PC (0)	--	EACH
D3-1B (POS)	VARIES	24	Trapelo Rd				8				P-5 (0)	--	EACH
D3-3B (POS)	VARIES	24	Mill St				1				P-5 (0)	--	EACH
D3-33B (POS)	VARIES	24	Belmont St				4				P-5	--	EACH
D3-7C (POS)	VARIES	24	← Lexington St				1				P-5 (0)	--	EACH
D3-33C (PBS)	VARIES	24	Belmont St→				1				P-5 (0)	--	EACH

NOTES:
1. REMOVE AND STACK ALL EXISTING TRAFFIC SIGNAL EQUIPMENT.

2. REMOVE ALL PULL BOXES AND ABANDON EXISTING TRAFFIC SIGNAL CONDUIT SYSTEM.

3. MINIMUM 36" CLEARANCE EXCLUDING THE CURB WIDTH IS REQUIRED ON ALL SIDEWALKS.

4. VIDEO DETECTION AREAS ARE SHOWN ON THE PLANS GRAPHICALLY AND SHOULD BE ADJUSTED IN THE FIELD FOR PROPER DETECTION.

5. REFER TO SHEET NO. 137 FOR TRAFFIC SEQUENCE PLAN.

6. REFER TO SHEET NOS. 164 TO 168 FOR MAST ARM FOUNDATION DETAILS.

7. REFER TO SHEET NO. 123 FOR COMPLETE PAVEMENT MARKING AND SIGNING PLAN.

8. REFER TO SHEET NO.162 FOR TRAFFIC SIGNAL INTERCONNECT PLAN AND SIGNAL INTERCONNECT MAJOR ITEMS LIST. PULL BOXES EXCLUSIVE TO THE INTERCONNECT ARE SHOWN ON THE TRAFFIC SIGNAL INTERCONNECT ITEM LIST.

9. PUSH BUTTONS SHALL BE LOCATED NO MORE THAN 10" HORIZONTALLY FROM A LEVEL SURFACE (≤1.5%).

10. TWO TEMPORARY TRAFFIC SIGNALS WILL BE REQUIRED.

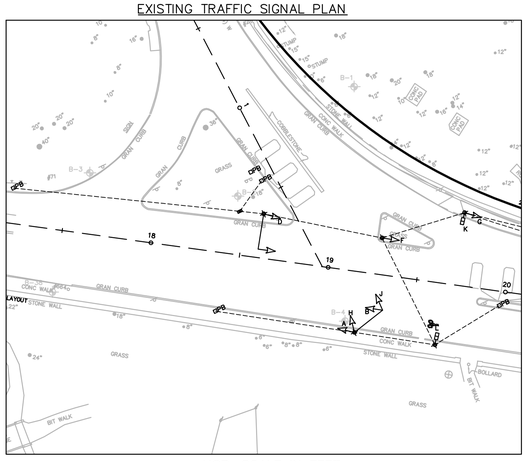
MAJOR ITEMS REQUIRED

QTY	ITEM 816.01
1	TRAFFIC SIGNAL CONTROLLER (TS-2, TYPE 1) W/ 8DW BASE MOUNTED CABINET
1	20' MAST ARM (STEEL), INCLUDE BASE & FOUNDATION
1	25' MAST ARM (STEEL), INCLUDE BASE & FOUNDATION W/(1) R10-11b
1	35' MAST ARM (STEEL), INCL. BASE & FNDN W/ (1) D3
1	30' MAST ARM (STEEL), INCL. BASE & FNDN W/ (2) R3-5L
1	10' TRAFFIC SIGNAL POST, BASE & FOUNDATION
9	8' TRAFFIC SIGNAL POST, BASE & FOUNDATION
6	1-WAY, 3-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
1	1-WAY, 5-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
1	2-WAY, 3-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
1	2-WAY, 3/5-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
11	5" LOUVERED BACKPLATES
10	PEDESTRIAN SIGNAL HEAD W/ EGG-CRATE VISOR (L.E.D. W/ COUNTDOWN)
10	ACCESSIBLE PEDESTRIAN PUSH BUTTON ASSEMBLY W/ SIGN
7	12" x 12" PULL BOXES*
1	12" x 24" PULL BOXES*
5	VIDEO DETECTION CAMERAS
5	VIDEO CAMERA MAST ARM MOUNTING BRACKET
3	VIDEO DETECTION PROCESSOR - TWO CHANNEL
3	OPTICAL PRE-EMPTION DETECTORS SINGLE CHANNEL
1	EMERGENCY VEHICLE PRE-EMPTION CONFIRMATION STROBE LIGHT (WHITE)
1	OPTICAL PHASE SELECTOR TWO CHANNEL
1	SERVICE CONNECTION (OVERHEAD)

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

* TO BE PAID UNDER ITS RESPECTIVE PAY ITEM.

EXISTING TRAFFIC SIGNAL PLAN



HOR. SCALE IN FEET
0 40 100 200

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

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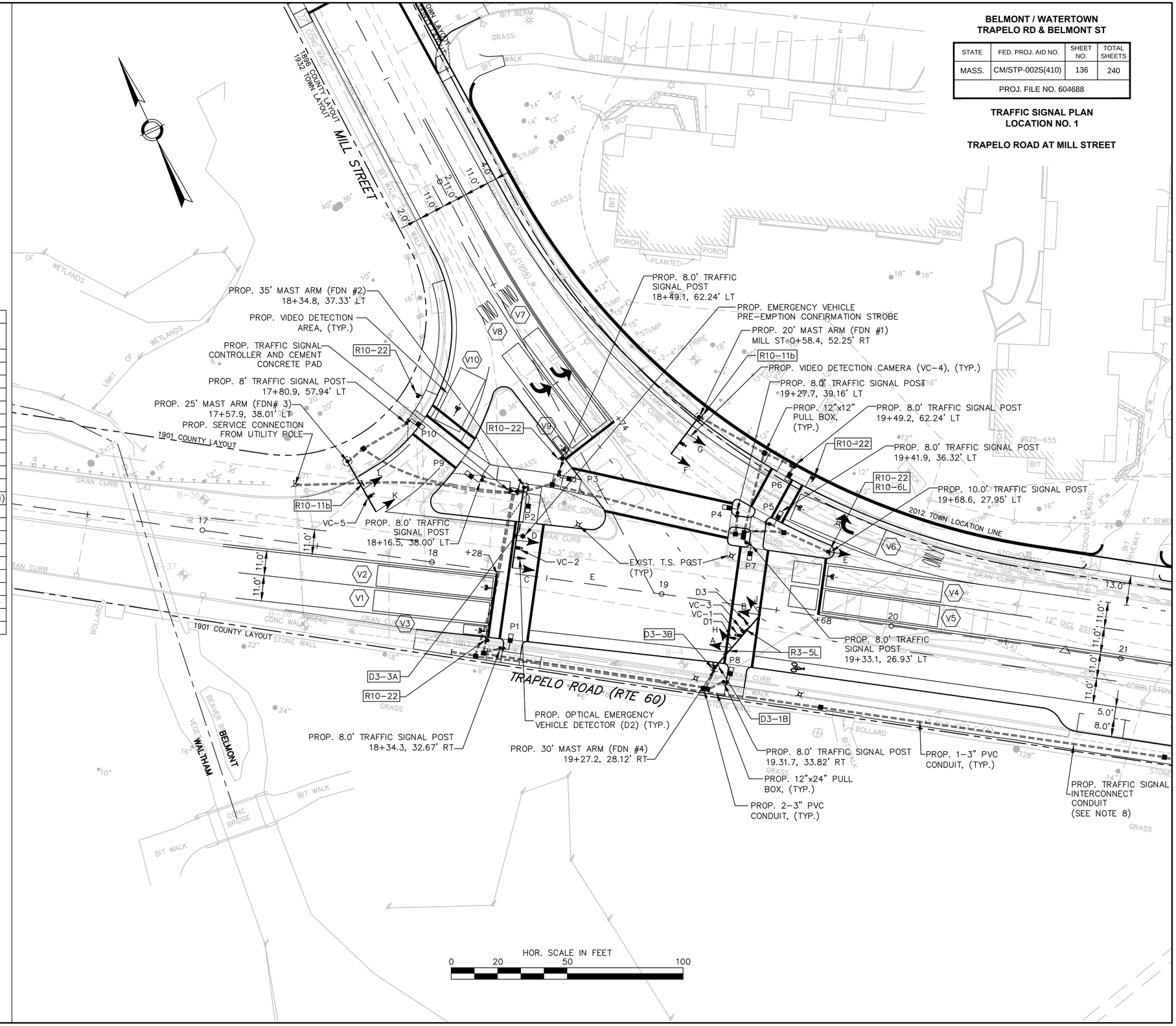
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 1

TRAPELO ROAD AT MILL STREET



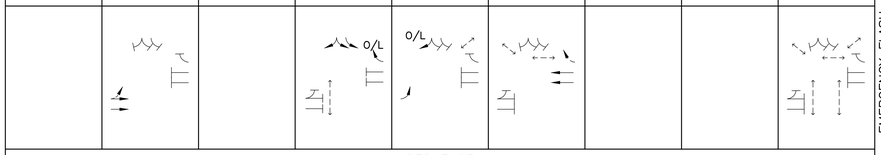
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	137	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 1

TRAPELO ROAD AT MILL STREET

SEQUENCE AND TIMING CHART

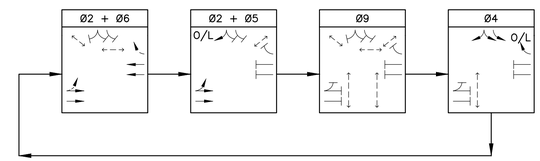


STREET	DIR.	FACE	Ø/OL	PHASE 1 R/W	PHASE 1 CL1	PHASE 1 CL2	PHASE 2 R/W	PHASE 2 CL1	PHASE 2 CL2	PHASE 3 R/W	PHASE 3 CL1	PHASE 3 CL2	PHASE 4 R/W	PHASE 4 CL1	PHASE 4 CL2	PHASE 5 R/W	PHASE 5 CL1	PHASE 5 CL2	PHASE 6 R/W	PHASE 6 CL1	PHASE 6 CL2	PHASE 7 R/W	PHASE 7 CL1	PHASE 7 CL2	PHASE 8 R/W	PHASE 8 CL1	PHASE 8 CL2	PHASE 9 R/W	PHASE 9 CL1	PHASE 9 CL2	EMERGENCY FLASH OPERATION
				SEQUENCE																											
TRAPELO RD	EB	A	2				G	Y	R				R	R	R	R	R	R	R	R	R							R	R	R	FY
TRAPELO RD	EB	B	2/5				G	Y	R				R	R	R	R	R	R	R	R	R							R	R	R	FY
TRAPELO RD	WB	C,D	6				R	R	R				R	R	R	R	R	R	G	Y	R							R	R	R	FY
TRAPELO RD	WB	E	6/4				R	R	R				R	R	R	R	R	R	G	Y	R							R	R	R	FY
TRAPELO RD	WB	F,G	6/4				R	R	R				G	Y	R	R	R	R	G	Y	R							R	R	R	FY
MILL ST	SB	H,J	4				FR	FR	FR				FR	FR	FR	FR	FR	FR	FR	FR	FR							FR	FR	FR	FR
MILL ST	SB	K,L	4/5				R	R	R				G	Y	R	G	Y	R	R	R	R							R	R	R	FR
PEDESTRIAN		P1–P2	4										•															F	F/		OFF
PEDESTRIAN		P3–P4	6																•									F	F/		OFF
PEDESTRIAN		P5–P6	5													•												F	F/		OFF
PEDESTRIAN		P7–P8	9																									F	F/		OFF
PEDESTRIAN		P9–P10	6																•									F	F/		OFF
				TIMING IN SECONDS																											
MINIMUM GREEN							10						8			4			10												
VEHICLE INTERVAL							2						2			2			2												
MAXIMUM GREEN I (FREE)							45						31			15			31												
MAXIMUM GREEN II (COORD)							49						29			14			30												
YELLOW CLEAR								4						4			4			3											
ALL RED CLEAR									2						2			2			2									4	
WALK INTERVAL													7			7			7									7			
PED CLEARANCE													12	4		3	3		18	2									14		
PED BUFFER															2		1	2		1	2									4	
DETECTOR							NON–LOCK						NON–LOCK			NON–LOCK			NON–LOCK									LOCK			
RECALL MODE							SOFT						OFF			OFF			SOFT									OFF			
				COORDINATION TIMING (SECONDS)																											
CYCLE		OFFSET		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
DIAL	SEC.	%	SEC.																												
AM	90	39	35				49	4	2				29	4	2	14	4	2	30	3	2										
AM W/Ø9 PED	90	39	35				31	4	2				22	4	2	8	4	2	20	3	2							7	14	4	
PM	90	42	38				49	4	2				29	4	2	14	4	2	30	3	2										
PM W/Ø9 PED	90	42	38				30	4	2				23	4	2	10	4	2	15	3	2							7	14	4	

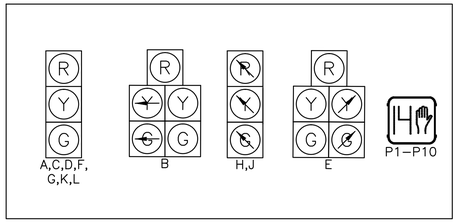
SEQUENCE NOTES:

1. ANY PHASE NOT CALLED WILL BE SKIPPED. SIGNAL IDENTIFICATION WILL NOT CHANGE IF THE ASSIGNED RIGHT OF WAY DOES NOT CHANGE DURING THE NEXT PHASE CALLED.
2. • NORMALLY DON'T WALK, UPON PEDESTRIAN PUSH BUTTON ACTIVATION, WALK/FLASHING DON'T WALK (COUNTDOWN).
3. COUNTDOWN PHASE OF PEDESTRAIN SIGNALS SHALL NOT OCCUR DURING THE WALK PERIOD.
4. THE RIGHT–OF–WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON–CONFLICTING PHASES.
5. Ø/OL = PHASE IN DISPLAY / OVERLAPPING PHASE.
6. DIAL 1 (AM) = 06:30 – 09:00, M–F
   DIAL 2 (PM) = 15:00 – 18:00, M–F
   FREE = ALL OTHER TIMES
7. OFFSETS REFERENCED TO THE BEGINNING OF GREEN, PHASE 2+6.
8. PHASE 9 TO BE CALLED ONLY BY P7–P8 PUSH BUTTON ACTIVATION.

PREFERENTIAL PHASING SEQUENCE



SIGNAL DISPLAY



SIGNAL DISPLAY NOTES:

1. ALL SIGNAL DISPLAYS SHALL BE EQUIPPED W/ LED MODULES (12–INCH LENS)
2. ALL SIGNAL HEADS SHALL BE RIGID MOUNTED AND EQUIPPED WITH ±5" LOUVERED BACKPLATES.
3. ALL PEDESTRIAN SIGNAL HEADS SHALL HAVE PEDESTRIAN COUNTDOWN TIMER AND EGG–CRATE VISOR.

EMERGENCY VEHICLE PRE–EMPTION PHASING AND PRIORITY

DETECTOR AND PRIORITY	PRE–EMPT PHASE ASSIGNMENT	MOVEMENT	VEHICLE PHASE ASSIGNMENT
D1	1		Ø2 + Ø5
D2	2		Ø6
D3	3		Ø4

EMERGENCY VEHICLE PRE–EMPTION PHASING AND PRIORITY 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. 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 FIVE (5) SECONDS OR UNTIL PRE–EMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME PRE–EMPTION PHASE CLEARANCE (4 SECONDS: YELLOW AND 2 SECONDS: ALL RED) AND SERVICE EMERGENCY VEHICLE PRE–EMPTION PHASE #2 (OR #1) IF NECESSARY, THEN TIME PHASE PRE–EMPTION CLEARANCE AND RESUME NORMAL SIGNAL OPERATION. EMERGENCY VEHICLE PRE–EMPTION PHASE #3 SHALL BE SIMILARLY SERVED.
3. MINIMUM GREEN, NORMAL VEHICLE CLEARANCE, SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PRE–EMPTION DEMAND.
4. PREEMPTION STROBE SHALL BE ILLUMINATED WHENEVER ANY EMERGENCY VEHICLE PRE–EMPTION GREEN IS ON.

DETECTOR OPERATION

DETECTOR NUMBER	NUMBER OF SECTION/SIZE	PROCESSOR NUMBER	CHANNEL NUMBER	Ø CALLED	Ø EXTENSION	OPERATION	DELAY (SECONDS)	EXTENSION (SECONDS)
V1	9'x50'	1	1	2	2	PRESENCE	0	0
V2	9'x50'	1	1	2/5	2/5	PRESENCE	0	0
V3	3'x10'	1	1	2	2	PRESENCE	0	0
V4	1 – 9'x50' 1 – 9'x12'	1	2	6	6	PRESENCE	0	0
V5	1 – 9'x50' 1 – 9'x12'	1	2	6	6	PRESENCE	0	0
V6	12'x40'	2	1	6	6	PRESENCE	0	0
V7	9'x50'	2	2	4	4	PRESENCE	0	0
V8	9'x50'	2	2	4	4	PRESENCE	0	0
V9	3'x8'	2	2	4	4	PRESENCE	0	0
V10	12'x25'	3	1	4	4	PRESENCE	0	0

DETECTOR OPERATION NOTES:

1. DELAY TIME SHALL BE EFFECTIVE ONLY DURING THE RED PORTION OF THE PHASE THAT IS CALLED AT THE DETECTOR.
2. DETECTOR OPERATION SHOULD BE BI–DIRECTIONAL.

NOTES:
1. REMOVE AND STACK ALL EXISTING TRAFFIC SIGNAL EQUIPMENT.

2. REMOVE ALL PULL BOXES AND ABANDON EXISTING TRAFFIC SIGNAL CONDUIT SYSTEM.

3. MINIMUM 36" CLEARANCE EXCLUDING THE CURB WIDTH IS REQUIRED ON ALL SIDEWALKS.

4. REFER TO SHEET NO. 139 FOR TRAFFIC SEQUENCE PLAN.

5. REFER TO SHEET NOS. 164 TO 168 FOR MAST ARM FOUNDATION DETAILS.

6. REFER TO SHEET NO. 123 FOR COMPLETE PAVEMENT MARKING AND SIGNING PLAN.

7. REFER TO SHEET NO. 162 FOR TRAFFIC SIGNAL INTERCONNECT PLAN AND SIGNAL INTERCONNECT MAJOR ITEMS LIST. PULL BOXES EXCLUSIVE TO THE INTERCONNECT ARE SHOWN ON THE TRAFFIC SIGNAL INTERCONNECT ITEM LIST.

8. AN 8M PERMIT IS REQUIRED FOR WORK WITHIN 15' OF MWRA FACILITIES INCLUDING THE 54" WESTON AQUEDUCT.

9. PUSH BUTTONS SHALL BE LOCATED NO MORE THAN 10" HORIZONTALLY FROM A LEVEL SURFACE (≤1.5%).

10. ONE TEMPORARY TRAFFIC SIGNALS WILLL BE REQUIRED.

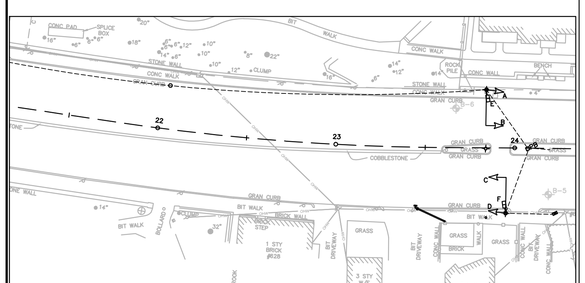
MAJOR ITEMS REQUIRED

QTY	ITEM 816.02
1	TRAFFIC SIGNAL CONTROLLER (TS-2, TYPE 1) W/ 8DW BASE MOUNTED CABINET AND FOUNDATION PAD
1	25' MAST ARM (STEEL), INCLUDE BASE & FOUNDATION
1	35' MAST ARM (STEEL), INCLUDE BASE & FOUNDATION
2	8' TRAFFIC SIGNAL POST, BASE & FOUNDATION
4	1-WAY, 3-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
4	±5" LOUVERED BACKPLATES
2	PEDESTRIAN SIGNAL HEAD W/ EGG-CRATE VISOR (L.E.D. W/ COUNTDOWN)
2	ACCESSIBLE PEDESTRIAN PUSH BUTTON ASSEMBLY W/ SIGN
1	12" x 12" PULL BOX*
1	SERVICE CONNECTION (OVERHEAD)

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

* TO BE PAID UNDER ITS RESPECTIVE PAY ITEM.

EXISTING TRAFFIC SIGNAL PLAN



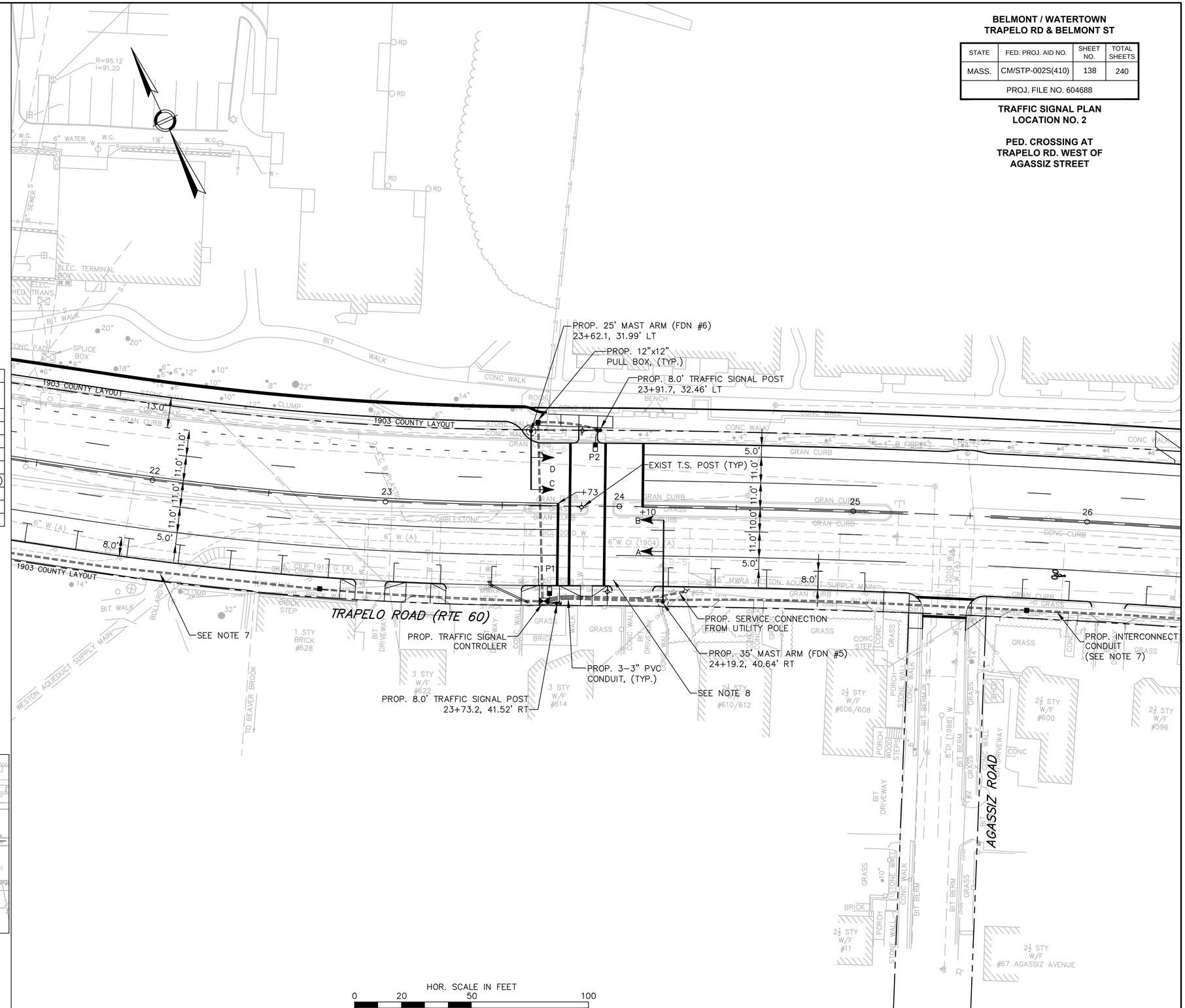
HOR. SCALE IN FEET
0 40 100 200

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	138	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 2

PED. CROSSING AT
TRAPELO RD. WEST OF
AGASSIZ STREET



BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	139	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 2

PED. CROSSING AT TRAPELO
ROAD WEST OF AGASSIZ STREET

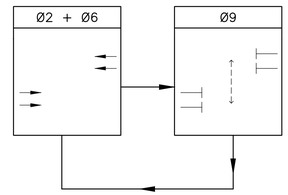
SEQUENCE AND TIMING CHART

				PHASE 1			PHASE 2			PHASE 3			PHASE 4			PHASE 5			PHASE 6			PHASE 7			PHASE 8			PHASE 9			EMERGENCY FLASH OPERATION
				SEQUENCE																											
STREET	DIR.	FACE	Ø/OL	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	
TRAPELO RD	EB	A,B	2				G	Y	R										R	R	R										FY
TRAPELO RD	WB	C,D	6				R	R	R										G	Y	R										FY
PEDESTRIAN		P1–P2	9																									F/			OFF
				TIMING IN SECONDS																											
MINIMUM GREEN							20												20												
VEHICLE INTERVAL																															
MAXIMUM GREEN I (FREE)							37												37												
MAXIMUM GREEN II (COORD)							57												57												
YELLOW CLEAR								4												4											
ALL RED CLEAR									1												1									4	
WALK INTERVAL																												7			
PED CLEARANCE																													17		
PED BUFFER																														4	
DETECTOR							NON–LOCK												NON–LOCK									LOCK			
RECALL MODE							SOFT												SOFT									OFF			
				COORDINATION TIMING (SECONDS)																											
CYCLE		OFFSET		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
DIAL	SEC.	%	SEC.																												
AM	90	83	75				57	4	1										57	4	1							7	17	4	
PM	90	37	33				57	4	1										57	4	1							7	17	4	

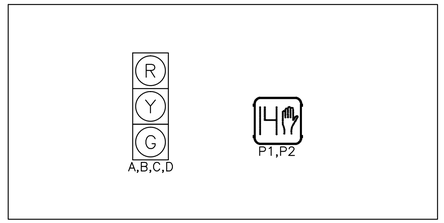
SEQUENCE NOTES:

1. ANY PHASE NOT CALLED WILL BE SKIPPED. SIGNAL IDENTIFICATION WILL NOT CHANGE IF THE ASSIGNED RIGHT OF WAY DOES NOT CHANGE DURING THE NEXT PHASE CALLED.
2. THE RIGHT–OF–WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON–CONFLICTING PHASES.
3. Ø/OL = PHASE IN DISPLAY / OVERLAPPING PHASE.
4. DIAL 1 (AM) = 06:30 – 09:00, M–F
   DIAL 2 (PM) = 15:00 – 18:30, M–F
   FREE = ALL OTHER TIMES
5. OFFSETS REFERENCED TO THE BEGINNING OF GREEN, PHASES 2+6.
6. COUNTDOWN PHASE OF PEDESTRIAN SIGNALS SHALL NOT OCCUR DURING THE WALK PERIOD.

PREFERENTIAL PHASING SEQUENCE



SIGNAL DISPLAY



SIGNAL DISPLAY NOTES:

1. ALL SIGNAL DISPLAYS SHALL BE EQUIPPED W/ LED MODULES (12–INCH LENS)
2. ALL SIGNAL HEADS SHALL BE RIGID MOUNTED AND EQUIPPED WITH ±5" LOUVERED BACKPLATES.
3. ALL PEDESTRIAN SIGNAL HEADS SHALL HAVE PEDESTRIAN COUNTDOWN TIMER AND EGG–CRATE VISOR.

NOTES:

1. MINIMUM 36" CLEARANCE EXCLUDING THE CURB WIDTH IS REQUIRED ON ALL SIDEWALKS.

2. VIDEO DETECTION AREAS ARE SHOWN ON THE PLANS GRAPHICALLY AND SHOULD BE ADJUSTED IN THE FIELD FOR PROPER DETECTION.

3. REFER TO SHEET NO. 141 FOR TRAFFIC SEQUENCE PLAN.

4. REFER TO SHEET NOS. 164 TO 168 FOR MAST ARM FOUNDATION DETAILS.

5. REFER TO SHEET NO. 124 FOR COMPLETE PAVEMENT MARKING AND SIGNING PLAN

6. REFER TO SHEET NO. 162 FOR TRAFFIC SIGNAL INTERCONNECT PLAN AND SIGNAL INTERCONNECT MAJOR ITEMS LIST. PULL BOXES EXCLUSIVE TO THE INTERCONNECT ARE SHOWN ON THE TRAFFIC SIGNAL INTERCONNECT ITEM LIST.

7. AN 8M PERMIT IS REQUIRED FOR WORK WITHIN 15' OF MWRA FACILITIES INCLUDING THE 56" WESTON AQUEDUCT.

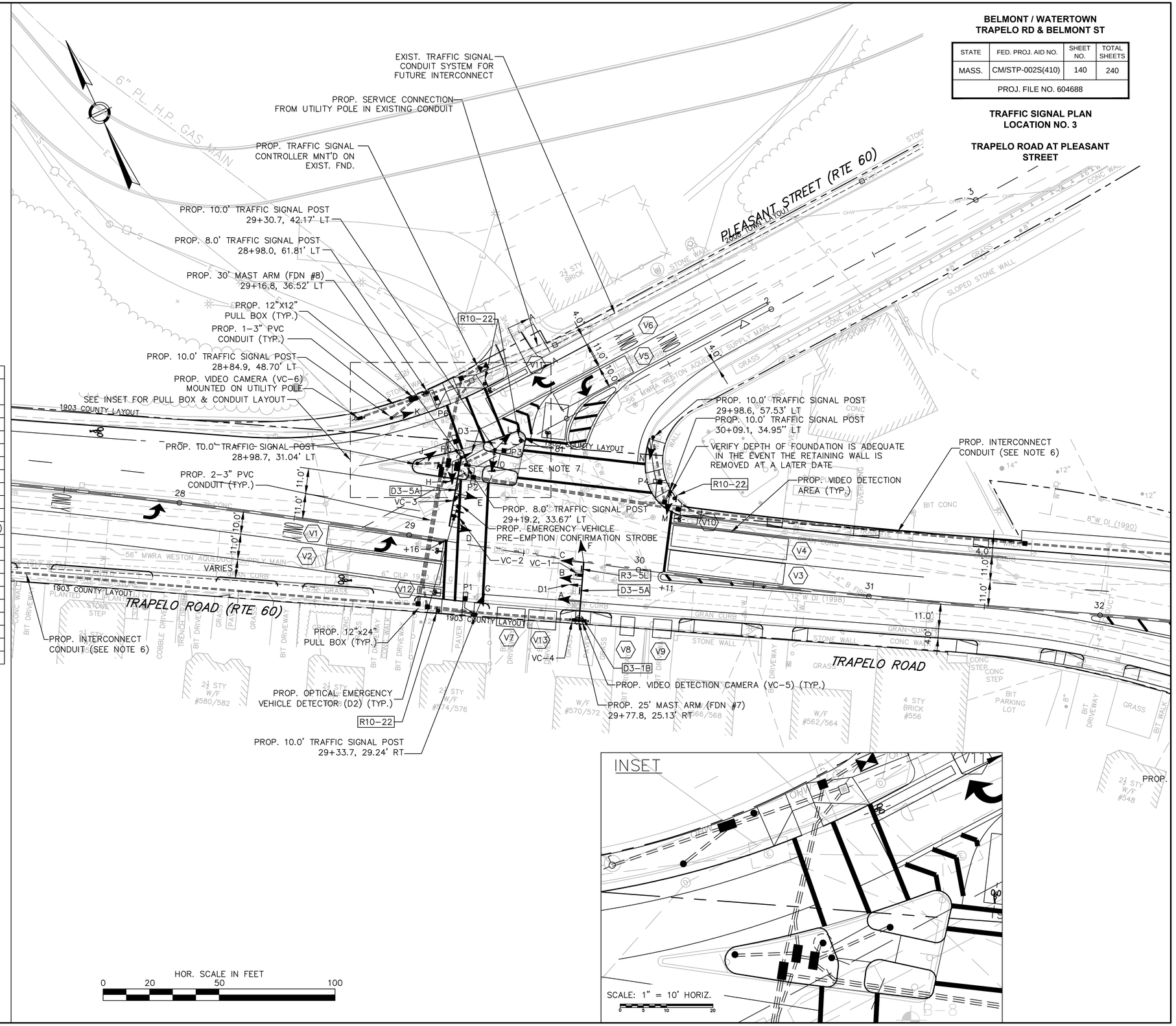
8. PUSH BUTTONS SHALL BE LOCATED NO MORE THAN 10" HORIZONTALLY FROM A LEVEL SURFACE (≤1.5%).

MAJOR ITEMS REQUIRED

QTY	ITEM 815.3
1	TRAFFIC SIGNAL CONTROLLER (TS-2, TYPE 1) W/8DW BASE MOUNTED CABINET MOUNTED ON EXISTING CEMENT CONCRETE PAD
1	25' MAST ARM (STEEL), INCL. BASE & FNDN W/ (1) R3-5L & (1) D3
1	30' MAST ARM (STEEL), INCL. BASE & FNDN W/ (1) D3
6	10' TRAFFIC SIGNAL POST, BASE & FOUNDATION
2	8' TRAFFIC SIGNAL POST, BASE & FOUNDATION
9	1-WAY, 3-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
1	2-WAY, 3-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
1	2-WAY, 3/5-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
1	1-WAY, 5-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
12	5" LOUVERED BACKPLATES
6	PEDESTRIAN SIGNAL HEAD W/ EGG-CRATE VISOR (L.E.D. W/ COUNTDOWN)
6	ACCESSIBLE PEDESTRIAN PUSH BUTTON ASSEMBLY W/ SIGN
3	12" x 12" PULL BOXES*
3	12" x 24" PULL BOXES*
6	VIDEO DETECTION CAMERAS
6	VIDEO CAMERA MAST ARM MOUNTING BRACKET
3	VIDEO DETECTION PROCESSOR – TWO CHANNEL
3	OPTICAL PRE-EMPTION DETECTORS SINGLE CHANNEL
1	EMERGENCY VEHICLE PRE-EMPTION CONFIRMATION STROBE LIGHT (WHITE)
1	OPTICAL PHASE SELECTOR TWO CHANNEL
1	SERVICE CONNECTION (OVERHEAD)

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

* TO BE PAID UNDER ITS RESPECTIVE PAY ITEM.



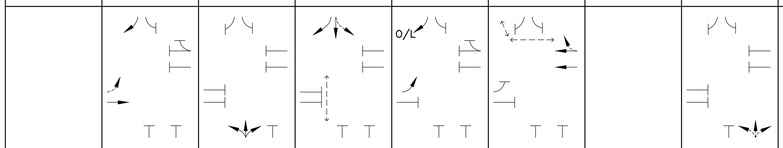
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	140	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 3

TRAPELO ROAD AT PLEASANT STREET

SEQUENCE AND TIMING CHART



SEQUENCE

STREET	DIR.	FACE	Ø/OL	PHASE 1 R/W	PHASE 1 CL1	PHASE 1 CL2	PHASE 2 R/W	PHASE 2 CL1	PHASE 2 CL2	PHASE 3 R/W	PHASE 3 CL1	PHASE 3 CL2	PHASE 4 R/W	PHASE 4 CL1	PHASE 4 CL2	PHASE 5 R/W	PHASE 5 CL1	PHASE 5 CL2	PHASE 6 R/W	PHASE 6 CL1	PHASE 6 CL2	PHASE 7 R/W	PHASE 7 CL1	PHASE 7 CL2	PHASE 8 R/W	PHASE 8 CL1	PHASE 8 CL2	PHASE 9 R/W	PHASE 9 CL1	PHASE 9 CL2	EMERGENCY FLASH OPERATION
TRAPELO RD	EB	A,B	2				G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R				R	R	R				FY
TRAPELO RD	EB	C	5				G	Y	R	R	R	R	R	R	R	R/G	Y	R	R	R	R				R	R	R				FY
TRAPELO RD	WB	D,E	6				R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R				R	R	R				FY
PLEASANT ST	SB	F,G	4				R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R				R	R	R				FR
PLEASANT ST	SB	J,K	4				R	R	R	R	R	R	G	ⓐ	ⓐ	G	Y	R	R	R	R				R	R	R				FR
PLEASANT ST	SB	L	4				R	R	R	R	R	R	G/ⓐ	Y/ⓐ	R	R/ⓐ	R/ⓐ	R	R	R	R				R	R	R				FR
DRIVEWAY 1	NB	M,N	8				R	R	R	R	R	R	R	R	R	R	R	R	R	R	R				G	Y	R				FR
DRIVEWAY 2	NB	H,O	3				R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R				R	R	R				FR
PEDESTRIAN		P1–P2	4				✋	✋	✋	✋	✋	✋	•	✋	✋	✋	✋	✋	✋	✋	✋				✋	✋	✋				OFF
PEDESTRIAN		P3–P4	6				✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	•	✋	✋				✋	✋	✋				OFF
PEDESTRIAN		P5–P6	6				✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	•	✋	✋				✋	✋	✋				OFF

TIMING IN SECONDS

	PHASE 1 R/W	PHASE 1 CL1	PHASE 1 CL2	PHASE 2 R/W	PHASE 2 CL1	PHASE 2 CL2	PHASE 3 R/W	PHASE 3 CL1	PHASE 3 CL2	PHASE 4 R/W	PHASE 4 CL1	PHASE 4 CL2	PHASE 5 R/W	PHASE 5 CL1	PHASE 5 CL2	PHASE 6 R/W	PHASE 6 CL1	PHASE 6 CL2	PHASE 7 R/W	PHASE 7 CL1	PHASE 7 CL2	PHASE 8 R/W	PHASE 8 CL1	PHASE 8 CL2	PHASE 9 R/W	PHASE 9 CL1	PHASE 9 CL2
MINIMUM GREEN				12			4			6			4			12						6					
VEHICLE INTERVAL				2			0			2			2			2						0					
MAXIMUM GREEN I (FREE)				48			4			22			15			30						6					
MAXIMUM GREEN II (COORD)				58			4			22			18			36						6					
YELLOW CLEAR					4			3			3			3			4						3				
ALL RED CLEAR						2			1			3			0			2						1			
WALK INTERVAL										7						7											
PED CLEARANCE										12	3					12	3										
PED BUFFER												3					1	2									
DETECTOR				NON–LOCK			NON–LOCK			NON–LOCK			NON–LOCK			NON–LOCK						NON–LOCK					
RECALL MODE				SOFT			OFF			OFF			SOFT			SOFT						OFF					

COORDINATION TIMING (SECONDS)

CYCLE DIAL	CYCLE SEC.	OFFSET %	OFFSET SEC.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
AM	90	83	75				56	4	2	4	3	1	22	3	3	18	3	0	35	4	2				6	3	1			
AM W/PED	90	83	75				56	4	2	4	3	1	22	3	3	18	3	0	35	4	2				6	3	1			
PM	90	85	77				58	4	2	4	3	1	20	3	3	19	3	0	36	4	2				6	3	1			
PM W/PED	90	86	77				56	4	2	4	3	1	22	3	3	18	3	0	35	4	2				6	3	1			

ⓐ ⓐ – G TO G, G IF FOLLOWED BY Ø5
G TO Y, R IF FOLLOWED BY Ø6

SEQUENCE NOTES:

1. ANY PHASE NOT CALLED WILL BE SKIPPED. SIGNAL IDENTIFICATION WILL NOT CHANGE IF THE ASSIGNED RIGHT OF WAY DOES NOT CHANGE DURING THE NEXT PHASE CALLED.
2. • NORMALLY DON'T WALK, UPON PEDESTRIAN PUSH BUTTON ACTIVATION, WALK/FLASHING DON'T WALK (COUNTDOWN).
3. THE RIGHT–OF–WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON–CONFLICTING PHASES.
4. Ø/OL = PHASE IN DISPLAY / OVERLAPPING PHASE.
5. DIAL 1 (AM) = 06:30 – 09:00, M–F
   DIAL 2 (PM) = 15:00 – 18:00, M–F
   FREE = ALL OTHER TIMES
6. OFFSETS REFERENCED TO THE BEGINNING OF GREEN, PHASE 2.
7. * TIME FOR PHASE 3 WHEN ACTUATED, TO BE TAKEN FROM PHASES 2+6.
8. COUNTDOWN PHASE OF PEDESTRIAN SIGNALS SHALL NOT OCCUR DURING THE WALK PERIOD.

EMERGENCY VEHICLE PRE–EMPTION PHASING AND PRIORITY 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. 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 FIVE (5) SECONDS OR UNTIL PRE–EMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME PRE–EMPTION PHASE CLEARANCE (4 SECONDS: YELLOW AND 2 SECONDS: ALL RED) AND SERVICE EMERGENCY VEHICLE PRE–EMPTION PHASE #2 (OR #1) IF NECESSARY, THEN TIME PHASE PRE–EMPTION CLEARANCE AND RESUME NORMAL SIGNAL OPERATION. EMERGENCY VEHICLE PRE–EMPTION PHASE #3 SHALL BE SIMILARLY SERVED.
3. MINIMUM GREEN, NORMAL VEHICLE CLEARANCE, SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PRE–EMPTION DEMAND.
4. PREEMPTION STROBE SHALL BE ILLUMINATED WHENEVER ANY EMERGENCY VEHICLE PRE–EMPTION GREEN IS ON.

EMERGENCY VEHICLE PRE–EMPTION PHASING AND PRIORITY

DETECTOR AND PRIORITY	PRE–EMPT PHASE ASSIGNMENT	MOVEMENT	VEHICLE PHASE ASSIGNMENT
D1	1		Ø2+Ø5
D2	2		Ø6
D3	3		Ø4

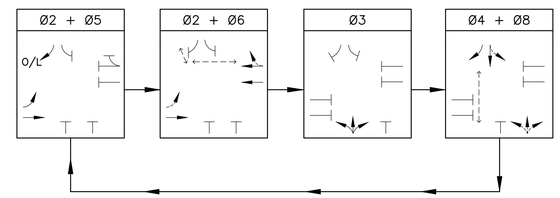
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	141	240
PROJ. FILE NO. 604688			

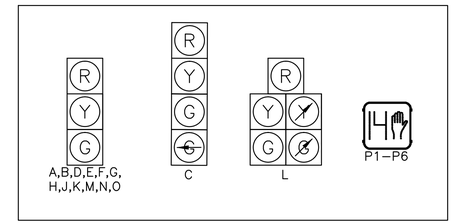
TRAFFIC SIGNAL PLAN
LOCATION NO. 3

TRAPELO ROAD AT
PLEASANT STREET

PREFERENTIAL PHASING SEQUENCE



SIGNAL DISPLAY



SIGNAL DISPLAY NOTES:

1. ALL SIGNAL DISPLAYS SHALL BE EQUIPPED W/ LED MODULES (12–INCH LENS)
2. ALL SIGNAL HEADS SHALL BE RIGID MOUNTED AND EQUIPPED WITH ±5" LOUVERED BACKPLATES.
3. ALL PEDESTRIAN SIGNAL HEADS SHALL HAVE PEDESTRIAN COUNTDOWN TIMER AND EGG–CRATE VISOR.

DETECTOR OPERATION

DETECTOR NUMBER	NUMBER OF SECTION/SIZE	PROCESSOR NUMBER	CHANNEL NUMBER	Ø CALLED	Ø EXTENSION	OPERATION	DELAY (SECONDS)	EXTENSION (SECONDS)
V1	8'x50'	1	1	5	5	PRESENCE	0	0
V2	9'x50'	1	1	2	2	PRESENCE	0	0
V3	9'x50'	1	2	6	6	PRESENCE	0	0
V4	9'x50'	1	2	6	6	PRESENCE	0	0
V5	1–10'x15' 1–8'x35'	2	1	4	4	PRESENCE	0	0
V6	10'x50'	2	2	4	4	PRESENCE	0	0
V7	8'x12'	3	1	3	3	PRESENCE	10	0
V8	6'x8'	3	2	8	8	PRESENCE	10	0
V9	8'x8'	3	2	8	8	PRESENCE	10	0
V10	3'x30'	1	2	6	6	PRESENCE	0	0
V11	2'x20'	2	2	4	4	PRESENCE	0	0
V12	4'x30'	1	1	2	2	PRESENCE	0	0
V13	8'x12'	3	1	3	3	PRESENCE	10	0

DETECTOR OPERATION NOTES:

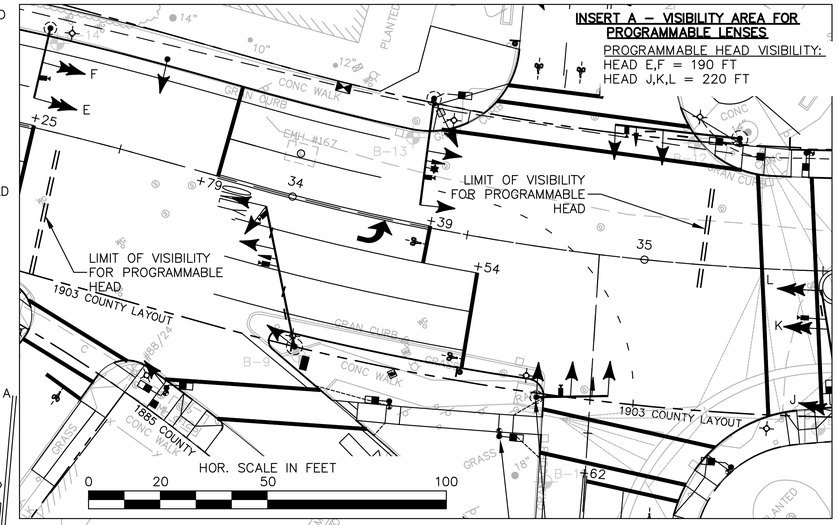
1. DELAY TIME SHALL BE EFFECTIVE ONLY DURING THE RED PORTION OF THE PHASE THAT IS CALLED AT THE DETECTOR.

MAJOR ITEMS REQUIRED

QTY	ITEM 816.04
1	MASTER CONTROLLER
1	TRAFFIC SIGNAL CONTROLLER (TS-2, TYPE 1) W/ 8DW BASE MOUNTED CABINET AND FOUNDATION PAD
2	20' MAST ARM (STEEL), INCL. BASE & FNDN W/ (1) D3
1	25' MAST ARM (STEEL), INCLUDE BASE & FOUNDATION
1	35' MAST ARM (STEEL), INCL. BASE & FNDN W/ (1) D3 & (1) R3-8C
1	35' MAST ARM TYPE B (STEEL), INCL. BASE & FNDN W/ (1) R3-5L & (1) D3
1	35' MAST ARM (STEEL), INCL. BASE & FNDN W/ (2) R10-7 & (1) D3
2	10' TRAFFIC SIGNAL POST, BASE & FOUNDATION
5	8' TRAFFIC SIGNAL POST, BASE & FOUNDATION
13	1-WAY, 3-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
2	1-WAY, 4-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
2	1-WAY, 5-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
1	2-WAY, 3-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
18	±5" LOUVERED BACKPLATES
10	PEDESTRIAN SIGNAL HEAD W/ EGG-CRATE VISOR (L.E.D. W/ COUNTDOWN)
10	ACCESSIBLE PEDESTRIAN PUSH BUTTON ASSEMBLY W/ SIGN
4	12" x 12" PULL BOXES*
2	12" x 24" PULL BOXES*
7	VIDEO DETECTION CAMERAS
7	VIDEO CAMERA MAST ARM MOUNTING BRACKET
4	VIDEO DETECTION PROCESSOR - TWO CHANNEL

NOTES:

1. ALL PROPOSED SIGNAL HEADS MUST BE AT LEAST 10 FEET FROM THE POWERED MBTA TROLLEY WIRES AND 5 FEET FROM THEIR SUPPORT CABLES. (SEE TYPE B MAST ARM DETAIL, SHEET NO. 146)
2. REMOVE AND STACK ALL EXISTING TRAFFIC SIGNAL EQUIPMENT.
3. REMOVE ALL PULL BOXES AND ABANDON EXISTING TRAFFIC SIGNAL CONDUIT SYSTEM, UNLESS OTHERWISE NOTED.
4. MINIMUM 36" CLEARANCE EXCLUDING THE CURB WIDTH IS REQUIRED ON ALL SIDEWALKS.
5. VIDEO DETECTION AREAS ARE SHOWN ON THE PLANS GRAPHICALLY AND SHOULD BE ADJUSTED IN THE FIELD.
6. REFER TO SHEET NO. 143 FOR TRAFFIC SEQUENCE PLAN.
7. REFER TO SHEET NOS. 164 TO 168 FOR MAST ARM FOUNDATION DETAILS.
8. REFER TO SHEET NO. 124 FOR COMPLETE PAVEMENT MARKING AND SIGNING PLAN.
9. REFER TO SHEET NO. 162 FOR TRAFFIC SIGNAL INTERCONNECT PLAN AND SIGNAL INTERCONNECT MAJOR ITEMS LIST. PULL BOXES EXCLUSIVE TO THE INTERCONNECT ARE SHOWN ON THE TRAFFIC SIGNAL INTERCONNECT ITEM LIST.
10. PUSH BUTTONS SHALL BE LOCATED NO MORE THAN 10" HORIZONTALLY FROM A LEVEL SURFACE (≤1.5%).
11. ONE TEMPORARY TRAFFIC SIGNAL WILL BE REQUIRED.
12. LOCATION OF MBTA OVERHEAD WIRE IS APPROXIMATE ONLY.



BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	142	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 4

TRAPELO ROAD AT
LEXINGTON STREET

PROP. 20' MAST ARM (FDN #14) 33+23.3, 28.00' LT
PROP. MASTER TRAFFIC SIGNAL CONTROLLER
PROP. 3-3" CONDUIT
PROP. EMERGENCY VEHICLE PRE-EMPTION CONFIRMATION STROBE
PROP. 10.0' TRAFFIC SIGNAL POST 33+56.1, 27.67' LT
PROP. 25' MAST ARM (FDN #13) 34+33.2, 35.66' LT
PROP. SERVICE CONNECTION FROM ELECTRIC MANHOLE
PROP. 2-3" CONDUIT
PROP. INTERCONNECT CONDUIT (SEE NOTE 9)
PROP. 10.0' TRAFFIC SIGNAL POST 33+80.6, 60.83' RT
PROP. 8.0' TRAFFIC SIGNAL POST 33+14.1, 47.09' RT
PROP. 1-3" PVC CONDUIT (TYP.)
PROP. 35' MAST ARM (FDN #9) 34+10.4, 40.51' RT
PROP. 8.0' TRAFFIC SIGNAL POST 34+37.7, 49.77' RT
PROP. 20' MAST ARM (FDN #10) 34+75.4, 41.77' RT
PROP. 8.0' TRAFFIC SIGNAL POST 34+67.3, 54.09' RT
PROP. OPTICAL EMERGENCY VEHICLE DETECTOR (D4) (TYP.)
PROP. 35' MAST ARM (FDN #12) 35+24.4, 35.92' LT
PROP. 8.0' TRAFFIC SIGNAL POST 35+44.3, 32.84' LT
PROP. INTERCONNECT CABLE IN EXISTING BELMONT MUNICIPAL LIGHT DEPT. ELECTRIC CONDUIT
PROP. VIDEO DETECTION CAMERA (VC-1) (TYP.)
PROP. 35' MAST ARM TYPE B (SEE SHEET NO. 146) (FDN #11) 35+55.9, 39.56' RT
PROP. PROGRAMMABLE HEAD (TYP.)
EXIST. T.S. POST (TYP.)
PROP. 12"x12" PULL BOX (TYP.)
PROP. 8.0' TRAFFIC SIGNAL POST 35+27.6, 55.92' RT
PROP. VIDEO DETECTION AREA (TYP.)
EXIST. T.S. POST (TYP.)
SHAW'S DRIVE
TRAPELO ROAD
MORAINE STREET
LEXINGTON STREET
CHURCH STREET
1991 TOWN LAYOUT
1903 COUNTY LAYOUT
1951 TOWN LAYOUT
1954 TOWN LAYOUT
HOR. SCALE IN FEET
0 20 50 100

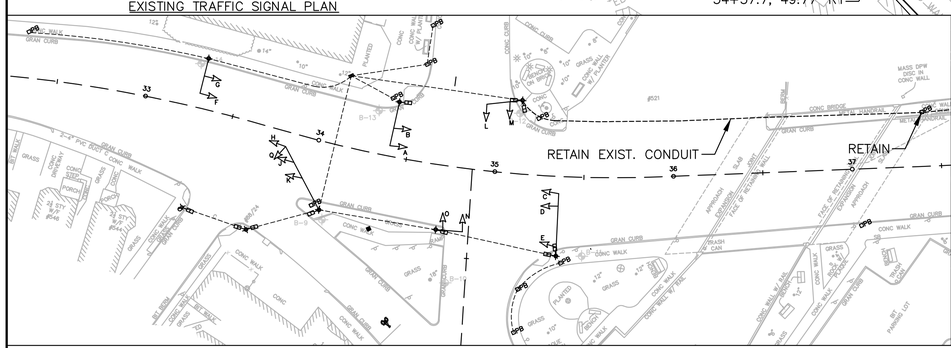
MAJOR ITEMS REQUIRED (CONTINUED)

QTY	ITEM 816.04
4	OPTICAL PRE-EMPTION DETECTORS SINGLE CHANNEL
1	EMERGENCY VEHICLE PRE-EMPTION CONFIRMATION STROBE LIGHT (WHITE)
1	SERVICE CONNECTION (UNDERGROUND)
1	OPTICAL PHASE SELECTOR TWO CHANNEL

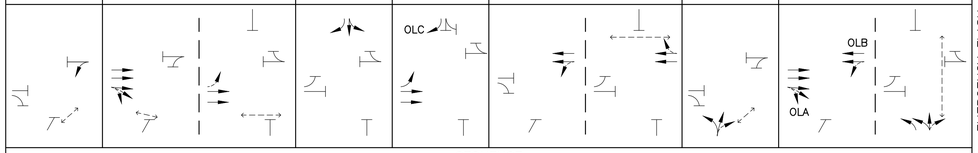
PLUS ALL NECESSARY DUCT, CABLE, FOUNDATIONS, LABOR, MISCELLANEOUS MATERIAL AND EQUIPMENT TO COMPLETE THE INSTALLATION.

* TO BE PAID UNDER ITS RESPECTIVE PAY ITEM.

EXISTING TRAFFIC SIGNAL PLAN



SEQUENCE AND TIMING CHART



STREET	DIR.	FACE	Ø/OL	PHASE 1 R/W	PHASE 1 CL1	PHASE 1 CL2	PHASE 2 R/W	PHASE 2 CL1	PHASE 2 CL2	PHASE 4 R/W	PHASE 4 CL1	PHASE 4 CL2	PHASE 5 R/W	PHASE 5 CL1	PHASE 5 CL2	PHASE 6 R/W	PHASE 6 CL1	PHASE 6 CL2	PHASE 7 R/W	PHASE 7 CL1	PHASE 7 CL2	PHASE 8 R/W	PHASE 8 CL1	PHASE 8 CL2	EMERGENCY FLASH OPERATION
				SEQUENCE																					
TRAPELO RD	EB	A,B,C,D	2,8	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	FY
TRAPELO RD	EB	J,K	2,5	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	FY
TRAPELO RD	EB	L	2,5	R	R	R	G	Y	R	R	R	R	R/G	R/G	R	R	R	R	R	R	R	R	R	R	FY
TRAPELO RD	WB	M	6	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	FY
TRAPELO RD	WB	N	6	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	FY
TRAPELO RD	WB	E	1,6,8	R/G	R/G	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	FY
TRAPELO RD	WB	F	6,8	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	FY
MORAINE ST	NB	G,H	7	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	FR
LEXINGTON ST	NB	R,T	8	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	G/G	Y	R	FR
LEXINGTON ST	NB	S	8	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	FR
SHAW'S DR	SB	Q	4/5	R	R	R	R	R	R	G	Y	R	G	R	R	R	R	R	R	R	R	R	R	R	FR
SHAW'S DR	SB	O,P	4	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	FR
PEDESTRIAN		P1–P2, P5–P8	2+6	✋	✋	✋	•	✋	✋	✋	✋	✋	✋	✋	✋	•	✋	✋	✋	✋	✋	✋	✋	✋	OFF
PEDESTRIAN		P3–P4	8	✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	•	✋	✋	OFF
PEDESTRIAN		P9–P10	5/7	ⓑ	ⓑ	ⓑ	✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	ⓑ	✋	✋	✋	✋	✋	OFF
				TIMING IN SECONDS																					
MINIMUM GREEN				4			12			6			4			12			6			12			
VEHICLE INTERVAL							2			2						2			2			2			
MAXIMUM GREEN I (FREE)				4			25			15			4			25			15			25			
MAXIMUM GREEN II (COORD)				4			30			10			4			30			10			26			
YELLOW CLEAR					4			4			3			4			4			3			3		
ALL RED CLEAR						1			2			3			1			2			3			3	
WALK INTERVAL				7ⓑ			7									7			ⓑ			7			
PED CLEARANCE					12ⓑ		11	3								13	3			12ⓑ		16	3		
PED BUFFER								1	2								1	2		3				3	
DETECTOR				NON–LOCK			NON–LOCK			NON–LOCK			NON–LOCK			NON–LOCK			NON–LOCK			NON–LOCK			
RECALL MODE				OFF			MIN			OFF			OFF			MIN			OFF			OFF			
				COORDINATION TIMING (SECONDS)																					
CYCLE		OFFSET		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
DIAL	SEC.	%	SEC.																						
AM	90	0	0	4	4	1	30	4	2	8	3	3	4	4	1	30	4	2	8	3	3	25	3	3	
PM	90	0	0	4	4	1	27	4	2	10	3	3	4	4	1	27	4	2	10	3	3	26	3	3	

ⓐ ⓐ – G/G TO G/G, G/G IF FOLLOWED BY Ø4
G/G TO Y/Y R IF FOLLOWED BY Ø8 OR Ø6

ⓑ NORMAL DON'T WALK. UPON PUSH BUTTON ACTIVATION, WALK SHALL BEGIN IN Ø1 FOR 7 SECONDS. "FLASHING DON'T WALK" SHALL BEGIN IN Ø1 AND CONTINUE INTO Ø7 FOR A TOTAL OF 12 SECONDS.

SEQUENCE NOTES:

1. ANY PHASE NOT CALLED WILL BE SKIPPED. SIGNAL IDENTIFICATION WILL NOT CHANGE IF THE ASSIGNED RIGHT OF WAY DOES NOT CHANGE DURING THE NEXT PHASE CALLED.
2. • NORMALLY DON'T WALK, UPON PEDESTRIAN PUSH BUTTON ACTIVATION, WALK/FLASHING DON'T WALK (COUNTDOWN).
3. THE RIGHT–OF–WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON–CONFLICTING PHASES.
4. Ø/OL = PHASE IN DISPLAY / OVERLAPPING PHASE.
5. DIAL 1 (AM) = 06:30 – 09:00, M–F, DIAL 2 (PM) = 15:00 – 18:00, M–F
   FREE = ALL OTHER TIMES
6. OFFSETS REFERENCED TO THE BEGINNING OF GREEN, PHASES 2+6.
7. COUNTDOWN PHASE OF PEDESTRIAN SIGNALS SHALL NOT OCCUR DURING THE WALK PERIOD.
8. ø4 & ø8 ARE NOT COMPATIBLE
9. TRAILING GREEN TIME FOR OLB WHEN USED TO BE TAKEN FROM ø6.

EMERGENCY VEHICLE PRE–EMPTION PHASING AND PRIORITY 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. 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 FIVE (5) SECONDS OR UNTIL PRE–EMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME PRE–EMPTION PHASE CLEARANCE (4 SECONDS: YELLOW AND 2 SECONDS: ALL RED) AND SERVICE EMERGENCY VEHICLE PRE–EMPTION PHASE #2 (OR #1) IF NECESSARY, THEN TIME PHASE PRE–EMPTION CLEARANCE AND RESUME NORMAL SIGNAL OPERATION. EMERGENCY VEHICLE PRE–EMPTION PHASE #3 AND #4 SHALL BE SIMILARLY SERVED.
3. MINIMUM GREEN, NORMAL VEHICLE CLEARANCE, SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PRE–EMPTION DEMAND.
4. PREEMPTION STROBE SHALL BE ILLUMINATED WHENEVER ANY EMERGENCY VEHICLE PRE–EMPTION GREEN IS ON.

EMERGENCY VEHICLE PRE–EMPTION PHASING AND PRIORITY

DETECTOR AND PRIORITY	PRE–EMPT PHASE ASSIGNMENT	MOVEMENT	VEHICLE PHASE ASSIGNMENT
D1	1		Ø6
D2	2		Ø2
D3	3		Ø1 & Ø4
D4	4		Ø8

DETECTOR OPERATION NOTES:

1. DELAY TIME SHALL BE EFFECTIVE ONLY DURING THE RED PORTION OF THE PHASE THAT IS CALLED AT THE DETECTOR.

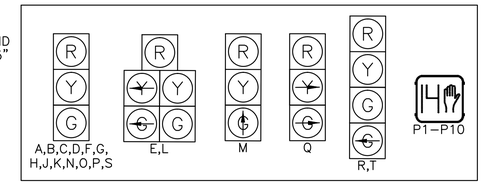
OVERLAP DATA

OVERLAP	PHASES	TRAILING GREEN	YELLOW	RED
OLA	Ø2+Ø8	––	––	––
OLB	Ø1+Ø6+Ø8	4	4	2
OLC	Ø4+Ø5	––	––	––

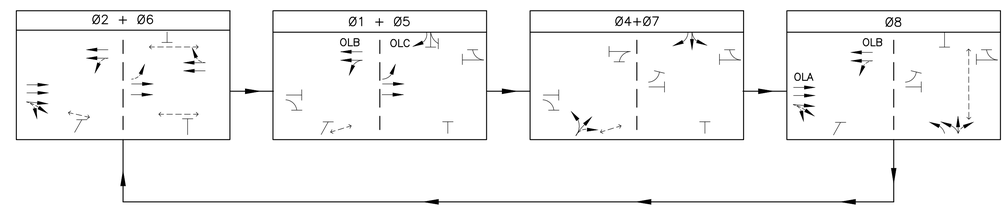
SIGNAL DISPLAY NOTES:

1. ALL SIGNAL DISPLAYS SHALL BE EQUIPPED W/ LED MODULES (12–INCH LENS)
2. ALL SIGNAL HEADS SHALL BE RIGID MOUNTED AND EQUIPPED WITH ±5° LOUVERED BACKPLATES.
3. ALL PEDESTRIAN SIGNAL HEADS SHALL HAVE PEDESTRIAN COUNTDOWN TIMER AND EGG–CRATE VISOR.
4. L,K,J,E,F ARE PROGRAMMABLE HEADS.

SIGNAL DISPLAY



PREFERENTIAL PHASING SEQUENCE



DETECTOR OPERATION

DETECTOR NUMBER	NUMBER OF SECTION/SIZE	PROCESSOR NUMBER	CHANNEL NUMBER	Ø CALLED	Ø EXTENSION	OPERATION	DELAY (SECONDS)	EXTENSION (SECONDS)
V1	9'x50'	1	1	2	2	PRESENCE	0	0
V2	9'x50'	1	1	2	2	PRESENCE	0	0
V3	8'x50'	1	1	5	5	PRESENCE	0	0
V4	3'x8'	1	1	2	2	PRESENCE	0	0
V5	9'x50'	1	2	6	6	PRESENCE	0	0
V6	9'x50'	1	2	6	6	PRESENCE	0	0
V7	3'x8'	1	2	6	6	PRESENCE	0	0
V8	2–8'x20' 1–8'x12'	2	1	8	8	PRESENCE	0	0
V9	2–10'x20' 1–10'x10'	2	1	8	8	PRESENCE	0	0
V10	10'x50'	2	2	4	5	PRESENCE	0	0
V11	9'x50'	2	2	4	4	PRESENCE	0	0
V12	9'x40'	3	1	7	7	PRESENCE	5	0
V13	8'x40'	3	1	2	8	PRESENCE	0	0
V14	9'x40'	3	2	2	8	PRESENCE	0	0
V15	9'x30'	3	2	2	8	PRESENCE	0	0
V16	9'x50'	4	1	1/6	8	PRESENCE	5	0
V17	9'x50'	4	1	6	8	PRESENCE	0	0

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	143	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 4

TRAPELO ROAD AT
LEXINGTON STREET

NOTES:
1. REMOVE AND STACK ALL EXISTING TRAFFIC SIGNAL EQUIPMENT.

2. REMOVE ALL PULL BOXES AND ABANDON EXISTING TRAFFIC SIGNAL CONDUIT SYSTEM.

3. MINIMUM 36" CLEARANCE EXCLUDING THE CURB WIDTH IS REQUIRED ON ALL SIDEWALKS.

4. VIDEO DETECTION AREAS ARE SHOWN ON THE PLANS GRAPHICALLY AND SHOULD BE ADJUSTED IN THE FIELD.

5. REFER TO SHEET NO. 145 FOR TRAFFIC SEQUENCE PLAN.

6. REFER TO SHEET NOS. 164 TO 168 FOR MAST ARM FOUNDATION DETAILS.

7. REFER TO SHEET NO. 124 FOR COMPLETE PAVEMENT MARKING AND SIGNING PLAN.

8. REFER TO SHEET NO. 162 FOR TRAFFIC SIGNAL INTERCONNECT PLAN AND SIGNAL INTERCONNECT MAJOR ITEMS LIST. PULL BOXES EXCLUSIVE TO THE INTERCONNECT ARE SHOWN ON THE TRAFFIC SIGNAL INTERCONNECT ITEM LIST.

9. PUSH BUTTONS SHALL BE LOCATED NO MORE THAN 10" HORIZONTALLY FROM A LEVEL SURFACE (≤1.5%).

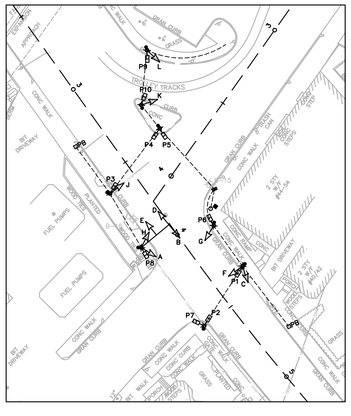
MAJOR ITEMS REQUIRED

QTY	ITEM 816.05
1	TRAFFIC SIGNAL CONTROLLER (TS–2, TYPE 1) W/ 8DW BASE MOUNTED CABINET AND FOUNDATION PAD
1	30' MAST ARM (STEEL), INCL. BASE & FNDN W/ (1) R10–11b
5	10' TRAFFIC SIGNAL POST, BASE & FOUNDATION
7	8' TRAFFIC SIGNAL POST, BASE & FOUNDATION
6	1–WAY, 3–SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
1	2–WAY, 3–SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
1	3–WAY, 3–SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
10	5" LOUVERED BACKPLATES
10	PEDESTRIAN SIGNAL HEAD W/ EGG–CRATE VISOR (L.E.D. W/ COUNTDOWN)
10	ACCESSIBLE PEDESTRIAN PUSH BUTTON ASSEMBLY W/ SIGN
2	12" x 12" PULL BOXES*
4	12" x 24" PULL BOXES*
4	VIDEO DETECTION CAMERAS
4	VIDEO CAMERA MAST ARM MOUNTING BRACKET
2	VIDEO DETECTION PROCESSOR – TWO CHANNEL
4	OPTICAL PRE–EMPTION DETECTORS SINGLE CHANNEL
1	EMERGENCY VEHICLE PRE–EMPTION CONFIRMATION STROBE LIGHT (WHITE)
1	OPTICAL PHASE SELECTOR TWO CHANNEL
1	SERVICE CONNECTION (UNDERGROUND)

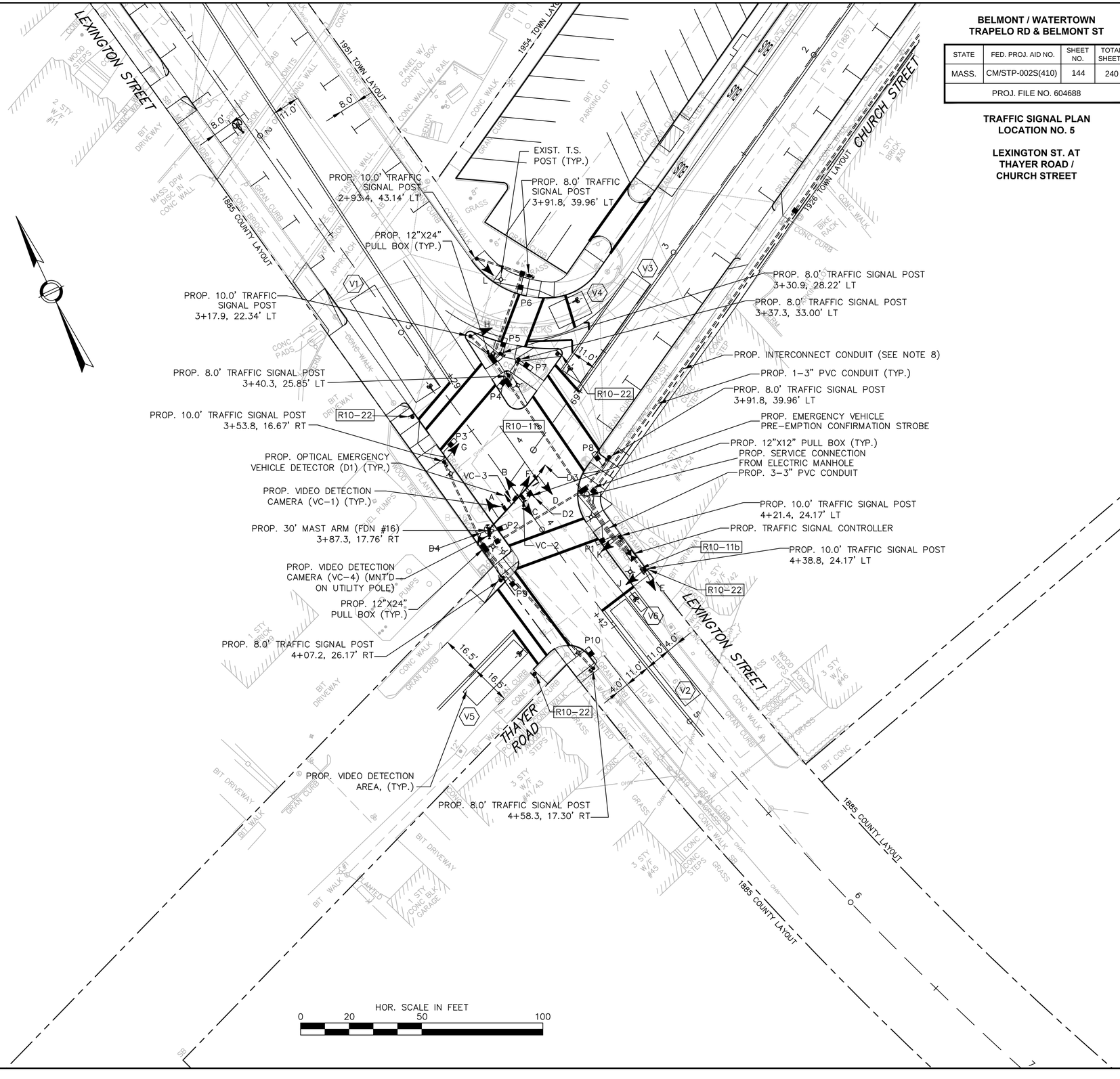
PLUS ALL NECESSARY DUCT, CABLE, FOUNDATIONS, LABOR, MISCELLANEOUS MATERIAL AND EQUIPMENT TO COMPLETE THE INSTALLATION.

* TO BE PAID UNDER ITS RESPECTIVE PAY ITEM.

EXISTING TRAFFIC SIGNAL PLAN



HOR. SCALE IN FEET
0 40 100 200



HOR. SCALE IN FEET
0 20 50 100

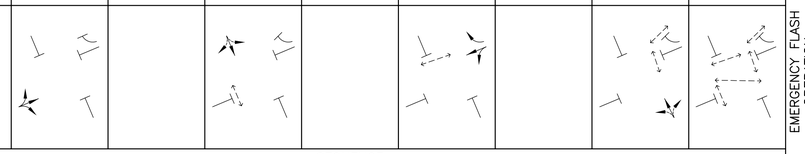
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	144	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 5

LEXINGTON ST. AT
THAYER ROAD /
CHURCH STREET

SEQUENCE AND TIMING CHART



STREET	DIR.	FACE	Ø/OL	PHASE 1 R/W	PHASE 1 CL1	PHASE 1 CL2	PHASE 2 R/W	PHASE 2 CL1	PHASE 2 CL2	PHASE 3 R/W	PHASE 3 CL1	PHASE 3 CL2	PHASE 4 R/W	PHASE 4 CL1	PHASE 4 CL2	PHASE 5 R/W	PHASE 5 CL1	PHASE 5 CL2	PHASE 6 R/W	PHASE 6 CL1	PHASE 6 CL2	PHASE 7 R/W	PHASE 7 CL1	PHASE 7 CL2	PHASE 8 R/W	PHASE 8 CL1	PHASE 8 CL2	PHASE 9 R/W	PHASE 9 CL1	PHASE 9 CL2	EMERGENCY FLASH OPERATION
				SEQUENCE																											
LEXINGTON ST	SB	A,B	4				R	R	R				G	Y	R				R	R	R				R	R	R	R	R	R	FY
LEXINGTON ST	NB	C,D,E	8				R	R	R				R	R	R				R	R	R				G	Y	R	R	R	R	FY
CHURCH ST	WB	F,G	6				R	R	R				R	R	R				G	Y	R				R	R	R	R	R	R	FR
CHURCH ST	WB	H,L	6				R	R	R				R	R	R				⊘	↗	R				R	R	R	R	R	R	FR
THAYER RD	EB	J,K	2				G	Y	R				R	R	R				R	R	R				R	R	R	R	R	R	FR
PEDESTRIAN		P1–P2	9				✋	✋	✋				✋	✋	✋				✋	✋	✋				✋	✋	🚶	🚶	F/✋	✋	OFF
PEDESTRIAN		P3–P4	6				✋	✋	✋				✋	✋	✋				•	✋	✋				✋	✋	🚶	🚶	F/✋	✋	OFF
PEDESTRIAN		P5–P6	8				✋	✋	✋				✋	✋	✋				✋	✋	✋				•	✋	🚶	🚶	F/✋	✋	OFF
PEDESTRIAN		P7–P8	8				✋	✋	✋				✋	✋	✋				✋	✋	✋				•	✋	🚶	🚶	F/✋	✋	OFF
PEDESTRIAN		P9–P10	4				✋	✋	✋				•	✋	✋				✋	✋	✋				🚶	F/✋	🚶	🚶	F/✋	✋	OFF
				TIMING IN SECONDS																											
MINIMUM GREEN							2						10						6						10						
VEHICLE INTERVAL							2						2						2						2						
MAXIMUM GREEN I (FREE)							10						30						22						30						
MAXIMUM GREEN II (COORD)							6						44						22						44						
YELLOW CLEAR								3						4						4						4					
ALL RED CLEAR									3						3						3						3			2	
WALK INTERVAL													7						7						7			7			
PED CLEARANCE													7.5	4					7.5	4					7.5	4			10		
PED BUFFER															3						3						3			4	
DETECTOR							NON–LOCK						NON–LOCK						NON–LOCK						NON–LOCK			LOCK			
RECALL MODE							OFF						SOFT						OFF						SOFT			OFF			
				COORDINATION TIMING (SECONDS)																											
CYCLE		OFFSET		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
DIAL	SEC.	%	SEC.																												
AM	90	50	45				6	3	3				44	4	3				20	4	3				44	4	3				
AM W/EX PED	90	50	45				6	3	3				33	4	3				10	4	3				33	4	3	7	12	2	
PM	90	51	46				6	3	3				42	4	3				22	4	3				42	4	3				
PM W/ EX PED	90	51	46				4	3	3				35	4	3				10	4	3				35	4	3	7	12	2	

SEQUENCE NOTES:

1. ANY PHASE NOT CALLED WILL BE SKIPPED. SIGNAL IDENTIFICATION WILL NOT CHANGE IF THE ASSIGNED RIGHT OF WAY DOES NOT CHANGE DURING THE NEXT PHASE CALLED.
2. • NORMALLY DON'T WALK, UPON PEDESTRIAN PUSH BUTTON ACTIVATION, WALK/FLASHING DON'T WALK (COUNTDOWN).
3. PHASE 9 ONLY BY P1–P2 PUSH BUTTON ACTIVATION.
4. THE RIGHT–OF–WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON–CONFLICTING PHASES.
5. Ø/OL = PHASE IN DISPLAY / OVERLAPPING PHASE.
6. DIAL 1 (AM) = 06:30 – 09:00, M–F
   DIAL 2 (PM) = 15:00 – 18:00, M–F
   FREE = ALL OTHER TIMES
7. OFFSETS REFERENCED TO THE BEGINNING OF GREEN, PHASES 4+8 LEXINGTON NB & SB.
8. PHASES 2 AND 6 ARE NOT COMPATIBLE (SPLIT PHASE)
9. COUNTDOWN PHASE OF PEDESTRIAN SIGNALS SHALL NOT OCCUR DURING THE WALK PERIOD.

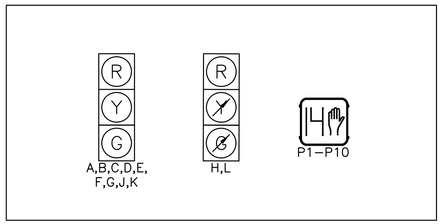
EMERGENCY VEHICLE PRE–EMPTION PHASING AND PRIORITY NOTES:

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. 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 FIVE (5) SECONDS OR UNTIL PRE–EMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME PRE–EMPTION PHASE CLEARANCE (4 SECONDS: YELLOW AND 2 SECONDS: ALL RED) AND SERVICE EMERGENCY VEHICLE PRE–EMPTION PHASE #2 (OR #1) IF NECESSARY, THEN TIME PHASE PRE–EMPTION CLEARANCE AND RESUME NORMAL SIGNAL OPERATION. EMERGENCY VEHICLE PRE–EMPTION PHASE #3 AND #4 SHALL BE SIMILARLY SERVED.
3. MINIMUM GREEN, NORMAL VEHICLE CLEARANCE, SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PRE–EMPTION DEMAND.
4. PREEMPTION STROBE SHALL BE ILLUMINATED WHENEVER ANY EMERGENCY VEHICLE PRE–EMPTION GREEN IS ON.

EMERGENCY VEHICLE PRE–EMPTION PHASING AND PRIORITY

DETECTOR AND PRIORITY	PRE–EMPT PHASE ASSIGNMENT	MOVEMENT	VEHICLE PHASE ASSIGNMENT
D1	1		Ø4
D2	2		Ø8
D3	3		Ø6
D4	4		Ø2

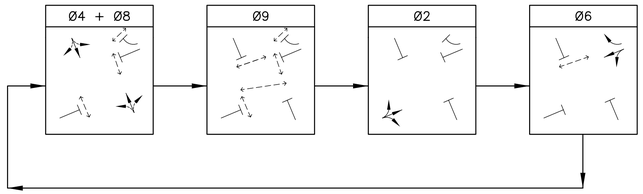
SIGNAL DISPLAY



SIGNAL DISPLAY NOTES:

1. ALL SIGNAL DISPLAYS SHALL BE EQUIPPED W/ LED MODULES (12–INCH LENS)
2. ALL SIGNAL HEADS SHALL BE RIGID MOUNTED AND EQUIPPED WITH ±5" LOUVERED BACKPLATES.
3. ALL PEDESTRIAN SIGNAL HEADS SHALL HAVE PEDESTRIAN COUNTDOWN TIMER AND EGG–CRATE VISOR.

PREFERENTIAL PHASING SEQUENCE



DETECTOR OPERATION

DETECTOR NUMBER	NUMBER OF SECTION/SIZE	PROCESSOR NUMBER	CHANNEL NUMBER	Ø CALLED	Ø EXTENSION	OPERATION	DELAY (SECONDS)	EXTENSION (SECONDS)
V1	12'x50'	1	1	4	4	PRESENCE	0	0
V2	8'x50'	1	2	8	8	PRESENCE	0	0
V3	9'x50'	2	1	6	6	PRESENCE	0	0
V4	10'x15'	2	1	6	6	PRESENCE	0	0
V5	8'x30'	2	2	2	2	PRESENCE	0	0
V6	3'x8'	2	2	8	8	PRESENCE	0	0

DETECTOR OPERATION NOTES:

1. DELAY TIME SHALL BE EFFECTIVE ONLY DURING THE RED PORTION OF THE PHASE THAT IS CALLED AT THE DETECTOR.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	145	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 5

TRAPELO ROAD AT
THAYER ROAD / CHURCH STREET

NOTES:

1. ALL PROPOSED SIGNAL HEADS MUST BE AT LEAST 10 FEET FROM THE POWERED MBTA TROLLEY WIRES AND 5 FEET FROM THEIR SUPPORT CABLES. (SEE TYPE B MAST ARM DETAIL, THIS SHEET)

2. REMOVE AND STACK ALL EXISTING TRAFFIC CONTROL EQUIPMENT.

3. REMOVE ALL PULL BOXES AND ABANDON EXISTING TRAFFIC SIGNAL CONDUIT SYSTEM, EXCEPT AS NOTED BELOW.

4. MINIMUM 36" CLEARANCE EXCLUDING THE CURB WIDTH IS REQUIRED ON ALL SIDEWALKS.

5. REFER TO SHEET NO. 147 FOR TRAFFIC SEQUENCE PLAN.

6. REFER TO SHEET NOS. 164 TO 168 FOR MAST ARM FOUNDATION.

7. REFER TO SHEET NO. 124 FOR COMPLETE PAVEMENT MARKING AND SIGNING PLAN

8. REFER TO SHEET NO. 162 FOR TRAFFIC SIGNAL INTERCONNECT PLAN AND SIGNAL INTERCONNECT MAJOR ITEMS LIST. PULL BOXES EXCLUSIVE TO THE INTERCONNECT ARE SHOWN ON THE TRAFFIC SIGNAL INTERCONNECT ITEM LIST.

9. PUSH BUTTONS SHALL BE LOCATED NO MORE THAN 10" HORIZONTALLY FROM A LEVEL SURFACE (≤1.5%).

10. LOCATION OF MBTA OVERHEAD WIRE IS APPROXIMATE ONLY.

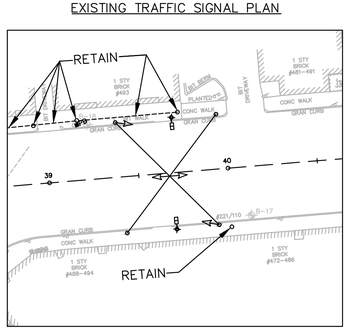
MAJOR ITEMS REQUIRED (TRAFFIC SIGNAL EQUIPMENT)

QTY	ITEM 816.06
1	TRAFFIC SIGNAL CONTROLLER (TS-2, TYPE 1) W/ 8DW BASE MOUNTED CABINET AND FOUNDATION PAD
1	25' MAST ARM TYPE B (STEEL), INCLUDE BASE & FOUNDATION
1	30' MAST ARM TYPE B (STEEL), INCLUDE BASE & FOUNDATION
2	8' TRAFFIC SIGNAL POST, BASE & FOUNDATION
4	1-WAY, 3-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
4	±5" LOUVERED BACKPLATES
2	PEDESTRIAN SIGNAL HEAD W/ EGG-CRATE VISOR (L.E.D. W/ COUNTDOWN)
2	ACCESSIBLE PEDESTRIAN PUSH BUTTON ASSEMBLY W/SIGN
1	12" x 24" PULL BOXES*
1	SERVICE CONNECTION (UNDERGROUND)

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

* TO BE PAID UNDER ITS RESPECTIVE PAY ITEM.

EXISTING TRAFFIC SIGNAL PLAN



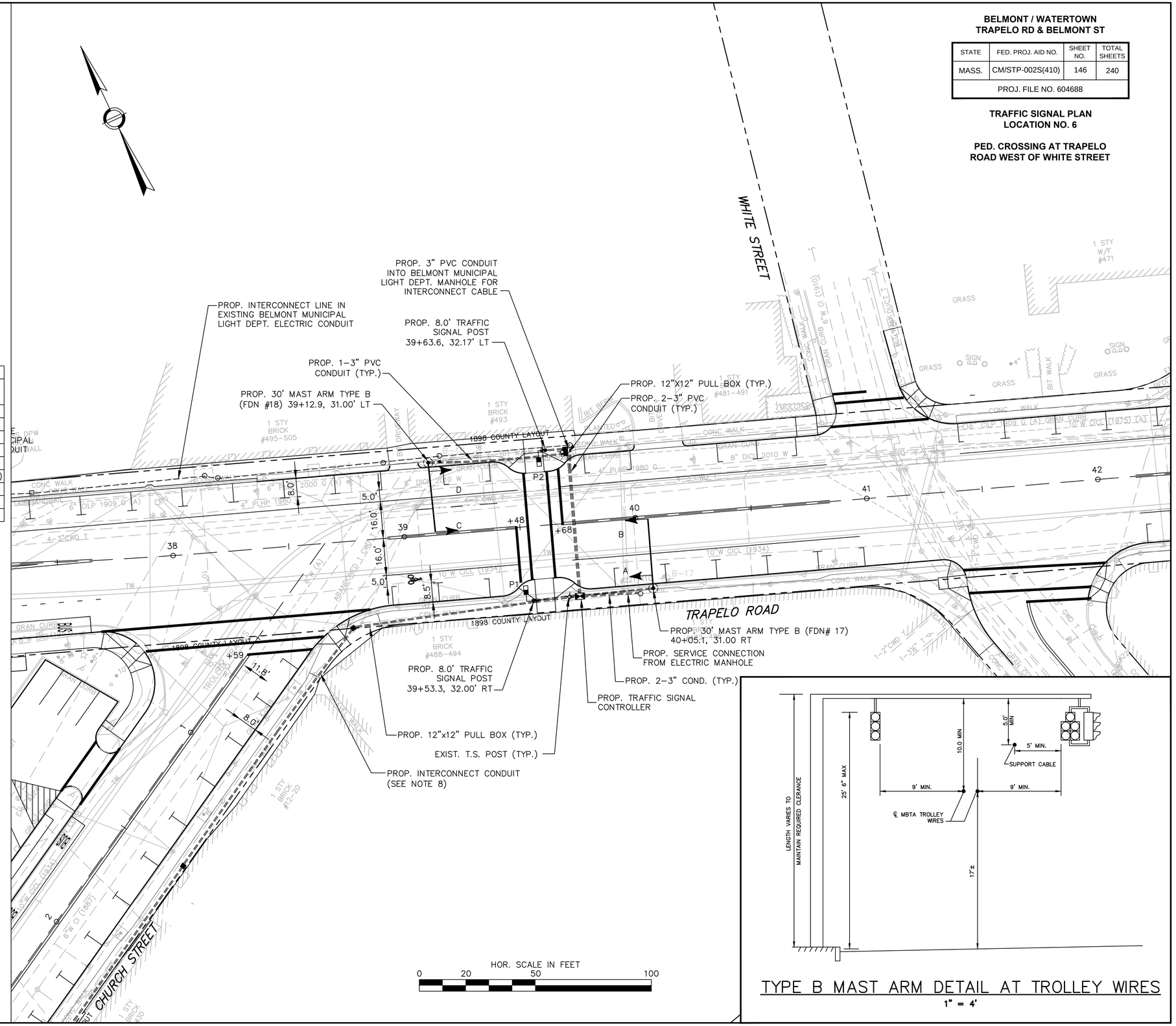
HOR. SCALE IN FEET
0 40 100 200

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	146	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 6

PED. CROSSING AT TRAPELO ROAD WEST OF WHITE STREET



TYPE B MAST ARM DETAIL AT TROLLEY WIRES

1" = 4'

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	147	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 6

PED CROSSING AT TRAPELO ROAD
WEST OF WHITE STREET

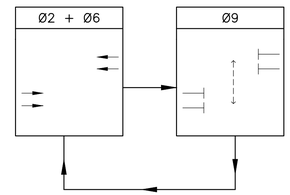
SEQUENCE AND TIMING CHART

				PHASE 1			PHASE 2			PHASE 3			PHASE 4			PHASE 5			PHASE 6			PHASE 7			PHASE 8			PHASE 9			EMERGENCY FLASH OPERATION
				SEQUENCE																											
STREET	DIR.	FACE	Ø/OL	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	
TRAPELO RD	EB	A,B	2				G	Y	R										R	R	R							R	R	R	FY
TRAPELO RD	WB	C,D	6				R	R	R										G	Y	R							R	R	R	FY
PEDESTRIAN		P1–P2	9																									F/			OFF
				TIMING IN SECONDS																											
MINIMUM GREEN							20												20												
VEHICLE INTERVAL																															
MAXIMUM GREEN I							32												32												
MAXIMUM GREEN II							32												32												
YELLOW CLEAR								4												4											
ALL RED CLEAR									1												1										
WALK INTERVAL																												7			
PED CLEARANCE																													12		
PED BUFFER																														4	
DETECTOR							NON–LOCK												NON–LOCK									LOCK			
RECALL MODE				SOFT															SOFT									OFF			
CYCLE		OFFSET		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
DIAL	SEC.	%	SEC.																												
AM	60						32	4.0	1.0										32	4.0	1.0							7	12	4	
PM	60						32	4.0	1.0										32	4.0	1.0							7	12	4	

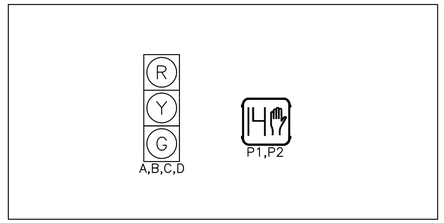
SEQUENCE NOTES:

1. ANY PHASE NOT CALLED WILL BE SKIPPED. SIGNAL IDENTIFICATION WILL NOT CHANGE IF THE ASSIGNED RIGHT OF WAY DOES NOT CHANGE DURING THE NEXT PHASE CALLED.
2. THE RIGHT–OF–WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON–CONFLICTING PHASES.
3. Ø/OL = PHASE IN DISPLAY / OVERLAPPING PHASE.
4. DIAL 1 (AM) = 06:30 – 09:00, M–F
   DIAL 2 (PM) = 15:00 – 18:00, M–F
   FREE = ALL OTHER TIMES
5. COUNTDOWN PHASE OF PEDESTRIAN SIGNALS SHALL NOT OCCUR DURING THE WALK PERIOD.

PREFERENTIAL PHASING SEQUENCE



SIGNAL DISPLAY



SIGNAL DISPLAY NOTES:

1. ALL SIGNAL DISPLAYS SHALL BE EQUIPPED W/ LED MODULES (12–INCH LENS)
2. ALL SIGNAL HEADS SHALL BE RIGID MOUNTED AND EQUIPPED WITH ±5" LOUVERED BACKPLATES.
3. ALL PEDESTRIAN SIGNAL HEADS SHALL HAVE PEDESTRIAN COUNTDOWN TIMER AND EGG–CRATE VISOR.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	148	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 7

TRAPELO ROAD AT BEECH STREET

NOTES:

1. ALL PROPOSED SIGNAL HEADS MUST BE AT LEAST 10 FEET FROM THE POWERED MBTA TROLLEY WIRES AND 5 FEET FROM THEIR SUPPORT CABLES. (SEE TYPE B MAST ARM DETAIL, SHEET 146)
2. REMOVE AND STACK ALL EXISTING TRAFFIC SIGNAL EQUIPMENT.
3. REMOVE ALL PULL BOXES AND ABANDON EXISTING TRAFFIC SIGNAL CONDUIT SYSTEM.
4. MINIMUM 36" CLEARANCE EXCLUDING THE CURB WIDTH IS REQUIRED ON ALL SIDEWALKS.
5. VIDEO DETECTION AREAS ARE SHOWN ON THE PLANS GRAPHICALLY AND SHOULD BE ADJUSTED IN THE FIELD FOR PROPER DETECTION.
6. REFER TO SHEET NO. 149 FOR TRAFFIC SEQUENCE PLAN.
7. REFER TO SHEET NOS. 164 TO 168 FOR MAST ARM FOUNDATION.
8. REFER TO SHEET NO. 125 FOR COMPLETE PAVEMENT MARKING AND SIGNING PLAN.
9. PUSH BUTTONS SHALL BE LOCATED NO MORE THAN 10" HORIZONTALLY FROM A LEVEL SURFACE (≤1.5%).
10. LOCATION OF MBTA OVERHEAD WIRE IS APPROXIMATE ONLY.

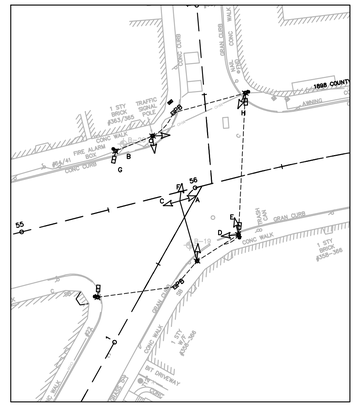
MAJOR ITEMS REQUIRED

QTY	ITEM 816.07
1	TRAFFIC SIGNAL CONTROLLER (TS-2, TYPE 1) W/ 8DW BASE MOUNTED CABINET AND FOUNDATION PAD
1	30' MAST ARM TYPE B (STEEL), INCL. BASE & FNDN W/ (1) D3 & (2) R10-11b
1	30' MAST ARM TYPE B (STEEL), INCL. BASE & FNDN W/ (1) D3 & (1) R10-11b
7	8' TRAFFIC SIGNAL POST, BASE & FOUNDATION
4	1-WAY, 3-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
2	2-WAY, 3-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
8	±5" LOUVERED BACKPLATES
8	PEDESTRIAN SIGNAL HEAD W/ EGG-CRATE VISOR (L.E.D. W/ COUNTDOWN)
8	ACCESSIBLE PEDESTRIAN PUSH BUTTON ASSEMBLY W/SIGN
3	12" x 12" PULL BOXES*
2	12" x 24" PULL BOXES*
4	VIDEO DETECTION CAMERAS
4	VIDEO CAMERA MAST ARM MOUNTING BRACKET
2	VIDEO DETECTION PROCESSOR – TWO CHANNEL
4	OPTICAL PRE-EMPTION DETECTORS SINGLE CHANNEL
1	EMERGENCY VEHICLE PRE-EMPTION CONFIRMATION STROBE LIGHT (WHITE)
1	OPTICAL PHASE SELECTOR TWO CHANNEL
1	SERVICE CONNECTION (UNDERGROUND)

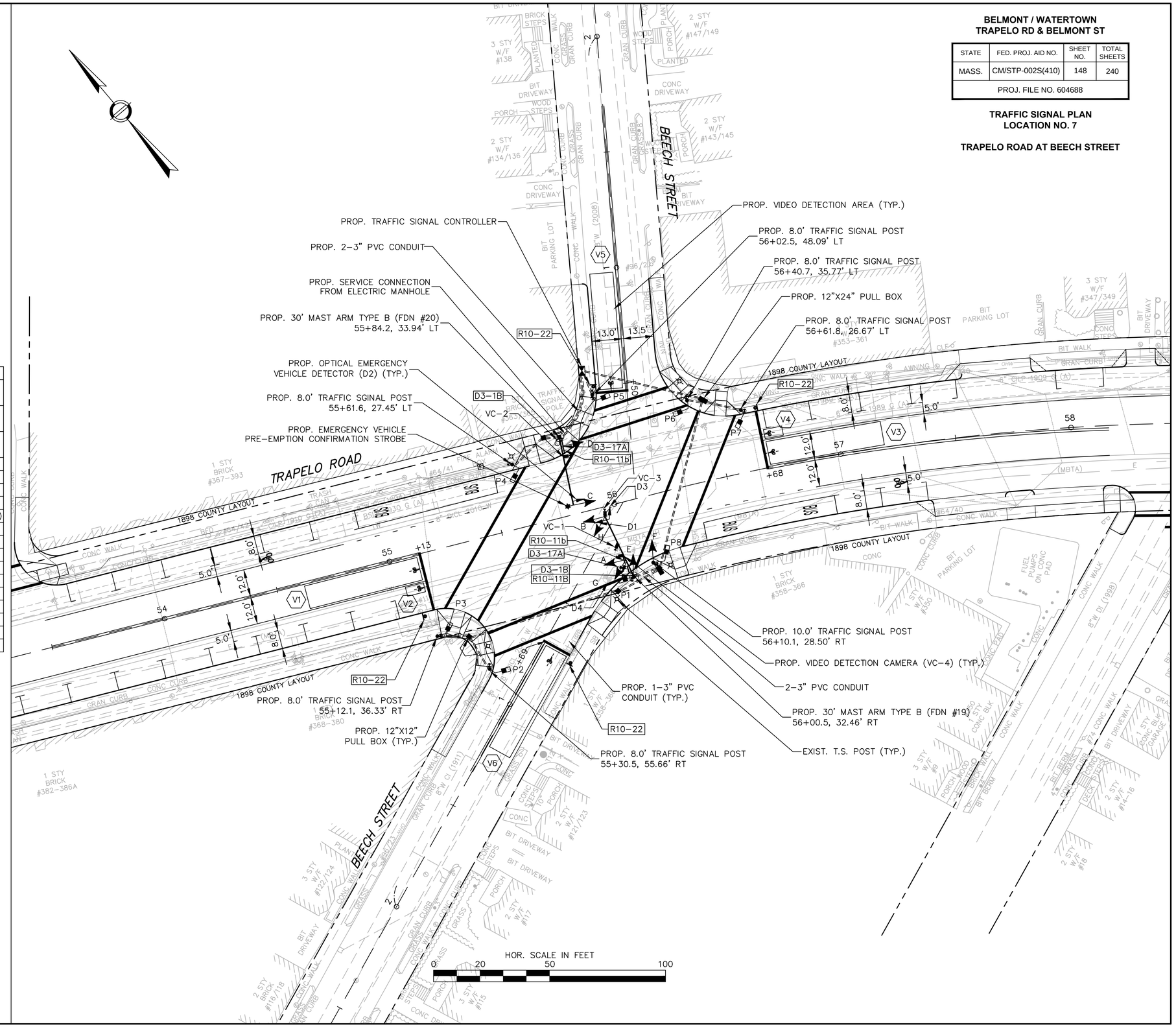
PLUS ALL NECESSARY DUCT, CABLE, FOUNDATIONS, LABOR, MISCELLANEOUS MATERIAL AND EQUIPMENT TO COMPLETE THE INSTALLATION AND PROVIDE AN OPERATING TRAFFIC SIGNAL.

* TO BE PAID UNDER ITS RESPECTIVE PAY ITEM.

EXISTING TRAFFIC SIGNAL PLAN



HOR. SCALE IN FEET
0 40 100 200



HOR. SCALE IN FEET
0 20 50 100

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	149	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 7

TRAPELO ROAD AT
BEECH STREET

SEQUENCE AND TIMING CHART

				PHASE 1			PHASE 2			PHASE 3			PHASE 4			PHASE 5			PHASE 6			PHASE 7			PHASE 8			PHASE 9			EMERGENCY FLASH OPERATION
				SEQUENCE																											
STREET	DIR.	FACE	Ø/OL	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	
TRAPELO RD	EB	A,B	2				G	Y	R				R	R	R				R	R	R				R	R	R	R	R	R	FY
TRAPELO RD	WB	C,D	6				R	R	R				R	R	R				G	Y	R				R	R	R	R	R	R	FR
BEECH ST	NB	G,H	8				R	R	R				R	R	R				R	R	R				G	Y	R	R	R	R	FR
BEECH ST	SB	E,F	4				R	R	R				G	Y	R				R	R	R				R	R	R	R	R	R	FR
PEDESTRIAN		P1–P2	2				•																						F/		OFF
PEDESTRIAN		P5–P6	6																•										F/		OFF
PEDESTRIAN		P3–P4, P7–P8	9																										F/		OFF
				TIMING IN SECONDS																											
MINIMUM GREEN							12						6						12						6						
VEHICLE INTERVAL							2						2						2						2						
MAXIMUM GREEN I (ALL OTHER TIMES)							38						18						38						18						
MAXIMUM GREEN II (AM,PM)							43						18						43						18						
YELLOW CLEAR								4						3						4						3					
ALL RED CLEAR									3						4						3						4				
WALK INTERVAL							7												7									7			
PED CLEARANCE							11.5	4											11.5	4									21		
PED BUFFER									3												3									4	
DETECTOR							NON–LOCK						NON–LOCK						NON–LOCK						NON–LOCK			LOCK			
RECALL MODE							SOFT						OFF						SOFT						OFF			OFF			
CYCLE				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
DIAL	SEC.																														
AM	70						38	4	3				18	3	4				38	4	3				18	3	4				
AM W/ EX PED	100						41	4	3				13	3	4				41	4	3				13	3	4	7	21	4	
PM	70						38	4	3				18	3	4				38	4	3				18	3	4				
PM W/ EX PED	90						33	4	3				11	3	4				33	4	3				11	3	4	7	21	4	

SEQUENCE NOTES:

1. ANY PHASE NOT CALLED WILL BE SKIPPED. SIGNAL IDENTIFICATION WILL NOT CHANGE IF THE ASSIGNED RIGHT OF WAY DOES NOT CHANGE DURING THE NEXT PHASE CALLED.
2. • NORMALLY DON'T WALK, UPON PEDESTRIAN PUSH BUTTON ACTIVATION, WALK/FLASHING DON'T WALK (COUNTDOWN).
3. THE RIGHT–OF–WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON–CONFLICTING PHASES.
4. Ø/OL = PHASE IN DISPLAY / OVERLAPPING PHASE.
5. DIAL 1 (AM) = 06:30 – 09:00, M–F
   DIAL 2 (PM) = 15:00 – 18:00, M–F
   MAX1 = ALL OTHER TIMES
6. PHASE 9 SHALL ONLY NE ACTIVATED BY P3, P4, P7 AND P8.
7. COUNTDOWN PHASE OF PEDESTRIAN SIGNALS SHALL NOT OCCUR DURING THE WALK PERIOD.

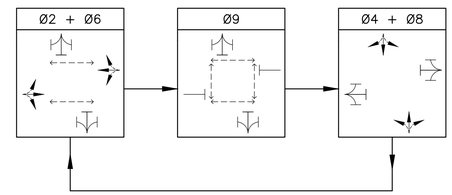
EMERGENCY VEHICLE PRE–EMPTION PHASING AND PRIORITY NOTES:

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. 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 FIVE (5) SECONDS OR UNTIL PRE–EMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME PRE–EMPTION PHASE CLEARANCE (4 SECONDS: YELLOW AND 2 SECONDS: ALL RED) AND SERVICE EMERGENCY VEHICLE PRE–EMPTION PHASE #2 (OR #1) IF NECESSARY, THEN TIME PHASE PRE–EMPTION CLEARANCE AND RESUME NORMAL SIGNAL OPERATION. EMERGENCY VEHICLE PRE–EMPTION PHASE #3 AND #4 SHALL BE SIMILARLY SERVED.
3. MINIMUM GREEN, NORMAL VEHICLE CLEARANCE, SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PRE–EMPTION DEMAND.
4. PREEMPTION STROBE SHALL BE ILLUMINATED WHENEVER ANY EMERGENCY VEHICLE PRE–EMPTION GREEN IS ON.

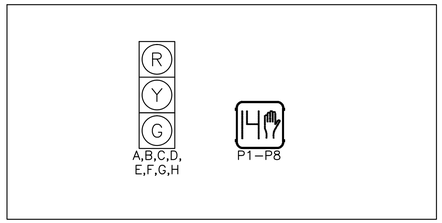
EMERGENCY VEHICLE PRE–EMPTION PHASING AND PRIORITY

DETECTOR AND PRIORITY	PRE–EMPT PHASE ASSIGNMENT	MOVEMENT	VEHICLE PHASE ASSIGNMENT
D1	1		Ø2
D2	2		Ø6
D3	3		Ø4
D4	4		Ø8

PREFERENTIAL PHASING SEQUENCE



SIGNAL DISPLAY



SIGNAL DISPLAY NOTES:

1. ALL SIGNAL DISPLAYS SHALL BE EQUIPPED W/ LED MODULES (12–INCH LENS)
2. ALL SIGNAL HEADS SHALL BE RIGID MOUNTED AND EQUIPPED WITH ±5" LOUVERED BACKPLATES.
3. ALL PEDESTRIAN SIGNAL HEADS SHALL HAVE PEDESTRIAN COUNTDOWN TIMER AND EGG–CRATE VISOR.

DETECTOR OPERATION

DETECTOR NUMBER	NUMBER OF SECTION/SIZE	PROCESSOR NUMBER	CHANNEL NUMBER	Ø CALLED	Ø EXTENSION	OPERATION	DELAY (SECONDS)	EXTENSION (SECONDS)
V1	10'x50'	1	1	2	2	PRESENCE	0	0
V2	4'x8'	1	1	2	2	PRESENCE	0	0
V3	10'x50'	1	2	6	6	PRESENCE	0	0
V4	4'x8'	1	2	6	6	PRESENCE	0	0
V5	10'x50'	2	1	4	4	PRESENCE	0	0
V6	10'x50'	2	2	8	8	PRESENCE	0	0

DETECTOR OPERATION NOTES:

1. DELAY TIME SHALL BE EFFECTIVE ONLY DURING THE RED PORTION OF THE PHASE THAT IS CALLED AT THE DETECTOR.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	150	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 8

TRAPELO ROAD AT
SLADE STREET /
HARRIET STREET

NOTES:

1. ALL PROPOSED SIGNAL HEADS MUST BE AT LEAST 10 FEET FROM THE POWERED MBTA TROLLEY WIRES AND 5 FEET FROM THEIR SUPPORT CABLES. (SEE TYPE B MAST ARM DETAIL, SHEET 146)
2. REMOVE AND STACK ALL EXISTING TRAFFIC SIGNAL EQUIPMENT.
3. REMOVE ALL PULL BOXES AND ABANDON EXISTING TRAFFIC SIGNAL CONDUIT SYSTEM.
4. MINIMUM 36" CLEARANCE EXCLUDING THE CURB WIDTH IS REQUIRED ON ALL SIDEWALKS.
5. VIDEO DETECTION AREAS ARE SHOWN ON THE PLANS GRAPHICALLY AND SHOULD BE ADJUSTED IN THE FIELD FOR PROPER DETECTION.
6. REFER TO SHEET NO. 151 FOR TRAFFIC SEQUENCE PLAN.
7. REFER TO SHEET NOS. 164 TO 168 FOR MAST ARM FOUNDATION.
8. REFER TO SHEET NO. 126 FOR COMPLETE PAVEMENT MARKING AND SIGNING PLAN.
9. PUSH BUTTONS SHALL BE LOCATED NO MORE THAN 10" HORIZONTALLY FROM A LEVEL SURFACE (≤1.5%).
10. LOCATION OF MBTA OVERHEAD WIRE IS APPROXIMATE ONLY.

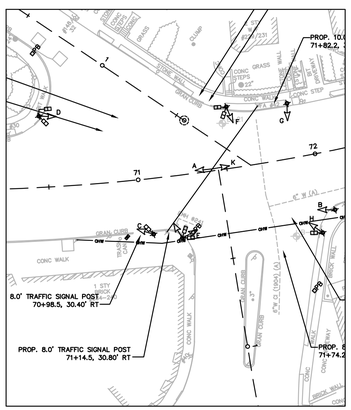
MAJOR ITEMS REQUIRED

QTY	ITEM 816.08
1	TRAFFIC SIGNAL CONTROLLER (TS-2, TYPE 1) W/8DW BASE MOUNTED CABINET AND FOUNDATION PAD
1	30' MAST ARM TYPE B (STEEL), INCL. BASE & FNDN W/ (1) D3
1	35' MAST ARM TYPE B (STEEL), INCL. BASE & FNDN W/ (1) D3
5	8' TRAFFIC SIGNAL POST, BASE & FOUNDATION
1	10' TRAFFIC SIGNAL POST, BASE & FOUNDATION
3	1-WAY, 3-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
3	2-WAY, 3-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
8	±5" LOUVERED BACKPLATES
8	PEDESTRIAN SIGNAL HEAD W/ EGG-CRATE VISOR (L.E.D. W/ COUNTDOWN)
8	ACCESSIBLE PEDESTRIAN PUSH BUTTON ASSEMBLY W/SIGN
3	12" x 12" PULL BOXES *
2	12" x 24" PULL BOXES *
4	VIDEO DETECTION CAMERAS
4	VIDEO CAMERA MAST ARM MOUNTING BRACKET
2	VIDEO DETECTION PROCESSOR – TWO CHANNEL
4	OPTICAL PRE-EMPTION DETECTORS SINGLE CHANNEL
1	EMERGENCY VEHICLE PRE-EMPTION CONFIRMATION STROBE LIGHT (WHITE)
1	OPTICAL PHASE SELECTOR TWO CHANNEL
1	SERVICE CONNECTION (UNDERGROUND)

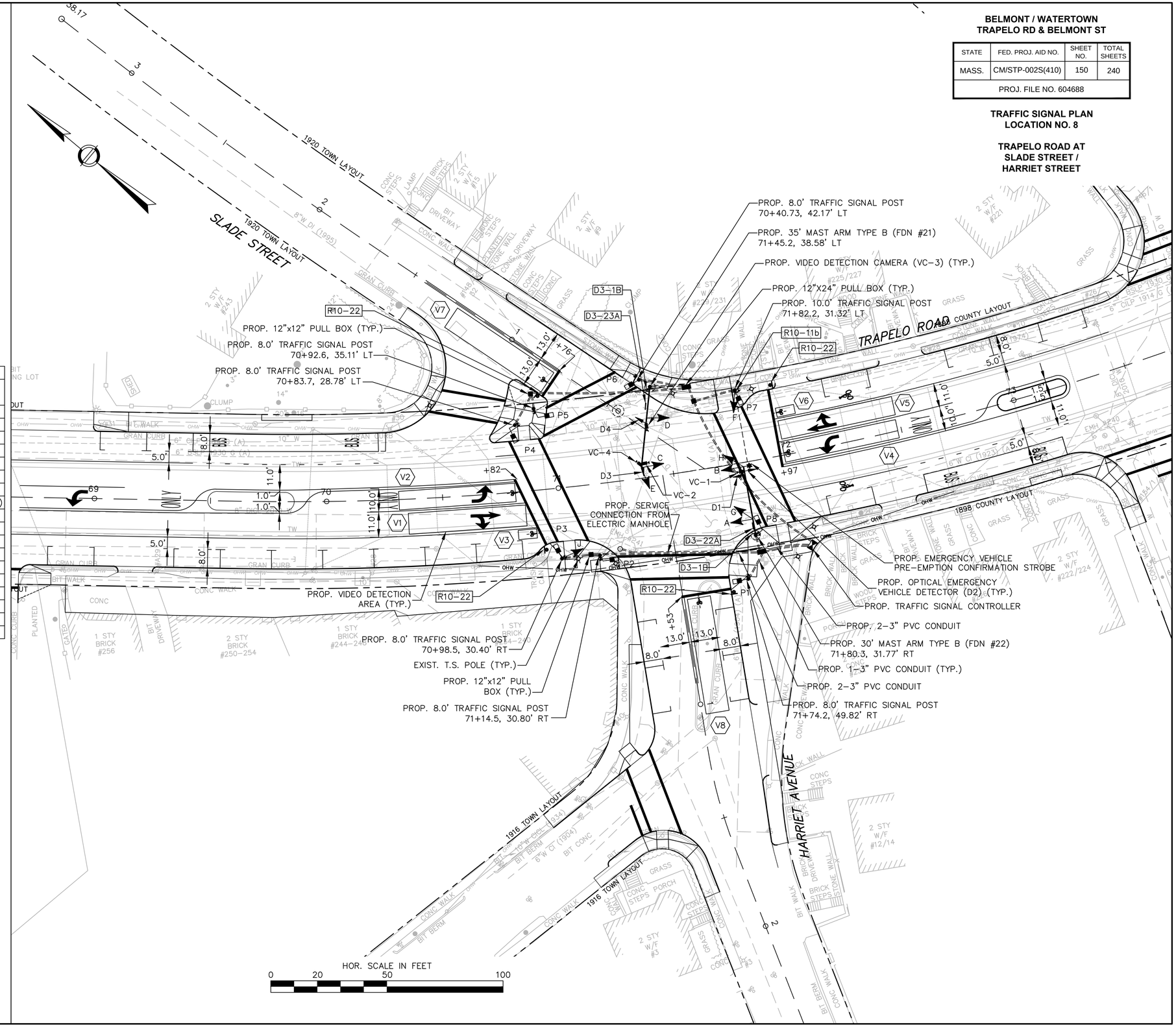
PLUS ALL NECESSARY DUCT, CABLE, FOUNDATIONS, LABOR, MISCELLANEOUS MATERIAL AND EQUIPMENT TO COMPLETE THE INSTALLATION AND PROVIDE AN OPERATING TRAFFIC SIGNAL.

* TO BE PAID UNDER RESPECTIVE PAY ITEM

EXISTING TRAFFIC SIGNAL PLAN



HOR. SCALE IN FEET
0 40 100 200



HOR. SCALE IN FEET
0 20 50 100

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

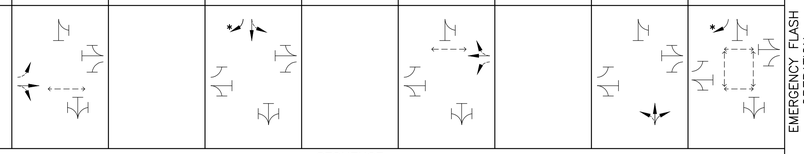
STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	151	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 8

TRAPELO ROAD AT SLADE STREET/ HARRIET STREET

SEQUENCE AND TIMING CHART

* YIELD CONTROL



SEQUENCE

STREET	DIR.	FACE	Ø/OL	PHASE 1 R/W	PHASE 1 CL1	PHASE 1 CL2	PHASE 2 R/W	PHASE 2 CL1	PHASE 2 CL2	PHASE 3 R/W	PHASE 3 CL1	PHASE 3 CL2	PHASE 4 R/W	PHASE 4 CL1	PHASE 4 CL2	PHASE 5 R/W	PHASE 5 CL1	PHASE 5 CL2	PHASE 6 R/W	PHASE 6 CL1	PHASE 6 CL2	PHASE 7 R/W	PHASE 7 CL1	PHASE 7 CL2	PHASE 8 R/W	PHASE 8 CL1	PHASE 8 CL2	PHASE 9 R/W	PHASE 9 CL1	PHASE 9 CL2	EMERGENCY FLASH OPERATION
TRAPELO RD	EB	A,B	2				G	Y	R				R	R	R				R	R	R				R	R	R	R	R	R	FY
TRAPELO RD	WB	C,D,J	6				R	R	R				R	R	R				G	Y	R				R	R	R	R	R	R	FY
HARRIET AVE	NB	E,F	8				R	R	R				R	R	R				R	R	R				G	Y	R	R	R	R	FR
SLADE ST	SB	G,H	4				R	R	R				G	Y	R				R	R	R				R	R	R	R	R	R	FR
PEDESTRIAN		P1–P2	2				•																						F/		OFF
PEDESTRIAN		P5–P6	6																•										F/		OFF
PEDESTRIAN		P3–P4, P7–P8	9																										F/		OFF

TIMING IN SECONDS

	PHASE 1 R/W	PHASE 1 CL1	PHASE 1 CL2	PHASE 2 R/W	PHASE 2 CL1	PHASE 2 CL2	PHASE 3 R/W	PHASE 3 CL1	PHASE 3 CL2	PHASE 4 R/W	PHASE 4 CL1	PHASE 4 CL2	PHASE 5 R/W	PHASE 5 CL1	PHASE 5 CL2	PHASE 6 R/W	PHASE 6 CL1	PHASE 6 CL2	PHASE 7 R/W	PHASE 7 CL1	PHASE 7 CL2	PHASE 8 R/W	PHASE 8 CL1	PHASE 8 CL2	PHASE 9 R/W	PHASE 9 CL1	PHASE 9 CL2
MINIMUM GREEN				12						6						12						6					
VEHICLE INTERVAL				2						2						2						2					
MAXIMUM GREEN I (ALL OTHER TIMES)				40						15						40						15					
MAXIMUM GREEN II (AM,PM)				43						19						43						19					
YELLOW CLEAR					4						3						4						3				
ALL RED CLEAR						3						3						3						3			
WALK INTERVAL				7												7									7		
PED CLEARANCE				11	4											11	4									15	
PED BUFFER						3												3									4
DETECTOR				NON–LOCK						NON–LOCK						NON–LOCK						NON–LOCK			LOCK		
RECALL MODE				SOFT						OFF						SOFT						OFF			OFF		

CYCLE DIAL	CYCLE SEC.	OFFSET %	OFFSET SEC.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
AM	70						43	4	3				14	3	3				43	4	3				14	3	3			
AM W/PED	90						37	4	3				14	3	3				37	4	3				14	3	3	7	15	4
PM	70						38	4	3				19	3	3				38	4	3				19	3	3			
PM W/PED	90						37	4	3				14	3	3				37	4	3				14	3	3	7	15	4

SEQUENCE NOTES:

1. ANY PHASE NOT CALLED WILL BE SKIPPED. SIGNAL IDENTIFICATION WILL NOT CHANGE IF THE ASSIGNED RIGHT OF WAY DOES NOT CHANGE DURING THE NEXT PHASE CALLED.
2. • NORMALLY DON'T WALK, UPON PEDESTRIAN PUSH BUTTON ACTIVATION, WALK/FLASHING DON'T WALK (COUNTDOWN).
3. THE RIGHT–OF–WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON–CONFLICTING PHASES.
4. Ø/OL = PHASE IN DISPLAY / OVERLAPPING PHASE.
5. DIAL 1 (AM) = 06:30 – 09:00, M–F
   DIAL 2 (PM) = 15:00 – 18:00, M–F
   MAX1 = ALL OTHER TIMES
6. PHASE 9 SHALL ONLY BE ACTIVATED BY P3, P4, P7 AND P8.
7. COUNTDOWN PHASE OF PEDESTRIAN SIGNALS SHALL NOT OCCUR DURING THE WALK PERIOD.

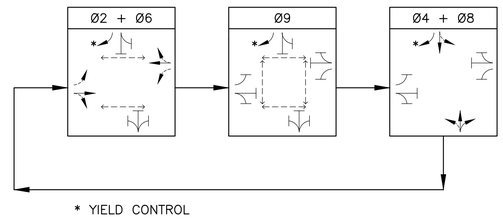
EMERGENCY VEHICLE PRE–EMPTION PHASING AND PRIORITY NOTES:

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. 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 FIVE (5) SECONDS OR UNTIL PRE–EMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME PRE–EMPTION PHASE CLEARANCE (4 SECONDS: YELLOW AND 2 SECONDS: ALL RED) AND SERVICE EMERGENCY VEHICLE PRE–EMPTION PHASE #2 (OR #1) IF NECESSARY, THEN TIME PHASE PRE–EMPTION CLEARANCE AND RESUME NORMAL SIGNAL OPERATION. EMERGENCY VEHICLE PRE–EMPTION PHASE #3 AND #4 SHALL BE SIMILARLY SERVED.
3. MINIMUM GREEN, NORMAL VEHICLE CLEARANCE, SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PRE–EMPTION DEMAND.
4. PREEMPTION STROBE SHALL BE ILLUMINATED WHENEVER ANY EMERGENCY VEHICLE PRE–EMPTION GREEN IS ON.

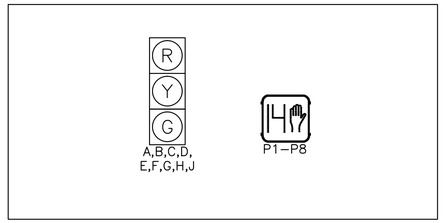
EMERGENCY VEHICLE PRE–EMPTION PHASING AND PRIORITY

DETECTOR AND PRIORITY	PRE–EMPT PHASE ASSIGNMENT	MOVEMENT	VEHICLE PHASE ASSIGNMENT
D1	1		Ø2
D2	2		Ø6
D3	3		Ø8
D4	4		Ø4

PREFERENTIAL PHASING SEQUENCE



SIGNAL DISPLAY



SIGNAL DISPLAY NOTES:

1. ALL SIGNAL DISPLAYS SHALL BE EQUIPPED W/ LED MODULES (12–INCH LENS)
2. ALL SIGNAL HEADS SHALL BE RIGID MOUNTED AND EQUIPPED WITH ±5" LOUVERED BACKPLATES.
3. ALL PEDESTRIAN SIGNAL HEADS SHALL HAVE PEDESTRIAN COUNTDOWN TIMER AND EGG–CRATE VISOR.

DETECTOR OPERATION

DETECTOR NUMBER	NUMBER OF SECTION/SIZE	PROCESSOR NUMBER	CHANNEL NUMBER	Ø CALLED	Ø EXTENSION	OPERATION	DELAY (SECONDS)	EXTENSION (SECONDS)
V1	9'x50'	1	1	2	2	PRESENCE	0	0
V2	8'x50'	1	1	2	2	PRESENCE	0	0
V3	4'x8'	1	1	2	2	PRESENCE	0	0
V4	8'x50'	1	2	6	6	PRESENCE	0	0
V5	9'x50'	1	2	6	6	PRESENCE	0	0
V6	4'x8'	1	2	6	6	PRESENCE	0	0
V7	10'x50'	2	1	4	4	PRESENCE	0	0
V8	10'x50'	2	2	8	8	PRESENCE	0	0

DETECTOR OPERATION NOTES:

1. DELAY TIME SHALL BE EFFECTIVE ONLY DURING THE RED PORTION OF THE PHASE THAT IS CALLED AT THE DETECTOR.

NOTES:

1. ALL PROPOSED SIGNAL HEADS MUST BE AT LEAST 10 FEET FROM THE POWERED MBTA TROLLEY WIRES AND 5 FEET FROM THEIR SUPPORT CABLES. (SEE TYPE B MAST ARM DETAIL, SHEET 146)
2. REMOVE AND STACK ALL EXISTING TRAFFIC SIGNAL EQUIPMENT.
3. REMOVE ALL PULL BOXES AND ABANDON EXISTING TRAFFIC SIGNAL CONDUIT SYSTEM.
4. MINIMUM 36" CLEARANCE EXCLUDING CURB WIDTH IS REQUIRED ON ALL SIDEWALKS.
5. VIDEO DETECTION AREAS ARE SHOWN ON THE PLANS GRAPHICALLY AND SHOULD BE ADJUSTED IN THE FIELD FOR PROPER DETECTION.
6. REFER TO SHEET NO. 153 FOR TRAFFIC SEQUENCE PLAN.
7. REFER TO SHEET NOS. 164 TO 168 FOR MAST ARM FOUNDATION.
8. REFER TO SHEET NO. 127 FOR COMPLETE PAVEMENT MARKING AND SIGNING PLAN.
9. PUSH BUTTONS SHALL BE LOCATED NO MORE THAN 10" HORIZONTALLY FROM A LEVEL SURFACE (≤1.5%).
10. FOUR TEMPORARY TRAFFIC SIGNALS WILL BE REQUIRED.
11. LOCATION OF MBTA OVERHEAD WIRE IS APPROXIMATE ONLY.

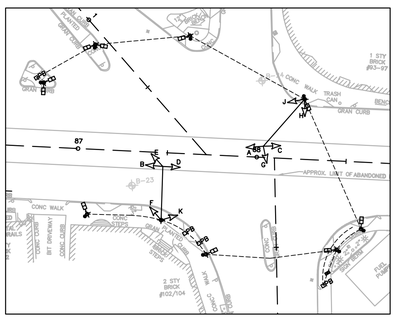
MAJOR ITEMS REQUIRED (TRAFFIC SIGNAL EQUIPMENT)

QTY	ITEM 816.09
1	TRAFFIC SIGNAL CONTROLLER (TS-2, TYPE 1) W/ 8DW BASE MOUNTED CABINET AND FOUNDATION PAD
1	35' MAST ARM TYPE B (STEEL), INCL. BASE & FNDN W/ (1) R3-8d & (1) R10-12
1	35' MAST ARM TYPE B (STEEL), INCL. BASE & FNDN W/ (1) R3-5L, (1) R10-12 & (1) D3
7	8' TRAFFIC SIGNAL POST, BASE & FOUNDATION
2	10' TRAFFIC SIGNAL POST, BASE & FOUNDATION
2	1-WAY, 3-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
2	2-WAY, 3-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
2	2-WAY, 3/5-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
10	±5" LOUVERED BACKPLATES
8	PEDESTRIAN SIGNAL HEAD W/ EGG-CRATE VISOR (L.E.D. W/ COUNTDOWN)
8	ACCESSIBLE PEDESTRIAN PUSH BUTTON ASSEMBLY W/SIGN
3	12" x 12" PULL BOXES *
3	12" x 24" PULL BOXES *
4	VIDEO DETECTION CAMERAS
4	VIDEO CAMERA MAST ARM MOUNTING BRACKET
2	VIDEO DETECTION PROCESSOR – TWO CHANNEL
4	OPTICAL PRE-EMPTION DETECTORS SINGLE CHANNEL
1	EMERGENCY VEHICLE PRE-EMPTION CONFIRMATION STROBE LIGHT (WHITE)
1	OPTICAL PHASE SELECTOR TWO CHANNEL
1	SERVICE CONNECTION (UNDERGROUND)

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

* TO BE PAID UNDER RESPECTIVE PAY ITEM

EXISTING TRAFFIC SIGNAL PLAN



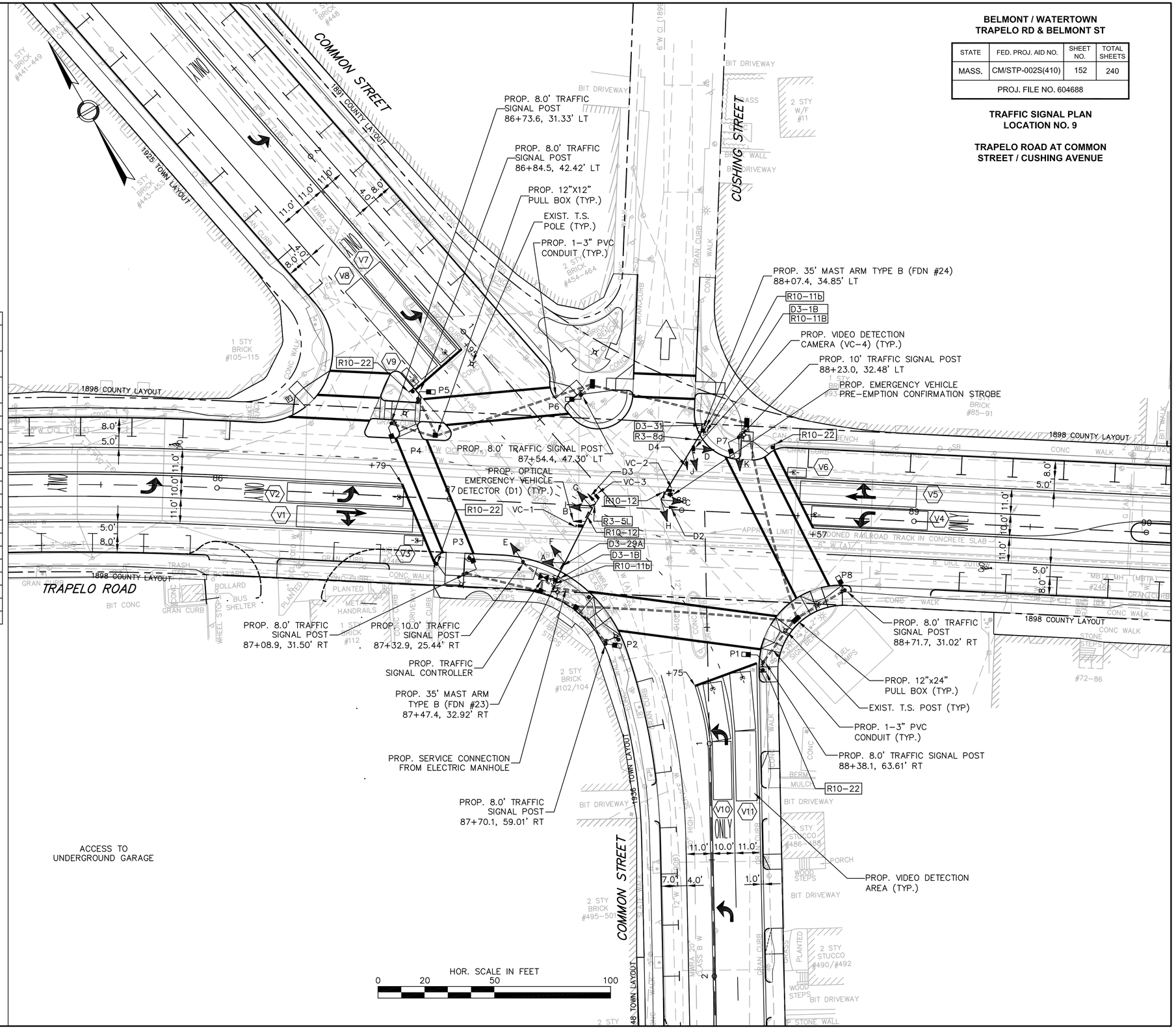
HOR. SCALE IN FEET
0 40 100 200

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	152	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 9

TRAPELO ROAD AT COMMON STREET / CUSHING AVENUE



BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

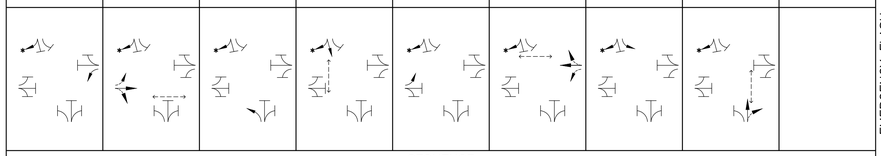
STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	153	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 9

TRAPELO ROAD AT COMMON
STREET / CUSHING AVENUE

SEQUENCE AND TIMING CHART

* YIELD CONTROL

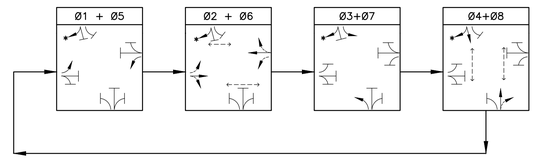


STREET	DIR.	FACE	Ø/OL	PHASE 1 R/W	PHASE 1 CL1	PHASE 1 CL2	PHASE 2 R/W	PHASE 2 CL1	PHASE 2 CL2	PHASE 3 R/W	PHASE 3 CL1	PHASE 3 CL2	PHASE 4 R/W	PHASE 4 CL1	PHASE 4 CL2	PHASE 5 R/W	PHASE 5 CL1	PHASE 5 CL2	PHASE 6 R/W	PHASE 6 CL1	PHASE 6 CL2	PHASE 7 R/W	PHASE 7 CL1	PHASE 7 CL2	PHASE 8 R/W	PHASE 8 CL1	PHASE 8 CL2	PHASE 9 R/W	PHASE 9 CL1	PHASE 9 CL2	EMERGENCY FLASH OPERATION
				SEQUENCE																											
TRAPELO RD	EB	B	2,5	R	R	R	G	Y	R	R	R	R	R	R	R	R/G	R/Y	R	R	R	R	R	R	R	R	R	R				FY
TRAPELO RD	EB	A	2	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R				FY
TRAPELO RD	WB	C	1,6	R/G	R/Y	R	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R				FY
TRAPELO RD	WB	D	6	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R				FY
COMMON ST	NB	H	3	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~G~~	~~Y~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~				~~FR~~
COMMON ST	NB	J,K	8	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R				FR
COMMON ST	SB	G	7	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~G~~	~~Y~~	~~R~~	~~R~~	~~R~~	~~R~~				~~FR~~
COMMON ST	SB	E,F	4	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R				FR
PEDESTRIAN		P1–P2, P5–P6		✋	✋	✋	•	✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	•	✋	✋	✋	✋	✋	✋	✋	✋				OFF
PEDESTRIAN		P3–P4, P7–P8		✋	✋	✋	✋	✋	✋	✋	✋	✋	•	✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	✋	•	✋	✋				OFF
				TIMING IN SECONDS																											
MINIMUM GREEN				3			12			6			12			3			12			6			12						
VEHICLE INTERVAL				2			2			2			2			2			2			2			2						
MAXIMUM GREEN I (ALL OTHER TIMES)				8			40			12			25			8						12			25						
MAXIMUM GREEN II (AM,PM)				8			49			15			27			8			49			15			27						
YELLOW CLEAR					3			4			4			4			3			4			4			4					
ALL RED CLEAR						0			3			3			3			0			3			3			3				
WALK INTERVAL							7						7						7						7						
PED CLEARANCE							16	4					14.5	4					16	4					14.5	4					
PED BUFFER									3						3						3						3				
DETECTOR				NON–LOCK			NON–LOCK			NON–LOCK			NON–LOCK			NON–LOCK			NON–LOCK			NON–LOCK			NON–LOCK						
RECALL MODE				OFF			SOFT			OFF			OFF			OFF			SOFT			OFF			OFF						
CYCLE				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
DIAL	SEC.																														
AM	120			5	3	0	49	4	3	15	4	3	27	4	3	5	3	0	49	4	3	15	4	3	27	4	3				
PM	120			8	3	0	49	4	3	14	4	3	25	4	3	8	3	0	49	4	3	14	4	3	25	4	3				

SEQUENCE NOTES:

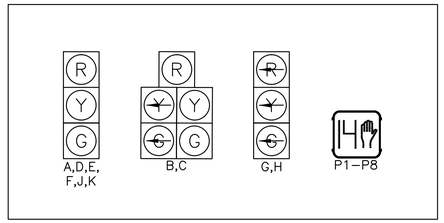
1. ANY PHASE NOT CALLED WILL BE SKIPPED. SIGNAL IDENTIFICATION WILL NOT CHANGE IF THE ASSIGNED RIGHT OF WAY DOES NOT CHANGE DURING THE NEXT PHASE CALLED.
2. • NORMALLY DON'T WALK, UPON PEDESTRIAN PUSH BUTTON ACTIVATION, WALK/FLASHING DON'T WALK (COUNTDOWN).
3. THE RIGHT–OF–WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON–CONFLICTING PHASES.
4. Ø/OL = PHASE IN DISPLAY / OVERLAPPING PHASE.
5. DIAL 1 (AM) = 06:30 – 09:00, M–F
   DIAL 2 (PM) = 15:00 – 18:00, M–F
   MAX1 = ALL OTHER TIMES
6. COUNTDOWN PHASE OF PEDESTRIAN SIGNALS SHALL NOT OCCUR DURING THE WALK PERIOD.

PREFERENTIAL PHASING SEQUENCE



* YIELD CONTROL

SIGNAL DISPLAY



SIGNAL DISPLAY NOTES:

1. ALL SIGNAL DISPLAYS SHALL BE EQUIPPED W/ LED MODULES (12–INCH LENS)
2. ALL SIGNAL HEADS SHALL BE RIGID MOUNTED AND EQUIPPED WITH ±5" LOUVERED BACKPLATES.
3. ALL PEDESTRIAN SIGNAL HEADS SHALL HAVE PEDESTRIAN COUNTDOWN TIMER AND EGG–CRATE VISOR.

EMERGENCY VEHICLE PRE–EMPTION PHASING AND PRIORITY

DETECTOR AND PRIORITY	PRE–EMPT PHASE ASSIGNMENT	MOVEMENT	VEHICLE PHASE ASSIGNMENT
D1	1		Ø2+Ø5
D2	2		Ø1+Ø6
D3	3		Ø4+Ø7
D4	4		Ø3+Ø8

EMERGENCY VEHICLE PRE–EMPTION PHASING AND PRIORITY 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. 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 FIVE (5) SECONDS OR UNTIL PRE–EMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME PRE–EMPTION PHASE CLEARANCE (4 SECONDS: YELLOW AND 2 SECONDS: ALL RED) AND SERVICE EMERGENCY VEHICLE PRE–EMPTION PHASE #2 (OR #1) IF NECESSARY, THEN TIME PHASE PRE–EMPTION CLEARANCE AND RESUME NORMAL SIGNAL OPERATION. EMERGENCY VEHICLE PRE–EMPTION PHASE #3 AND #4 SHALL BE SIMILARLY SERVED.
3. MINIMUM GREEN, NORMAL VEHICLE CLEARANCE, SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PRE–EMPTION DEMAND.
4. PREEMPTION STROBE SHALL BE ILLUMINATED WHENEVER ANY EMERGENCY VEHICLE PRE–EMPTION GREEN IS ON.

DETECTOR OPERATION

DETECTOR NUMBER	NUMBER OF SECTION/SIZE	PROCESSOR NUMBER	CHANNEL NUMBER	Ø CALLED	Ø EXTENSION	OPERATION	DELAY (SECONDS)	EXTENSION (SECONDS)
V1	9'x50'	1	1	2	2	PRESENCE	0	0
V2	8'x50'	1	1	5	5	PRESENCE	0	0
V3	4'x8'	1	1	2	2	PRESENCE	0	0
V4	8'x50'	1	2	1	1	PRESENCE	0	0
V5	9'x50'	1	2	6	6	PRESENCE	0	0
V6	4'x8'	1	2	6	6	PRESENCE	0	0
V7	9'x50'	2	1	7	7	PRESENCE	0	0
V8	9'x50'	2	1	4	4	PRESENCE	0	0
V9	3'x8'	2	1	4	4	PRESENCE	0	0
V10	2–8'x25'	2	2	3	3	PRESENCE	0	0
V11	1–9'x25' 1–9'x30'	2	2	8	8	PRESENCE	0	0

DETECTOR OPERATION NOTES:

1. DELAY TIME SHALL BE EFFECTIVE ONLY DURING THE RED PORTION OF THE PHASE THAT IS CALLED AT THE DETECTOR.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	154	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 10

TRAPELO ROAD AT BELMONT STREET / PINE STREET

NOTES:

1. ALL PROPOSED SIGNAL HEADS MUST BE AT LEAST 10 FEET FROM THE POWERED MBTA TROLLEY WIRES AND 5 FEET FROM THEIR SUPPORT CABLES. (SEE TYPE B MAST ARM DETAIL, SHEET 146)
2. REMOVE AND STACK ALL EXISTING TRAFFIC CONTROL EQUIPMENT.
3. PROTECT EXISTING TRAFFIC SIGNAL CONDUIT SYSTEM, EXCEPT AS NOTED BELOW.
4. MINIMUM 36" CLEARANCE EXCLUDING CURB WIDTH IS REQUIRED ON ALL SIDEWALKS.
5. VIDEO DETECTION AREAS ARE SHOWN ON THE PLANS GRAPHICALLY AND SHOULD BE ADJUSTED IN THE FIELD FOR PROPER DETECTION.
6. REFER TO SHEET NO. 155 FOR TRAFFIC SEQUENCE PLAN.
7. REFER TO SHEET NOS. 164 TO 168 FOR MAST ARM FOUNDATION.
8. REFER TO SHEET NO. 128 FOR COMPLETE PAVEMENT MARKING AND SIGNING PLAN.
9. PUSH BUTTONS SHALL BE LOCATED NO MORE THAN 10" HORIZONTALLY FROM A LEVEL SURFACE (≤1.5%).
10. LOCATION OF MBTA OVERHEAD WIRE IS APPROXIMATE ONLY.

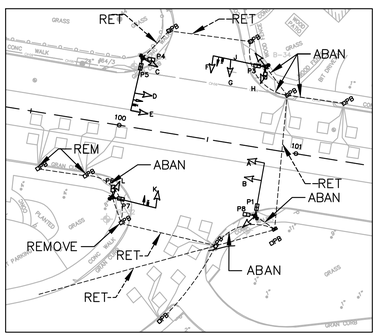
MAJOR ITEMS REQUIRED

QTY	ITEM 816.10
1	TRAFFIC SIGNAL CONTROLLER (TS-2, TYPE 1) W/ 8DW BASE MOUNTED CABINET AND CEMENT CONCRETE PAD
1	25' MAST ARM (STEEL), MNT'D ON EXIST. FNDN W/ (1) D3
1	25' MAST ARM (STEEL), MNT'D ON EXIST. FNDN W/ (2) D3
1	35' MAST ARM TYPE B (STEEL), MNT'D ON EXIST. FNDN W/ (1) D3 & (1) R10-12
1	35' MAST ARM TYPE B (STEEL), INCL. BASE & FNDN W/ (1) D3
2	10' TRAFFIC SIGNAL POST, BASE & FOUNDATION
4	8' TRAFFIC SIGNAL POST, BASE & FOUNDATION
9	1-WAY, 3-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
3	1-WAY, 5-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
12	5" LOUVERED BACKPLATES
8	PEDESTRIAN SIGNAL HEAD W/ EGG-CRATE VISOR (L.E.D. W/ COUNTDOWN)
8	ACCESSIBLE PEDESTRIAN PUSH BUTTON ASSEMBLY W/SIGN
2	12"x12" PULL BOXES*
4	VIDEO DETECTION CAMERAS
4	VIDEO CAMERA MAST ARM MOUNTING BRACKET
2	VIDEO DETECTION PROCESSOR - TWO CHANNEL
4	OPTICAL PRE-EMPTION DETECTORS SINGLE CHANNEL
1	EMERGENCY VEHICLE PRE-EMPTION CONFIRMATION STROBE LIGHT (WHITE)
1	OPTICAL PHASE SELECTOR TWO CHANNEL
1	SERVICE CONNECTION (UNDERGROUND)

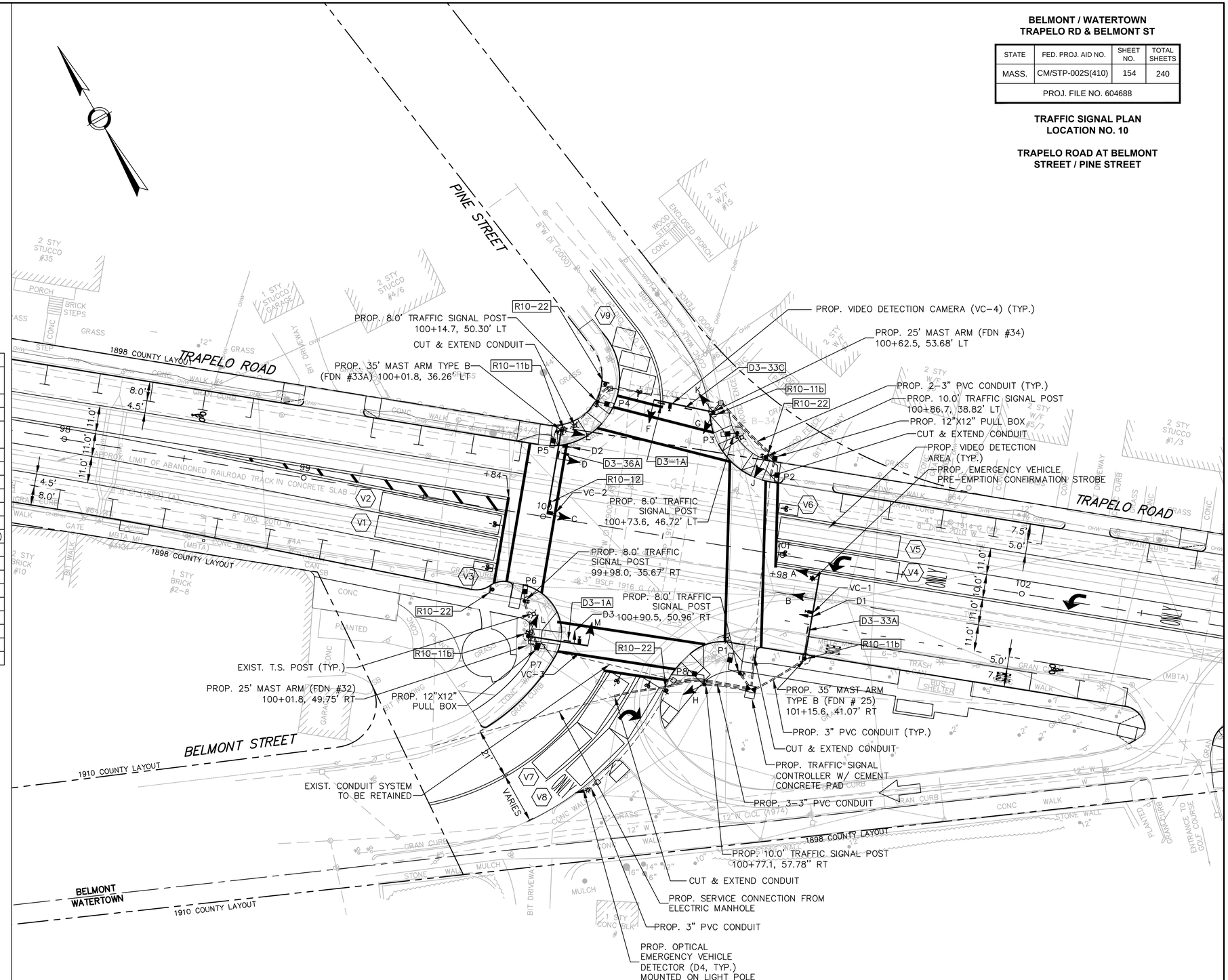
PLUS ALL NECESSARY DUCT, CABLE, FOUNDATIONS, LABOR, MISCELLANEOUS MATERIAL AND EQUIPMENT TO COMPLETE THE INSTALLATION AND PROVIDE AN OPERATING TRAFFIC SIGNAL.

* TO BE PAID UNDER ITS RESPECTIVE PAY ITEM.

EXISTING TRAFFIC SIGNAL PLAN



HOR. SCALE IN FEET
0 40 100 200



HOR. SCALE IN FEET
0 20 50 100

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	155	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 10

TRAPELO ROAD AT BELMONT
STREET / PINE STREET

SEQUENCE AND TIMING CHART

				PHASE 1			PHASE 2			PHASE 3			PHASE 4			PHASE 5			PHASE 6			PHASE 7			PHASE 8			PHASE 9			EMERGENCY FLASH OPERATION
				O/L																											
				SEQUENCE																											
STREET	DIR.	FACE	Ø/OL	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	
TRAPELO RD	EB	A,B	2	R	R	R	G	Y	R				R	R	R				R	R	R				R	R	R	R	R	R	FY
TRAPELO RD	WB	C	1,6	R/G	R/Y	R	R	R	R				R	R	R				G	Y	R				R	R	R	R	R	R	FY
TRAPELO RD	WB	D,E	6	G	Y	R	R	R	R				R	R	R				G	Y	R				R	R	R	R	R	R	FR
BELMONT ST	NB	F,G,H	8	R	R	R	R	R	R				R	R	R				R	R	R				G	Y	R	R	R	R	FR
BELMONT ST	NB	J	8,1	R/G	R/Y	R	R	R	R				R	R	R				R	R	R				G	Y	R	R	R	R	FR
PINE ST	SB	K,L,M	4	R	R	R	R	R	R				G	Y	R				R	R	R				R	R	R	R	R	R	FR
PEDESTRIAN		P1–P8	9																									F/			OFF
				TIMING IN SECONDS																											
MINIMUM GREEN				12			12						3						12						3						
VEHICLE INTERVAL				2			2						2						2						2						
MAXIMUM GREEN I (ALL OTHER TIMES)				25			30						9						58						9						
MAXIMUM GREEN II (AM,PM)				27			28						9						58						9						
YELLOW CLEAR					3			4						3						4						3					
ALL RED CLEAR						0			3						3						3						3				
WALK INTERVAL																												7			
PED CLEARANCE																													19		
PED BUFFER																														4	
DETECTOR				NON–LOCK			NON–LOCK						NON–LOCK						NON–LOCK						NON–LOCK			LOCK			
RECALL MODE				OFF			OFF						OFF						OFF						OFF			OFF			
CYCLE		OFFSET		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
DIAL	SEC.	%	SEC.																												
AM	80			27	3.0	0	28	4.0	3.0				9	3.0	3.0				58	4.0	3.0				9	3.0	3.0				
AM W/PED	90			19	3.0	0	19	4.0	3.0				6	3.0	3.0				41	4.0	3.0				6	3.0	3.0	7	19	4	
PM	80			27	3.0	0	28	4.0	3.0				9	3.0	3.0				58	4.0	3.0				9	3.0	3.0				
PM W/PED	100			26	3.0	0	21	4.0	3.0				7	3.0	3.0				50	4.0	3.0				7	3.0	3.0	7	19	4	

SEQUENCE NOTES:

1. ANY PHASE NOT CALLED WILL BE SKIPPED. SIGNAL IDENTIFICATION WILL NOT CHANGE IF THE ASSIGNED RIGHT OF WAY DOES NOT CHANGE DURING THE NEXT PHASE CALLED.
2. THE RIGHT–OF–WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON–CONFLICTING PHASES.
3. Ø/OL = PHASE IN DISPLAY / OVERLAPPING PHASE.
4. DIAL 1 (AM) = 06:30 – 09:00, M–F
   DIAL 2 (PM) = 15:00 – 18:00, M–F
   MAX1 = ALL OTHER TIMES
5. COUNTDOWN PHASE OF PEDESTRIAN SIGNALS SHALL NOT OCCUR DURING THE WALK PERIOD.

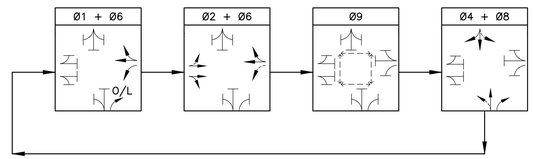
EMERGENCY VEHICLE PRE–EMPTION PHASING AND PRIORITY NOTES:

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. 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 FIVE (5) SECONDS OR UNTIL PRE–EMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME PRE–EMPTION PHASE CLEARANCE (4 SECONDS: YELLOW AND 2 SECONDS: ALL RED) AND SERVICE EMERGENCY VEHICLE PRE–EMPTION PHASE #2 (OR #1) IF NECESSARY, THEN TIME PHASE PRE–EMPTION CLEARANCE AND RESUME NORMAL SIGNAL OPERATION. EMERGENCY VEHICLE PRE–EMPTION PHASE #3 AND #4 SHALL BE SIMILARLY SERVED.
3. MINIMUM GREEN, NORMAL VEHICLE CLEARANCE, SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PRE–EMPTION DEMAND.
4. PREEMPTION STROBE SHALL BE ILLUMINATED WHENEVER ANY EMERGENCY VEHICLE PRE–EMPTION GREEN IS ON.

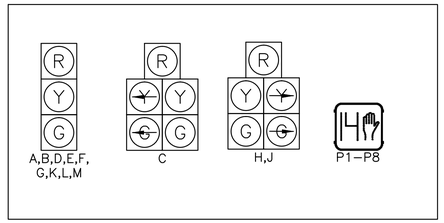
EMERGENCY VEHICLE PRE–EMPTION PHASING AND PRIORITY

DETECTOR AND PRIORITY	PRE–EMPT PHASE ASSIGNMENT	MOVEMENT	VEHICLE PHASE ASSIGNMENT
D1	1		Ø2
D2	2		Ø1 + Ø6
D3	3		Ø4
D4	4		Ø8

PREFERENTIAL PHASING SEQUENCE



SIGNAL DISPLAY



SIGNAL DISPLAY NOTES:

1. EXISTING PED. HEADS TO BE RETROFITTED WITH GRAPHIC SYMBOL AS SHOWN, IN COMFORMANCE WITH MUTCD STANDARDS.
2. ALL SIGNAL HEADS SHALL BE RIGID MOUNTED AND EQUIPPED WITH ±5" LOUVERED BACKPLATES.
3. ALL PEDESTRIAN SIGNAL HEADS SHALL HAVE PEDESTRIAN COUNTDOWN TIMER AND EGG–CRATE VISOR.

DETECTOR OPERATION

DETECTOR NUMBER	NUMBER OF SECTION/SIZE	PROCESSOR NUMBER	CHANNEL NUMBER	Ø CALLED	Ø EXTENSION	OPERATION	DELAY (SECONDS)	EXTENSION (SECONDS)
V1	9'x50'	1	1	2	2	PRESENCE	0	0
V2	9'x50'	1	1	2	2	PRESENCE	0	0
V3	3'x8'	1	1	2	2	PRESENCE	0	0
V4	8'x50'	1	2	1	1	PRESENCE	0	0
V5	9'x50'	1	2	6	6	PRESENCE	0	0
V6	4'x8'	1	2	6	6	PRESENCE	0	0
V7	2–9'x25'	2	1	8	8	PRESENCE	0	0
V8	2–9'x25'	2	1	8	8	PRESENCE	0	0
V9	1–8'x14' 1–6'x12' 1–8'x8'	2	2	4	4	PRESENCE	0	0

DETECTOR OPERATION NOTES:

1. DELAY TIME SHALL BE EFFECTIVE ONLY DURING THE RED PORTION OF THE PHASE THAT IS CALLED AT THE DETECTOR.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	156	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 11

PED. CROSSING AT BELMONT STREET EAST OF OAKLEY ROAD

NOTES:
1. ALL PROPOSED SIGNAL HEADS MUST BE AT LEAST 10 FEET FROM THE POWERED MBTA TROLLEY WIRES AND 5 FEET FROM THEIR SUPPORT CABLES. (SEE TYPE B MAST ARM DETAIL, SHEET 146)

2. REMOVE AND STACK ALL EXISTING TRAFFIC SIGNAL EQUIPMENT.

3. MINIMUM 36" CLEARANCE EXCLUDING CURB WIDTH IS REQUIRED ON ALL SIDEWALKS.

4. REFER TO SHEET NO. 157 FOR TRAFFIC SEQUENCE PLAN.

5. REFER TO SHEET NOS. 164 TO 168 FOR MAST ARM FOUNDATION.

6. REFER TO SHEET NO. 129 FOR COMPLETE PAVEMENT MARKING AND SIGNING PLAN.

7. PUSH BUTTONS SHALL BE LOCATED NO MORE THAN 10" HORIZONTALLY FROM A LEVEL SURFACE (≤1.5%).

8. LOCATION OF MBTA OVERHEAD WIRE IS APPROXIMATE ONLY.

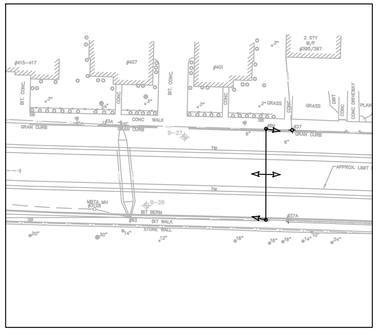
MAJOR ITEMS REQUIRED

QTY	ITEM 816.11
1	TRAFFIC SIGNAL CONTROLLER (TS-2, TYPE 1) W/ 8DW BASE MOUNTED CABINET AND FOUNDATION PAD
1	25' MAST ARM TYPE B (STEEL), INCLUDE BASE & FOUNDATION
1	30' MAST ARM TYPE B (STEEL), INCLUDE BASE & FOUNDATION
2	8' TRAFFIC SIGNAL POST, BASE & FOUNDATION
4	1-WAY, 3-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
4	±5" LOUVERED BACKPLATES
2	PEDESTRIAN SIGNAL HEAD W/ EGG-CRATE VISOR (L.E.D. W/ COUNTDOWN)
2	ACCESSIBLE PEDESTRIAN PUSH BUTTON ASSEMBLY W/SIGN
2	12" x 12" PULL BOXES*
1	SERVICE CONNECTION (OVERHEAD)

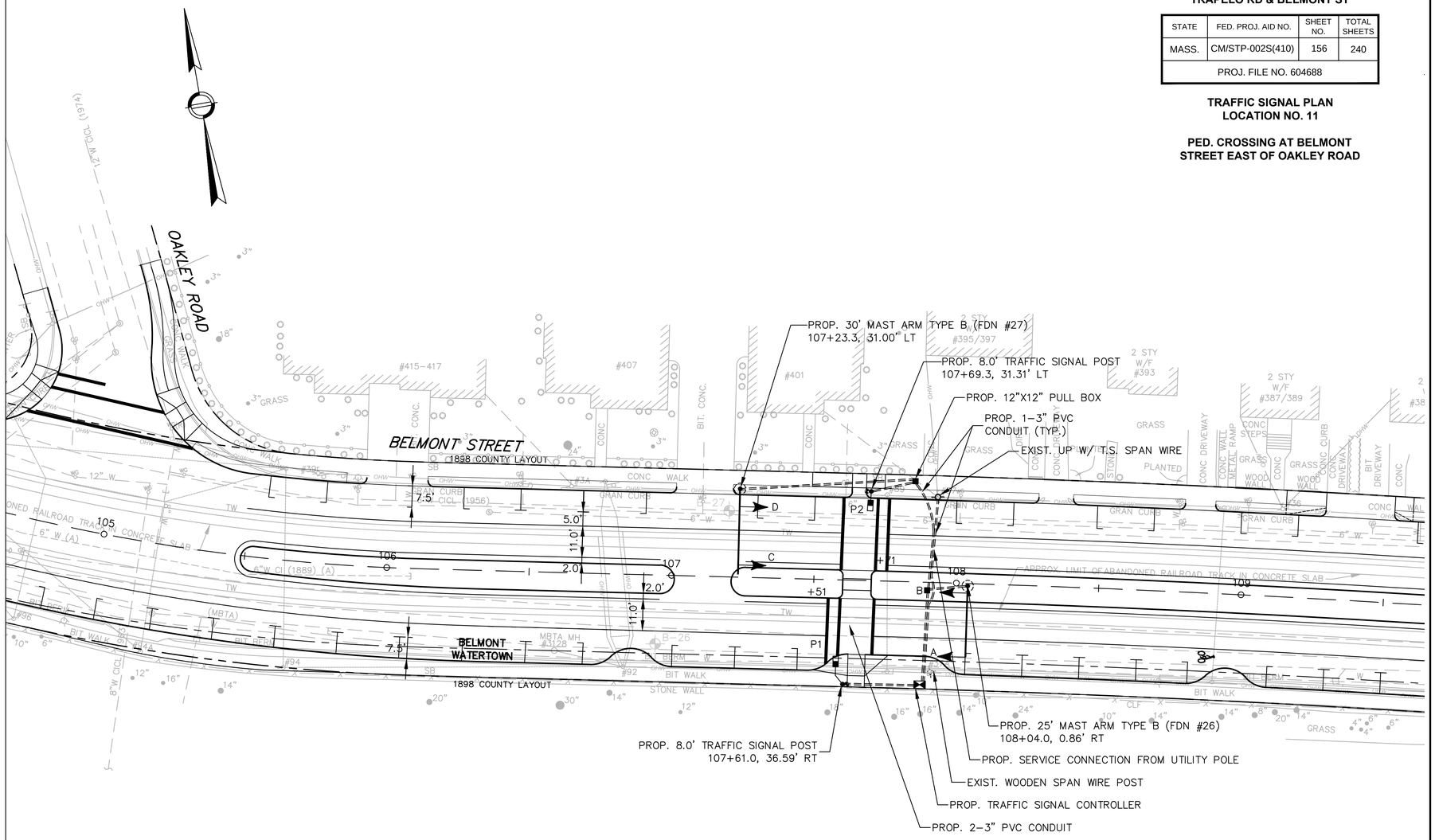
PLUS ALL NECESSARY DUCT, CABLE, FOUNDATIONS, LABOR, MISCELLANEOUS MATERIAL AND EQUIPMENT TO COMPLETE THE INSTALLATION AND PROVIDE AN OPERATING TRAFFIC SIGNAL.

* TO BE PAID UNDER ITS RESPECTIVE PAY ITEM.

EXISTING TRAFFIC SIGNAL PLAN



HOR. SCALE IN FEET
0 40 100 200



HOR. SCALE IN FEET
0 20 50 100

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	157	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 11

PED CROSSING AT BELMONT
STREET EAST OF OAKLEY ROAD

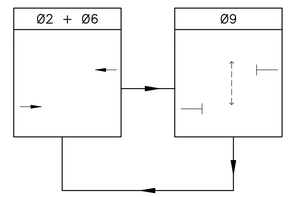
SEQUENCE AND TIMING CHART

				PHASE 1			PHASE 2			PHASE 3			PHASE 4			PHASE 5			PHASE 6			PHASE 7			PHASE 8			PHASE 9			EMERGENCY FLASH OPERATION
				SEQUENCE																											
STREET	DIR.	FACE	Ø/OL	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	
BELMONT ST	EB	A,B	2				G	Y	R										R	R	R							R	R	R	FY
BELMONT ST	WB	C,D	6				R	R	R										G	Y	R							R	R	R	FY
PEDESTRIAN		P1–P2	9																									F/		OFF
				TIMING IN SECONDS																											
MINIMUM GREEN							20												20												
VEHICLE INTERVAL							2												2												
MAXIMUM GREEN I (ALL OTHER TIMES)							41												41												
MAXIMUM GREEN II (AM & PM)							41												41												
YELLOW CLEAR								4												4											
ALL RED CLEAR									1												1										
WALK INTERVAL																												7			
PED CLEARANCE																													15		
PED BUFFER																														4	
DETECTOR							NON–LOCK												NON–LOCK									LOCK			
RECALL MODE							SOFT												SOFT									OFF			
CYCLE		OFFSET		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
DIAL	SEC.	%	SEC.																												
AM	70						39	4	1										39	4	1							7	15	4	
PM	70						39	4	1										39	4	1							7	15	4	

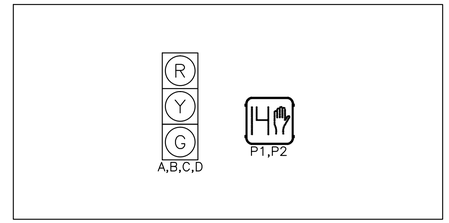
SEQUENCE NOTES:

1. ANY PHASE NOT CALLED WILL BE SKIPPED. SIGNAL IDENTIFICATION WILL NOT CHANGE IF THE ASSIGNED RIGHT OF WAY DOES NOT CHANGE DURING THE NEXT PHASE CALLED.
2. THE RIGHT–OF–WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON–CONFLICTING PHASES.
3. Ø/OL = PHASE IN DISPLAY / OVERLAPPING PHASE.
4. DIAL 1 (AM) = 06:30 – 09:00, M–F
   DIAL 2 (PM) = 15:00 – 18:00, M–F
   MAX1 = ALL OTHER TIMES
5. COUNTDOWN PHASE OF PEDESTRIAN SIGNALS SHALL NOT OCCUR DURING THE WALK PERIOD.

PREFERENTIAL PHASING SEQUENCE



SIGNAL DISPLAY



SIGNAL DISPLAY NOTES:

1. ALL SIGNAL DISPLAYS SHALL BE EQUIPPED W/ LED MODULES (12–INCH LENS)
2. ALL SIGNAL HEADS SHALL BE RIGID MOUNTED AND EQUIPPED WITH ±5" LOUVERED BACKPLATES.
3. ALL PEDESTRIAN SIGNAL HEADS SHALL HAVE PEDESTRIAN COUNTDOWN TIMER AND EGG–CRATE VISOR.

NOTES:

1. ALL PROPOSED SIGNAL HEADS MUST BE AT LEAST 10 FEET FROM THE POWERED MBTA TROLLEY WIRES AND 5 FEET FROM THEIR SUPPORT CABLES. (SEE TYPE B MAST ARM DETAIL, SHEET 146)
2. REMOVE AND STACK ALL EXISTING TRAFFIC SIGNAL EQUIPMENT.
3. REMOVE ALL PULL BOXES AND ABANDON EXISTING TRAFFIC SIGNAL CONDUIT SYSTEM.
4. MINIMUM 36" CLEARANCE EXCLUDING CURB WIDTH IS REQUIRED ON ALL SIDEWALKS.
5. VIDEO DETECTION AREAS ARE SHOWN ON THE PLANS GRAPHICALLY AND SHOULD BE ADJUSTED IN THE FIELD FOR PROPER DETECTION.
6. REFER TO SHEET NO. 159 FOR TRAFFIC SEQUENCE PLAN.
7. REFER TO SHEET NOS. 164 TO 168 FOR MAST ARM FOUNDATION.
8. REFER TO SHEET NO. 129 FOR COMPLETE PAVEMENT MARKING AND SIGNING PLAN.
9. PUSH BUTTONS SHALL BE LOCATED NO MORE THAN 10" HORIZONTALLY FROM A LEVEL SURFACE (≤1.5%).
10. THREE TEMPORARY TRAFFIC SIGNALS WILL BE REQUIRED.
11. LOCATION OF MBTA OVERHEAD WIRE IS APPROXIMATE ONLY.

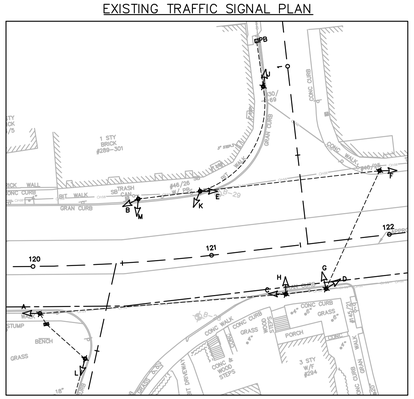
MAJOR ITEMS REQUIRED

QTY	ITEM 816.12
1	TRAFFIC SIGNAL CONTROLLER (TS-2, TYPE 1) W/ 8DW BASE MOUNTED CABINET AND FOUNDATION PAD
2	30' MAST ARM TYPE B (STEEL), INCL. BASE & FNDN
4	10' TRAFFIC SIGNAL POST, BASE & FOUNDATION
5	8' TRAFFIC SIGNAL POST, BASE & FOUNDATION
7	1-WAY, 3-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
2	2-WAY, 3-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
11	±5" LOUVERED BACKPLATES
8	PEDESTRIAN SIGNAL HEAD W/ EGG-CRATE VISOR (L.E.D. W/ COUNTDOWN)
8	ACCESSIBLE PEDESTRIAN PUSH BUTTON ASSEMBLY W/SIGN
5	12" x 12" PULL BOXES*
1	12" x 24" PULL BOXES*
4	VIDEO DETECTION CAMERAS
4	VIDEO CAMERA MAST ARM MOUNTING BRACKET
2	VIDEO DETECTION PROCESSOR – TWO CHANNEL
4	OPTICAL PRE-EMPTION DETECTORS SINGLE CHANNEL
1	EMERGENCY VEHICLE PRE-EMPTION CONFIRMATION STROBE LIGHT (WHITE)
1	OPTICAL PHASE SELECTOR TWO CHANNEL
1	SERVICE CONNECTION (OVERHEAD)

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

* TO BE PAID UNDER ITS RESPECTIVE PAY ITEM.

EXISTING TRAFFIC SIGNAL PLAN



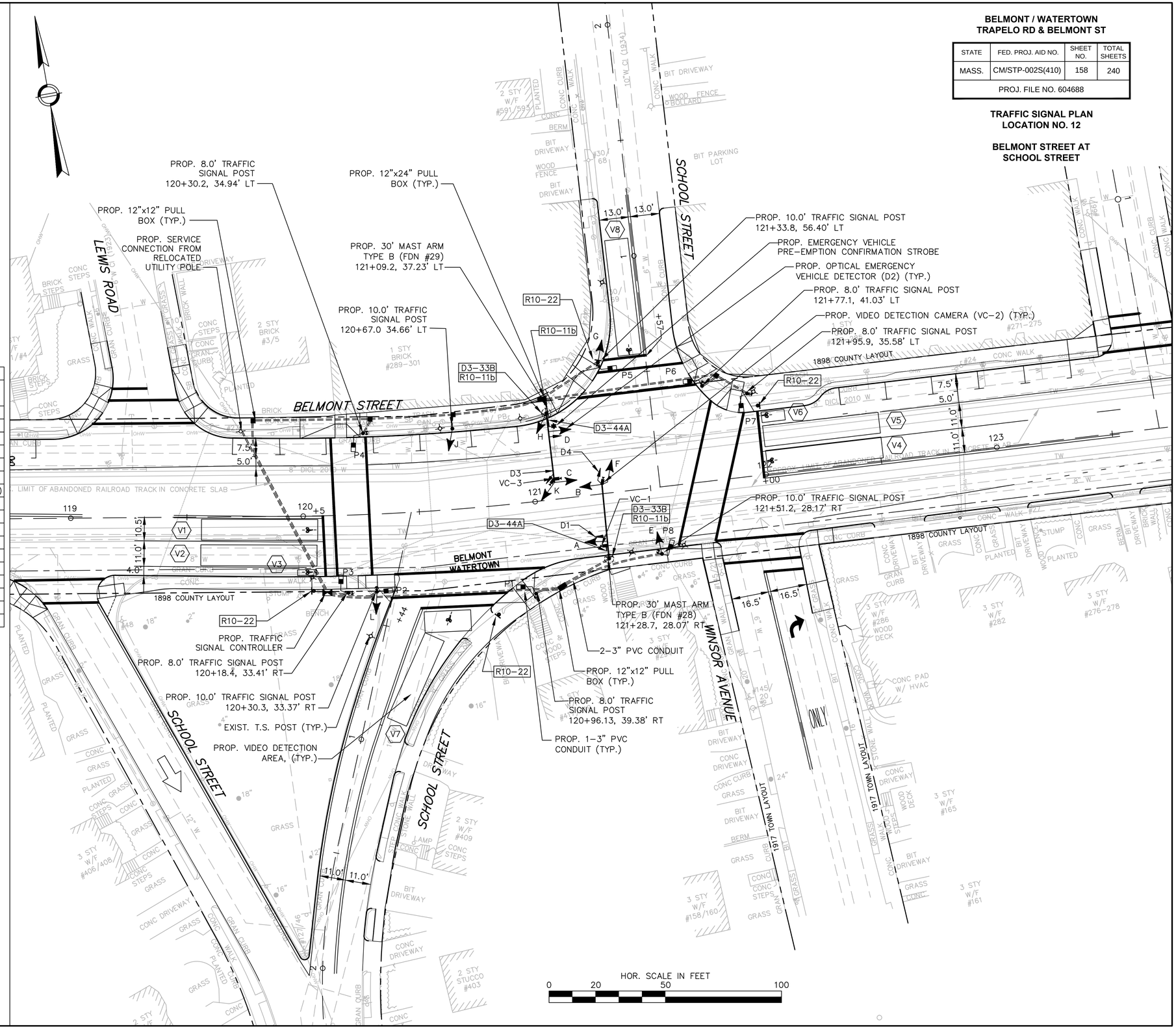
HOR. SCALE IN FEET
0 40 100 200

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	158	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 12

BELMONT STREET AT SCHOOL STREET



HOR. SCALE IN FEET
0 20 50 100

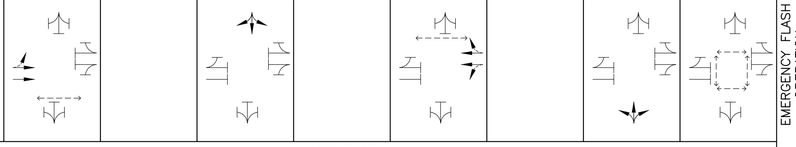
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	159	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 12

BELMONT STREET AT
SCHOOL STREET

SEQUENCE AND TIMING CHART



STREET	DIR.	FACE	Ø/OL	PHASE 1 R/W	PHASE 1 CL1	PHASE 1 CL2	PHASE 2 R/W	PHASE 2 CL1	PHASE 2 CL2	PHASE 3 R/W	PHASE 3 CL1	PHASE 3 CL2	PHASE 4 R/W	PHASE 4 CL1	PHASE 4 CL2	PHASE 5 R/W	PHASE 5 CL1	PHASE 5 CL2	PHASE 6 R/W	PHASE 6 CL1	PHASE 6 CL2	PHASE 7 R/W	PHASE 7 CL1	PHASE 7 CL2	PHASE 8 R/W	PHASE 8 CL1	PHASE 8 CL2	PHASE 9 R/W	PHASE 9 CL1	PHASE 9 CL2	EMERGENCY FLASH OPERATION
SEQUENCE																															
BELMONT ST	EB	A,B	2				G	Y	R				R	R	R				R	R	R				R	R	R	R	R	R	FY
BELMONT ST	WB	C,D	6				R	R	R				R	R	R				G	Y	R				R	R	R	R	R	R	FY
SCHOOL ST	NB	H,J,K,L	8				R	R	R				R	R	R				R	R	R				G	Y	R	R	R	R	FR
SCHOOL ST	SB	E,F,G	4				R	R	R				G	Y	R				R	R	R				R	R	R	R	R	R	FR
PEDESTRIAN		P1–P2	2				•																						F/		OFF
PEDESTRIAN		P5–P6	6																•										F/		OFF
PEDESTRIAN		P3–P4, P7–P8	9																										F/		OFF
TIMING IN SECONDS																															
MINIMUM GREEN							12						6						12						6						
VEHICLE INTERVAL							2						2						2						2						
MAXIMUM GREEN I (ALL OTHER TIMES)							40						35						40						35						
MAXIMUM GREEN II (AM, PM)							40						35						40						35						
YELLOW CLEAR								4						3						4						3					
ALL RED CLEAR									4						4						4						4				
WALK INTERVAL							7												7									7			
PED CLEARANCE							16	4											16	4									15		
PED BUFFER									4												4									4	
DETECTOR							NON–LOCK						NON–LOCK						NON–LOCK						NON–LOCK			LOCK			
RECALL MODE							SOFT						OFF						SOFT						OFF			OFF			

CYCLE		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
DIAL	SEC.																											
AM	100				42	4	4				33	3	4				42	4	4				33	3	4			
AM W/PED	100				31	4	4				28	3	4				31	4	4				28	3	4	7	15	4
PM	90				40	4	4				35	3	4				40	4	4				35	3	4			
PM W/PED	100				30	4	4				29	3	4				30	4	4				29	3	4	7	15	4

SEQUENCE NOTES:

1. ANY PHASE NOT CALLED WILL BE SKIPPED. SIGNAL IDENTIFICATION WILL NOT CHANGE IF THE ASSIGNED RIGHT OF WAY DOES NOT CHANGE DURING THE NEXT PHASE CALLED.
2. • NORMALLY DON'T WALK, UPON PEDESTRIAN PUSH BUTTON ACTIVATION, WALK/FLASHING DON'T WALK (COUNTDOWN).
3. THE RIGHT–OF–WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON–CONFLICTING PHASES.
4. Ø/OL = PHASE IN DISPLAY / OVERLAPPING PHASE.
5. DIAL 1 (AM) = 06:30 – 09:00, M–F
   DIAL 2 (PM) = 15:00 – 18:00, M–F
   MAX1 = ALL OTHER TIMES
6. Ø9 SHOULD ONLY BE CALLED BY P3–4 OR P7–8
7. PHASE 9 SHALL ONLY BE ACTIVATED BY P3, P4, P7 AND P8.
8. COUNTDOWN PHASE OF PEDESTRIAN SIGNALS SHALL NOT OCCUR DURING THE WALK PERIOD.

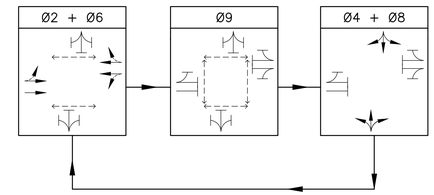
EMERGENCY VEHICLE PRE–EMPTION PHASING AND PRIORITY NOTES:

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. 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 FIVE (5) SECONDS OR UNTIL PRE–EMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME PRE–EMPTION PHASE CLEARANCE (4 SECONDS: YELLOW AND 2 SECONDS: ALL RED) AND SERVICE EMERGENCY VEHICLE PRE–EMPTION PHASE #2 (OR #1) IF NECESSARY, THEN TIME PHASE PRE–EMPTION CLEARANCE AND RESUME NORMAL SIGNAL OPERATION. EMERGENCY VEHICLE PRE–EMPTION PHASE #3 AND #4 SHALL BE SIMILARLY SERVED.
3. MINIMUM GREEN, NORMAL VEHICLE CLEARANCE, SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PRE–EMPTION DEMAND.
4. PREEMPTION STROBE SHALL BE ILLUMINATED WHENEVER ANY EMERGENCY VEHICLE PRE–EMPTION GREEN IS ON.

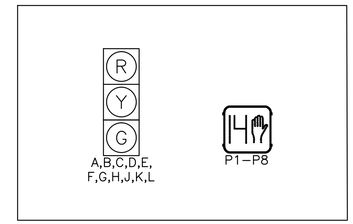
EMERGENCY VEHICLE PRE–EMPTION PHASING AND PRIORITY

DETECTOR AND PRIORITY	PRE–EMPT PHASE ASSIGNMENT	MOVEMENT	VEHICLE PHASE ASSIGNMENT
D1	1		Ø2
D2	2		Ø6
D3	3		Ø8
D4	4		Ø4

PREFERENTIAL PHASING SEQUENCE



SIGNAL DISPLAY



SIGNAL DISPLAY NOTES:

1. ALL SIGNAL DISPLAYS SHALL BE EQUIPPED W/ LED MODULES (12–INCH LENS)
2. ALL SIGNAL HEADS SHALL BE RIGID MOUNTED AND EQUIPPED WITH ±5" LOUVERED BACKPLATES.
3. ALL PEDESTRIAN SIGNAL HEADS SHALL HAVE PEDESTRIAN COUNTDOWN TIMER AND EGG–CRATE VISOR.

DETECTOR OPERATION

DETECTOR NUMBER	NUMBER OF SECTION/SIZE	PROCESSOR NUMBER	CHANNEL NUMBER	Ø CALLED	Ø EXTENSION	OPERATION	DELAY (SECONDS)	EXTENSION (SECONDS)
V1	9'x50'	1	1	2	2	PRESENCE	0	0
V2	9'x50'	1	1	2	2	PRESENCE	0	0
V3	4'x8'	1	1	2	2	PRESENCE	0	0
V4	9'x50'	1	2	6	6	PRESENCE	0	0
V5	9'x50'	1	2	6	6	PRESENCE	0	0
V6	6'x10'	1	2	6	6	PRESENCE	0	0
V7	1–9'x20' 1–9'x40'	2	1	8	8	PRESENCE	0	0
V8	10'x50'	2	2	4	4	PRESENCE	0	0

DETECTOR OPERATION NOTES:

1. DELAY TIME SHALL BE EFFECTIVE ONLY DURING THE RED PORTION OF THE PHASE THAT IS CALLED AT THE DETECTOR.

NOTES:

1. ALL PROPOSED SIGNAL HEADS MUST BE AT LEAST 10 FEET FROM THE POWERED MBTA TROLLEY WIRES AND 5 FEET FROM THEIR SUPPORT CABLES. (SEE TYPE B MAST ARM DETAIL, SHEET 146)
2. REMOVE AND STACK ALL EXISTING TRAFFIC SIGNAL EQUIPMENT.
3. REMOVE ALL PULL BOXES AND ABANDON EXISTING TRAFFIC SIGNAL CONDUIT SYSTEM.
4. MINIMUM 36" CLEARANCE EXCLUDING CURB WIDTH IS REQUIRED ON ALL SIDEWALKS.
5. VIDEO DETECTION AREAS ARE SHOWN ON THE PLANS GRAPHICALLY AND SHOULD BE ADJUSTED IN THE FIELD FOR PROPER DETECTION.
6. REFER TO SHEET NO. 161 FOR TRAFFIC SEQUENCE PLAN.
7. REFER TO SHEET NOS. 164 TO 168 FOR MAST ARM FOUNDATION.
8. REFER TO SHEET NO. 130 FOR COMPLETE PAVEMENT MARKING AND SIGNING PLAN.
9. PUSH BUTTONS SHALL BE LOCATED NO MORE THAN 10" HORIZONTALLY FROM A LEVEL SURFACE (≤1.5%).
10. THREE TEMPORARY TRAFFIC SIGNALS WILL BE REQUIRED.
11. LOCATION OF MBTA OVERHEAD WIRE IS APPROXIMATE ONLY.

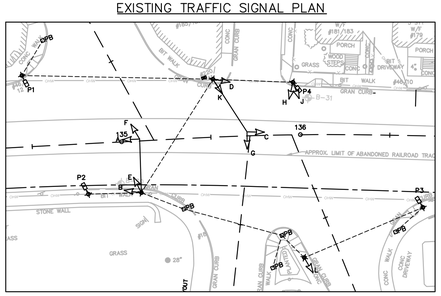
MAJOR ITEMS REQUIRED

QTY	ITEM 816.13
1	TRAFFIC SIGNAL CONTROLLER (TS-2, TYPE 1) W/ 8DW BASE MOUNTED CABINET AND FOUNDATION PAD
1	30' MAST ARM TYPE B (STEEL), INCL. BASE & FNDN
1	35' MAST ARM TYPE B (STEEL), INCL. BASE & FNDN
9	8' TRAFFIC SIGNAL POST, BASE & FOUNDATION
3	1-WAY, 3-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
4	2-WAY, 3-SECTION SIGNAL HEAD, 12" L.E.D. LENS (W/VISORS)
11	±5" LOUVERED BACKPLATES
10	PEDESTRIAN SIGNAL HEAD W/ EGG-CRATE VISOR (L.E.D. W/ COUNTDOWN)
9	ACCESSIBLE PEDESTRIAN PUSH BUTTON ASSEMBLY W/SIGN
4	12" x 12" PULL BOXES*
1	12" x 24" PULL BOXES*
5	VIDEO DETECTION CAMERAS
5	VIDEO CAMERA MAST ARM MOUNTING BRACKET
2	VIDEO DETECTION PROCESSOR - TWO CHANNEL
5	OPTICAL PRE-EMPTION DETECTORS SINGLE CHANNEL
1	EMERGENCY VEHICLE PRE-EMPTION CONFIRMATION STROBE LIGHT (WHITE)
1	OPTICAL PHASE SELECTOR TWO CHANNEL
1	OPTICAL PHASE SELECTOR TWO CHANNEL
1	SERVICE CONNECTION (OVERHEAD)

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

* TO BE PAID UNDER ITS RESPECTIVE PAY ITEM.

EXISTING TRAFFIC SIGNAL PLAN



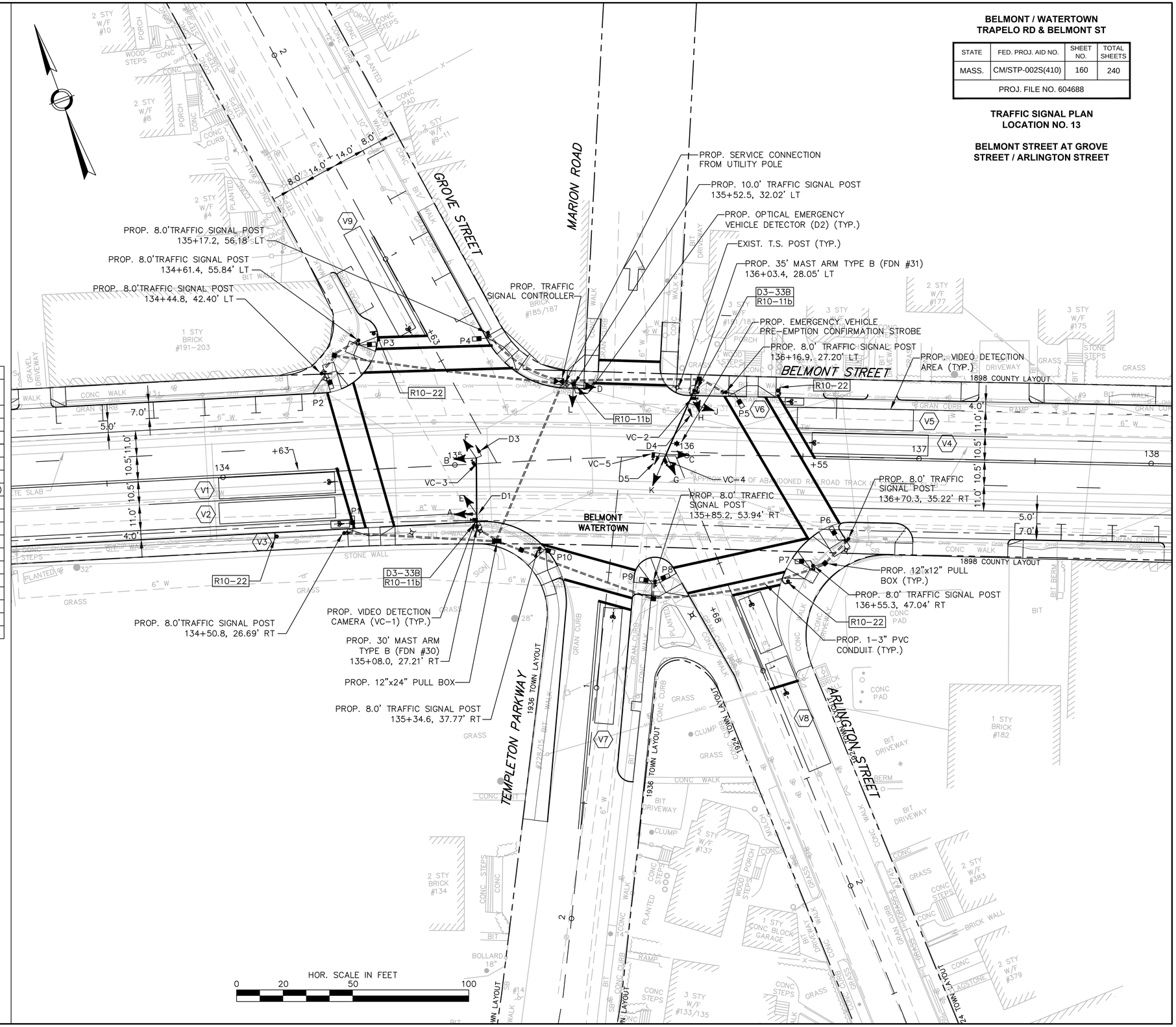
HOR. SCALE IN FEET
0 40 100 200

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	160	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 13

BELMONT STREET AT GROVE STREET / ARLINGTON STREET



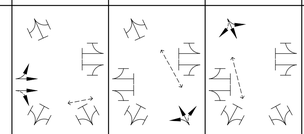
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	161	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL PLAN
LOCATION NO. 13

BELMONT STREET AT GROVE STREET / ARLINGTON STREET

SEQUENCE AND TIMING CHART



STREET	DIR.	FACE	Ø/OL	PHASE 1 R/W	PHASE 1 CL1	PHASE 1 CL2	PHASE 2 R/W	PHASE 2 CL1	PHASE 2 CL2	PHASE 3 R/W	PHASE 3 CL1	PHASE 3 CL2	PHASE 4 R/W	PHASE 4 CL1	PHASE 4 CL2	PHASE 5 R/W	PHASE 5 CL1	PHASE 5 CL2	PHASE 6 R/W	PHASE 6 CL1	PHASE 6 CL2	PHASE 7 R/W	PHASE 7 CL1	PHASE 7 CL2	PHASE 8 R/W	PHASE 8 CL1	PHASE 8 CL2	PHASE 9 R/W	PHASE 9 CL1	PHASE 9 CL2	EMERGENCY FLASH OPERATION
				SEQUENCE																											
BELMONT ST	EB	A,B	2				G	Y	R	R	R	R	R	R	R				R	R	R				R	R	R				FY
BELMONT ST	WB	C,D,J	6				R	R	R	R	R	R	R	R	R				G	Y	R				R	R	R				FY
GROVE ST	SB	E,F	4				R	R	R	R	R	R	G	Y	R				R	R	R				R	R	R				FR
ARLINGTON ST	NB	G,H	3				R	R	R	G	Y	R	R	R	R				R	R	R				R	R	R				FR
TEMPLETON PKWY	NB	K,L	8				R	R	R	R	R	R	R	R	R				R	R	R				G	Y	R				FR
PEDESTRIAN		P1–P2					✋	✋	✋	✋	✋	✋	•	✋	✋				✋	✋	✋				✋	✋	✋				OFF
PEDESTRIAN		P3–P4					✋	✋	✋	✋	✋	✋	✋	✋	✋				•	✋	✋				✋	✋	✋				OFF
PEDESTRIAN		P5–P6					✋	✋	✋	•	✋	✋	✋	✋	✋				✋	✋	✋				✋	✋	✋				OFF
PEDESTRIAN		P7–P8					•	✋	✋	✋	✋	✋	✋	✋	✋				✋	✋	✋				✋	✋	✋				OFF
PEDESTRIAN		P9–P10					•	✋	✋	✋	✋	✋	✋	✋	✋				✋	✋	✋				✋	✋	✋				OFF
															TIMING IN SECONDS																
MINIMUM GREEN							12			6			6						12						6						
VEHICLE INTERVAL							2			2			2						2						2						
MAXIMUM GREEN I (ALL OTHER TIMES)							30			24			25						30						25						
MAXIMUM GREEN II (AM & PM)							35			27			31						35						31						
YELLOW CLEAR								4			3			3						4						3					
ALL RED CLEAR									4			4			4						4						4				
WALK INTERVAL							7			7			7						7												
PED CLEARANCE							12	4		17	3		14	3					16	4						3					
PED BUFFER									4			4			4						4						4				
DETECTOR							NON–LOCK			NON–LOCK			NON–LOCK						NON–LOCK						NON–LOCK						
RECALL MODE							SOFT			OFF			OFF						SOFT						OFF						

CYCLE				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
DIAL	SEC.																													
AM	100						35	4	4	12	3	4	31	3	4				35	4	4				31	3	4			
AM W/PED	100						28	4	4	23	3	4	27	3	4				28	4	4				27	3	4			
PM	100						33	4	4	26	3	4	19	3	4				33	4	4				19	3	4			
PM W/PED	100						31	4	4	26	3	4	21	3	4				31	4	4				21	3	4			

SEQUENCE NOTES:

1. ANY PHASE NOT CALLED WILL BE SKIPPED. SIGNAL IDENTIFICATION WILL NOT CHANGE IF THE ASSIGNED RIGHT OF WAY DOES NOT CHANGE DURING THE NEXT PHASE CALLED.
2. • NORMALLY DON'T WALK, UPON PEDESTRIAN PUSH BUTTON ACTIVATION, WALK/FLASHING DON'T WALK (COUNTDOWN).
3. THE RIGHT–OF–WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON–CONFLICTING PHASES.
4. Ø/OL = PHASE IN DISPLAY / OVERLAPPING PHASE.
5. DIAL 1 (AM) = 06:30 – 09:00, M–F
   DIAL 2 (PM) = 15:00 – 18:00, M–F
   MAX1 = ALL OTHER TIMES
6. COUNTDOWN PHASE OF PEDESTRIAN SIGNALS SHALL NOT OCCUR DURING THE WALK PERIOD.

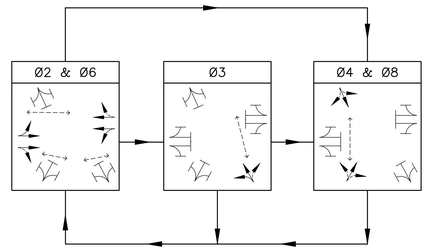
EMERGENCY VEHICLE PRE–EMPTION PHASING AND PRIORITY NOTES:

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. IN RESPONSE TO A PRE–EMPTION SIGNAL RECEIVED AT AN INTERSECTION BY OPTICAL DETECTOR D1 (OR D2, D3, D4, D5) 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 FIVE (5) SECONDS OR UNTIL PRE–EMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME PRE–EMPTION PHASE CLEARANCE (4 SECONDS: YELLOW AND 2 SECONDS: ALL RED) AND SERVICE EMERGENCY VEHICLE PRE–EMPTION PHASE #2 (OR #1) IF NECESSARY, THEN TIME PHASE PRE–EMPTION CLEARANCE AND RESUME NORMAL SIGNAL OPERATION. EMERGENCY VEHICLE PRE–EMPTION PHASE #3, #4 AND #5 SHALL BE SIMILARLY SERVED.
3. MINIMUM GREEN, NORMAL VEHICLE CLEARANCE, SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PRE–EMPTION DEMAND.
4. PREEMPTION STROBE SHALL BE ILLUMINATED WHENEVER ANY EMERGENCY VEHICLE PRE–EMPTION GREEN IS ON.

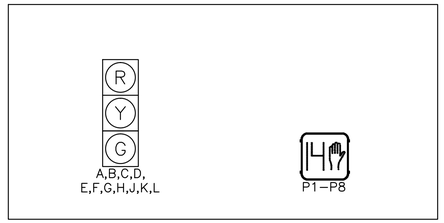
EMERGENCY VEHICLE PRE–EMPTION PHASING AND PRIORITY

DETECTOR AND PRIORITY	PRE–EMPT PHASE ASSIGNMENT	MOVEMENT	VEHICLE PHASE ASSIGNMENT
D1	1		Ø2
D2	2		Ø6
D3	3		Ø4
D4	4		Ø3
D5	5		Ø8

PREFERENTIAL PHASING SEQUENCE



SIGNAL DISPLAY



SIGNAL DISPLAY NOTES:

1. ALL SIGNAL DISPLAYS SHALL BE EQUIPPED W/ LED MODULES (12–INCH LENS)
2. ALL SIGNAL HEADS SHALL BE RIGID MOUNTED AND EQUIPPED WITH ±5" LOUVERED BACKPLATES.
3. ALL PEDESTRIAN SIGNAL HEADS SHALL HAVE PEDESTRIAN COUNTDOWN TIMER AND EGG–CRATE VISOR.

DETECTOR OPERATION

DETECTOR NUMBER	NUMBER OF SECTION/SIZE	PROCESSOR NUMBER	CHANNEL NUMBER	Ø CALLED	Ø EXTENSION	OPERATION	DELAY (SECONDS)	EXTENSION (SECONDS)
V1	9'x50'	1	1	2	2	PRESENCE	0	0
V2	9'x50'	1	1	2	2	PRESENCE	0	0
V3	3'x8'	1	1	2	2	PRESENCE	0	0
V4	9'x50'	1	2	6	6	PRESENCE	0	0
V5	9'x50'	1	2	6	6	PRESENCE	0	0
V6	3'x8'	1	2	6	6	PRESENCE	0	0
V7	8'x50'	2	1	8	8	PRESENCE	0	0
V8	10'X25' 10'x50'	2	1	3	3	PRESENCE	0	0
V9	8'x50'	2	2	4	4	PRESENCE	0	0

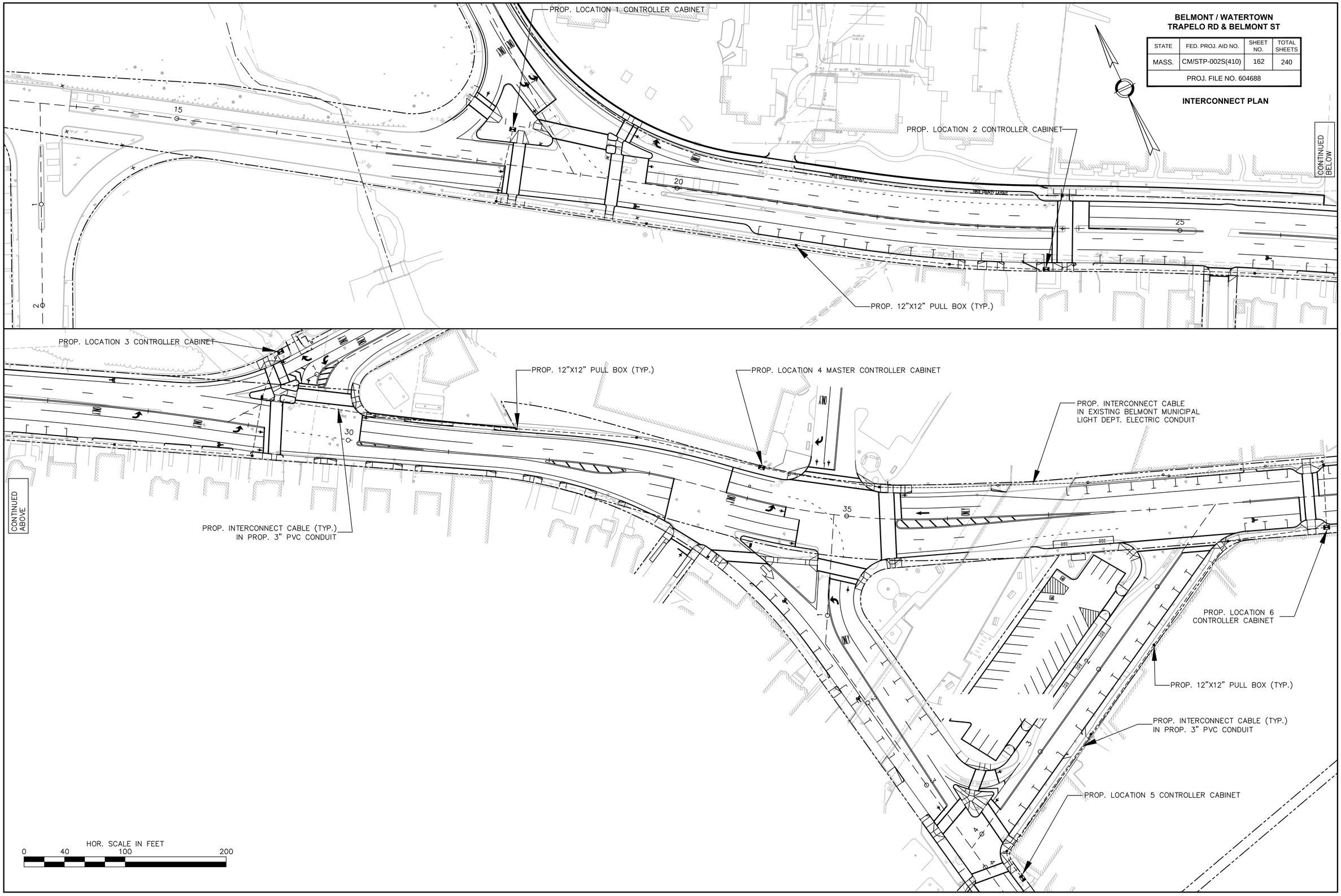
DETECTOR OPERATION NOTES:

1. DELAY TIME SHALL BE EFFECTIVE ONLY DURING THE RED PORTION OF THE PHASE THAT IS CALLED AT THE DETECTOR.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	162	240
PROJ. FILE NO. 604688			

INTERCONNECT PLAN

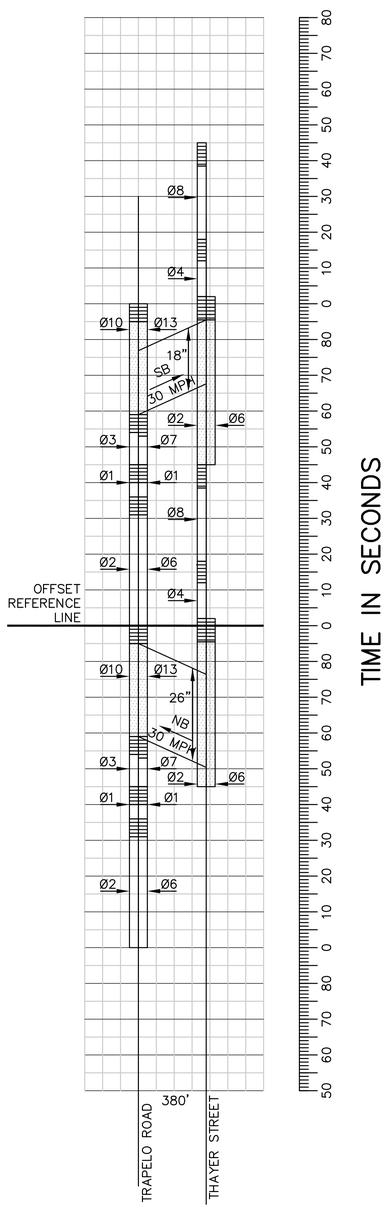


BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	163	240
PROJ. FILE NO. 604688			

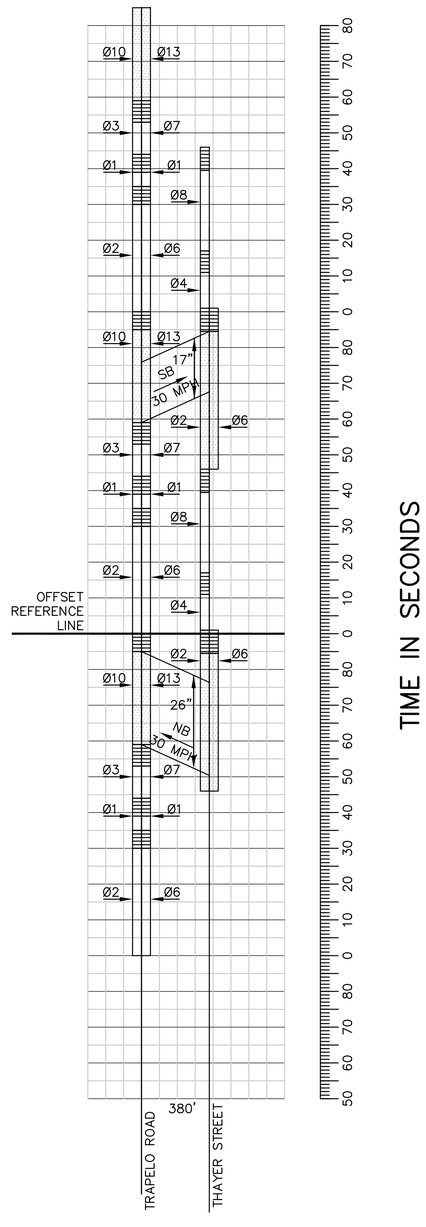
TIME SPACE DIAGRAM

LEXINGTON STREET
90 SECOND CYCLE (AM)



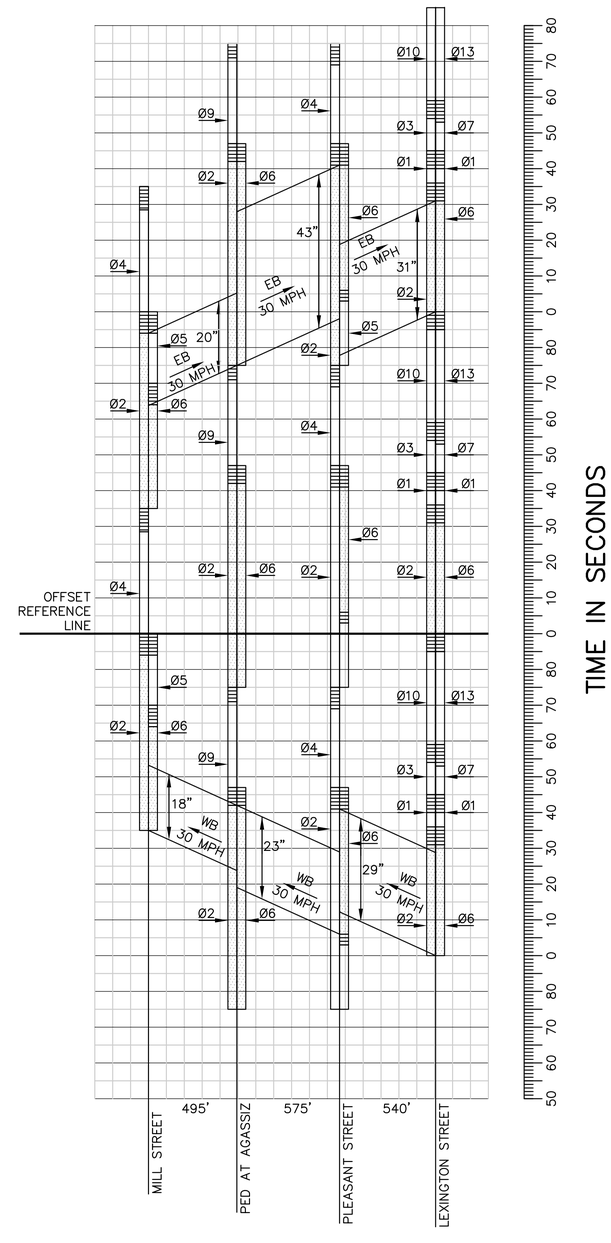
LEXINGTON STREET

LEXINGTON STREET
90 SECOND CYCLE (PM)



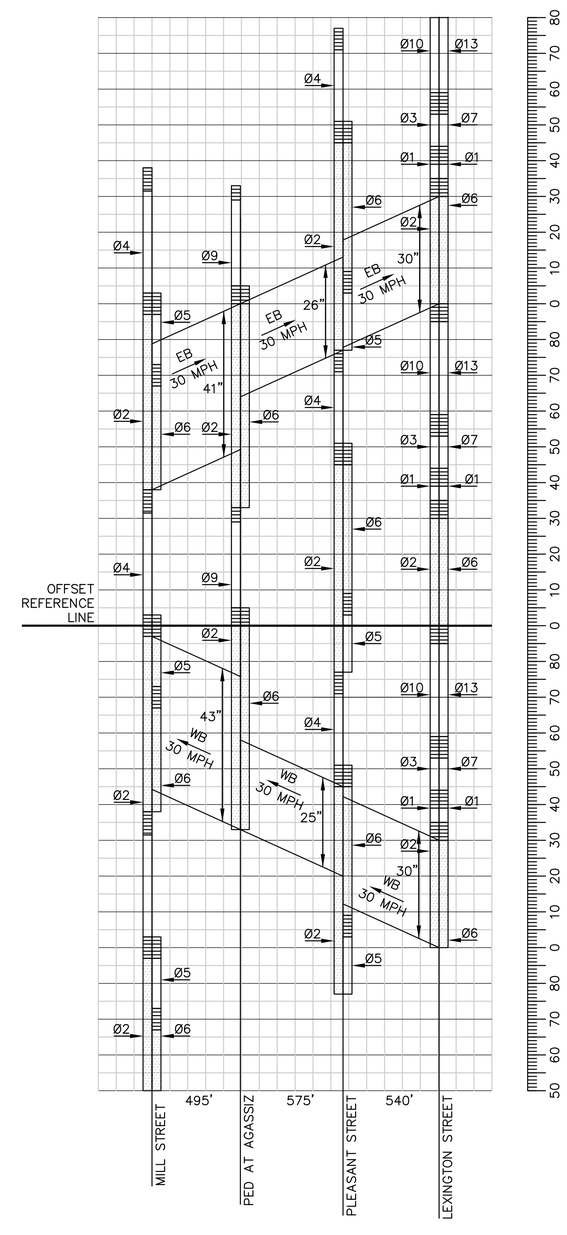
LEXINGTON STREET

TRAPELO ROAD
90 SECOND CYCLE (AM)



TRAPELO ROAD

TRAPELO ROAD
90 SECOND CYCLE (PM)



TRAPELO ROAD

SCALE IN FEET
0 400 800 1600

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	164	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL DETAILS

INDEX

SHEET NO.	DESCRIPTION
1	Title Sheet
2	Light, Medium & Short Span Load Diagrams
3	Heavy Load Diagrams
4	Details
5	Cored Pier Foundations

THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, HIGHWAY DIVISION 1988 STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, THE ENGLISH EDITION OF SUPPLEMENTAL SPECIFICATIONS DATED JUNE 6, 2006, THE AMENDMENTS TO THE STANDARD AND SUPPLEMENTAL SPECIFICATIONS, THE 1977 CONSTRUCTION STANDARDS, THE ENGLISH EDITION OF SUPPLEMENTAL DRAWINGS DATED APRIL 2003, THE 2001 "STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS" WITH LATEST REVISIONS, THE 2003 "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS" WITH LATEST REVISIONS, THE 1990 "STANDARD DRAWINGS FOR SIGNS AND SUPPORTS," AND THE 2004 EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK, WILL GOVERN.

MAST ARM & FOUNDATION

Details Standard Drawings

NOTES

1. For these standard drawings the Design Wind Speed for all Mast Arm Structures shall be **130 MPH**.

2. For these standard drawings the Design Wind Speed for mast arm foundations located in the following counties: Plymouth, Bristol, Barnstable, Dukes, and Nantucket counties in District 5 and Berkshire county in District 1 shall be **130 MPH**. The design wind speed for mast arm foundations for the remainder of the state shall be **110 MPH.**

3. For these standard drawings the mast arm structure design life shall be 25 years.

4. For these standard drawings the Fatigue Category no. 2 was used and truck induced gusts were excluded in the design.

5. These standard drawings do not apply for mast arm structures at intersections with an ADT greater than 40,000 vehicles and a truck percentage of greater than 10%. The responsibility for the design of mast structures and foundations will rest with the design engineer. The structure design life will be 50 years and the fatigue category shall be no. 1. The design wind speed criteria shall be as shown in Notes Nos. 1 & 2. The design will be submitted to MassDOT for review and comment.

6. For strain pole, dual mast arm designs, or mast arms longer than 45 feet, notes 1, 2, 3 and 4 will apply, if ADT (>40,000 vehicles) and truck percentage (10%) criterion is met, note 5 design criteria (50 year design life, fatigue category no. 1, wind design speed notes 1 and 2) will apply. The responsibility for the design of these structures and foundations will rest with the design engineer. The design will be submitted to MassDOT for review and comment.

NO.	REVISION	DATE

Moving Massachusetts Forward.
massDOT
Highway

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISON

RECOMMENDED FOR APPROVAL

Neil E. Boudreau 2/11/11
TRAFFIC ENGINEER DATE

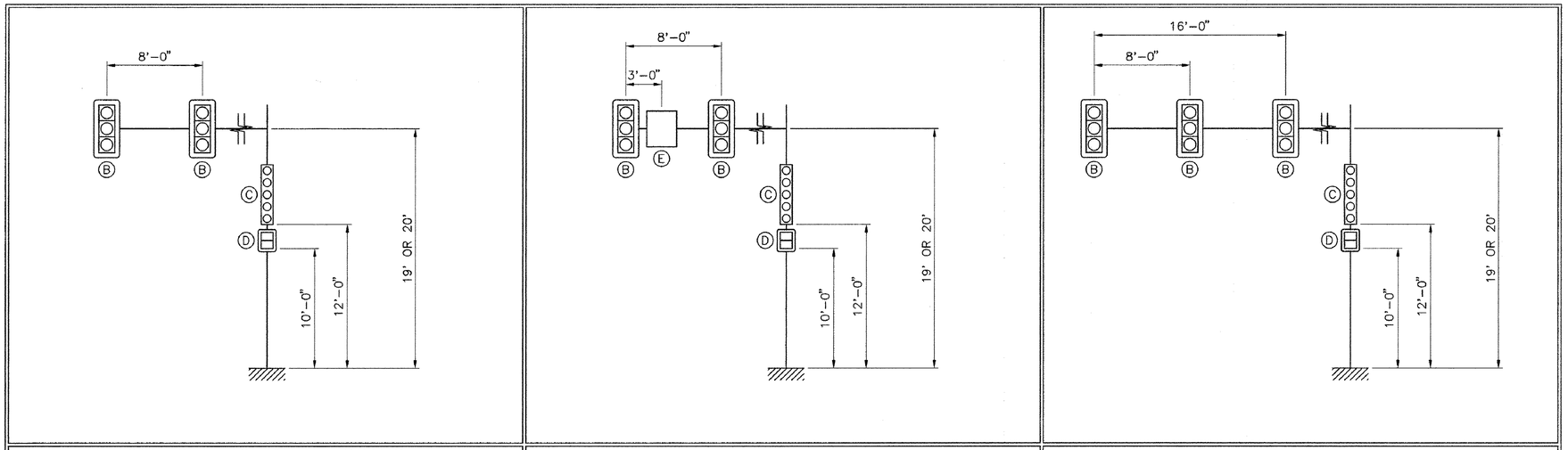
2/17/11
BRIDGE ENGINEER DATE

Frank A. Tramontozzi 2/24/2011
CHIEF ENGINEER DATE

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

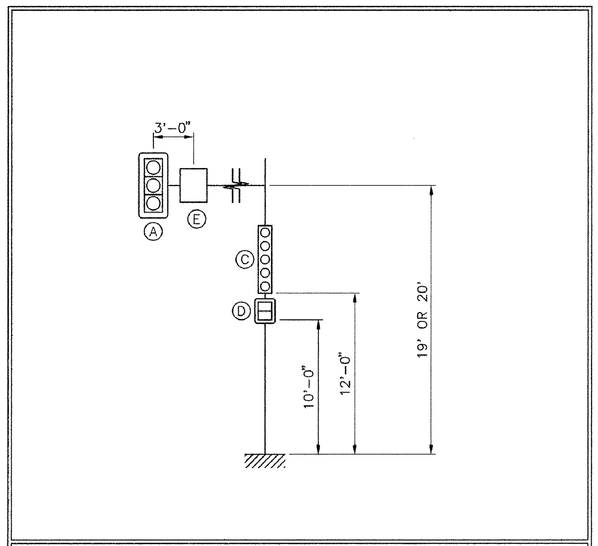
STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	165	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL DETAILS



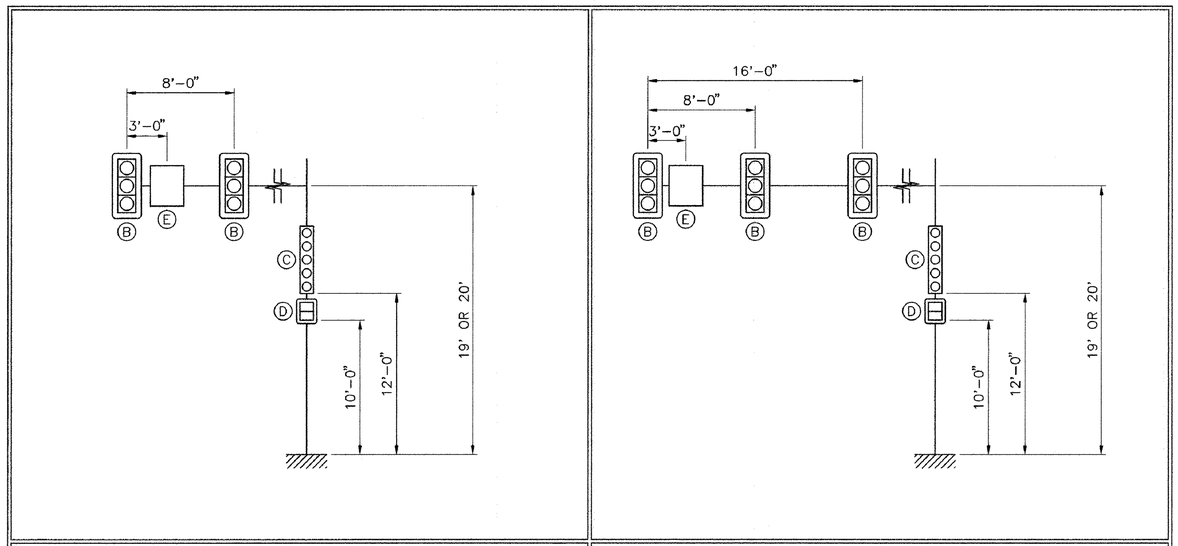
20', 25', 40' & 45' SPANS | 30' SPAN | 35' SPAN

LOAD DEFINITIONS – LIGHT LOADS



15' SPAN

SHORT SPAN LOADING



20' & 25' SPANS | 30', 35', 40' & 45' SPANS

LOAD DEFINITIONS – MEDIUM LOADS

DEVICE	DESCRIPTION	PROJ. AREA (FT~2)	WEIGHT (LBS)
A	3 SECTION, 3 WAY SIGNAL	13.50	202
B	3 SECTION, 1 WAY SIGNAL	8.67	74
C	5 SECTION, 1 WAY SIGNAL	13.33	110
D	DUAL PEDESTRIAN SIGNAL	8.00	80
E	30" X 36" REGULATORY SIGN	7.50	23

NOTE: ALL SIGNALS HAVE 5.0" BACKPLATES

MONTH_DD,_YYYY	ISSUED FOR CONSTRUCTION

Moving Massachusetts Forward.
massDOT Highway

STANDARD DRAWINGS

TYPE II MAST ARMS
LIGHT, MEDIUM & SHORT SPAN
LOAD DIAGRAMS

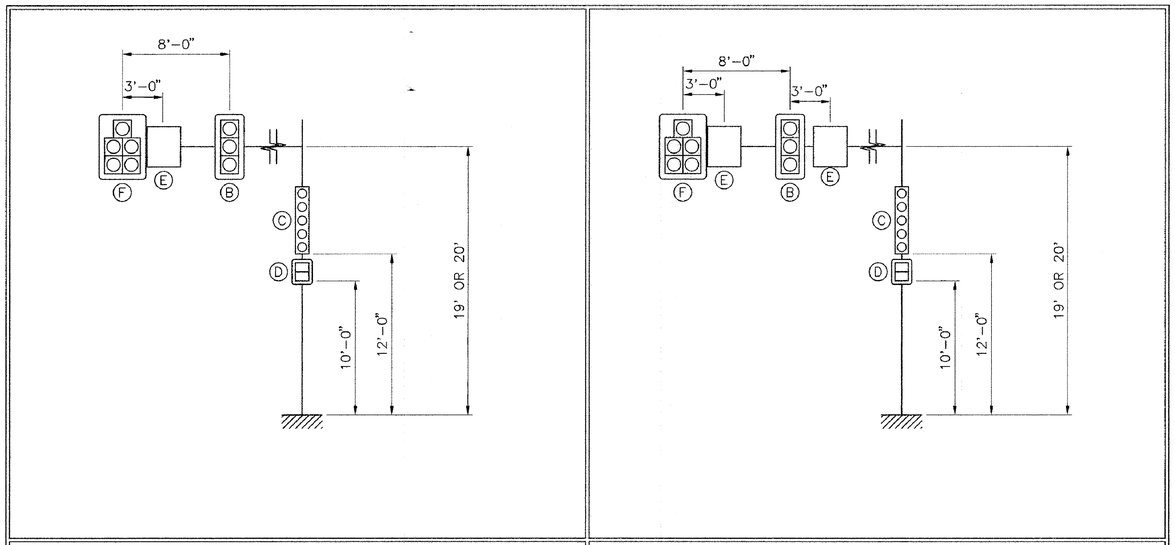
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

2/24/2011
CHIEF ENGINEER
BRIDGE ENGINEER
TRAFFIC ENGINEER

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

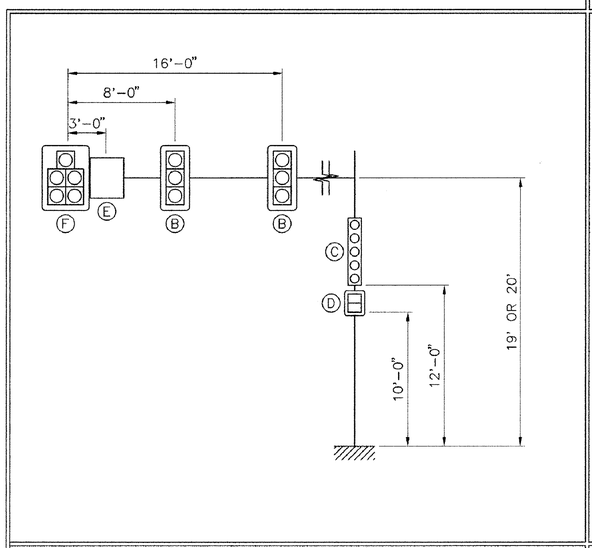
STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	166	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL DETAILS

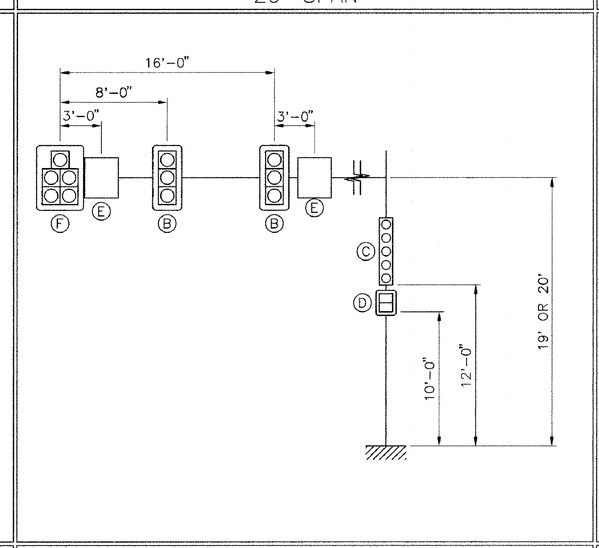


20' SPAN

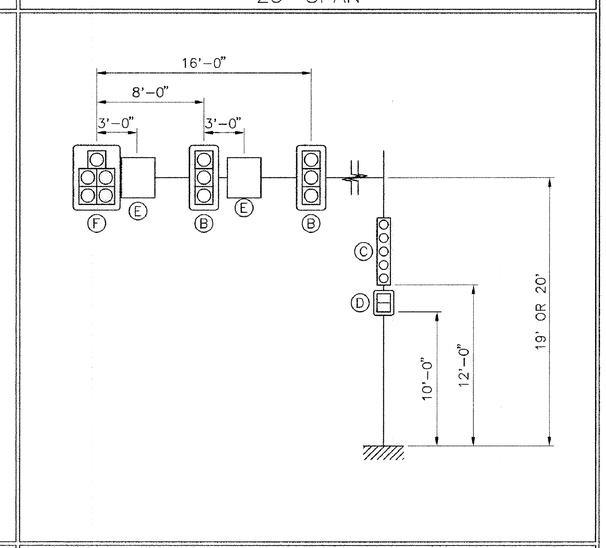
25' SPAN



30' SPAN



35' SPAN



40' & 45' SPANS

LOAD DEFINITIONS – HEAVY LOADS

DEVICE	DESCRIPTION	PROJ. AREA (FT~2)	WEIGHT (LBS)
A	3 SECTION, 3 WAY SIGNAL	18.29	202
B	3 SECTION, 1 WAY SIGNAL	8.67	74
C	5 SECTION, 1 WAY SIGNAL	13.33	110
D	DUAL PEDESTRIAN SIGNAL	8.00	80
E	30" X 36" REGULATORY SIGN	7.50	23
F	5 SECTION, 2 WAY SIGNAL	21.95	215

NOTE: ALL SIGNALS HAVE 5.0" BACKPLATES

MONTH_DD,_YYYY	ISSUED FOR CONSTRUCTION

massDOT Highway

STANDARD DRAWINGS

TYPE II MAST ARMS
HEAVY LOAD DIAGRAMS

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

2/24/2011
CHIEF ENGINEER

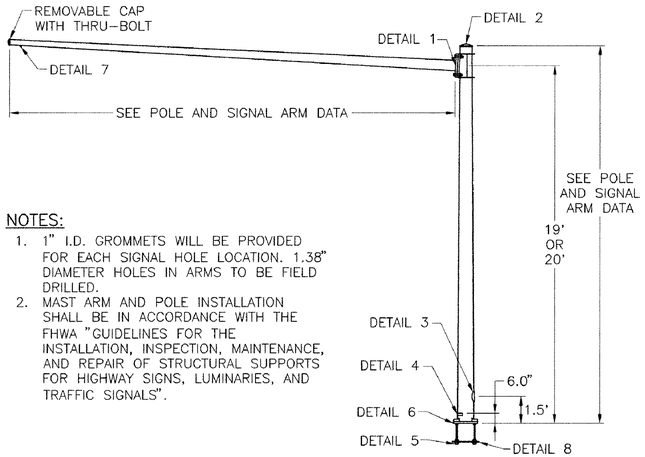
BRIDGE ENGINEER

TRAFFIC ENGINEER

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

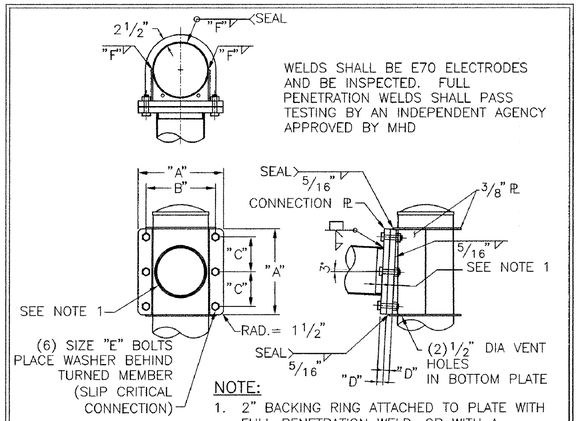
STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	167	240
PROJ. FILE NO. 604688			

TRAFFIC SIGNAL DETAILS



NOTES:
1. 1" I.D. GROMMETS WILL BE PROVIDED FOR EACH SIGNAL HOLE LOCATION. 1.38" DIAMETER HOLES IN ARMS TO BE FIELD DRILLED.
2. MAST ARM AND POLE INSTALLATION SHALL BE IN ACCORDANCE WITH THE FHWA "GUIDELINES FOR THE INSTALLATION, INSPECTION, MAINTENANCE, AND REPAIR OF STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES, AND TRAFFIC SIGNALS".

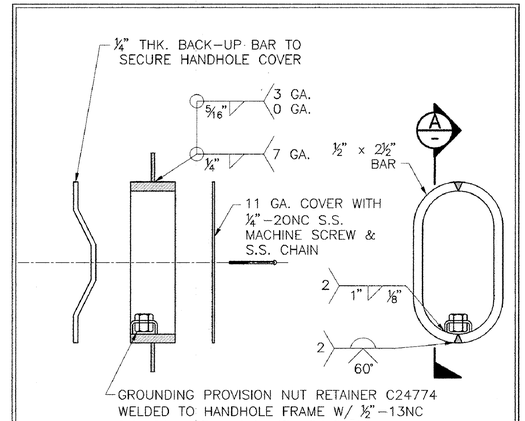
MAST ARM ELEVATION



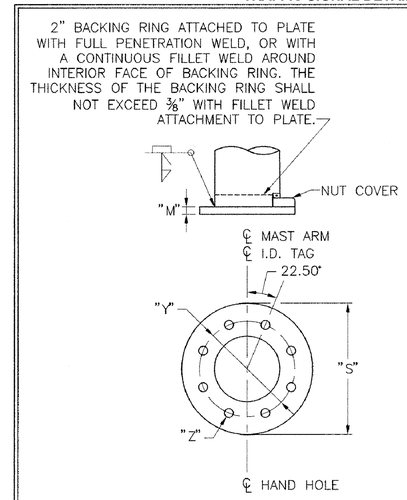
WELDS SHALL BE E70 ELECTRODES AND BE INSPECTED. FULL PENETRATION WELDS SHALL PASS TESTING BY AN INDEPENDENT AGENCY APPROVED BY MHD

NOTE:
1. 2" BACKING RING ATTACHED TO PLATE WITH FULL PENETRATION WELD, OR WITH A CONTINUOUS FILLET WELD AROUND INTERIOR FACE OF BACKING RING. THE THICKNESS OF THE BACKING RING SHALL NOT EXCEED 3/8" WITH FILLET WELD ATTACHMENT TO PLATE.

DETAIL 1 | SIGNAL ARM ATTACHMENT



DETAIL 3 | 4"x8" HANDHOLE

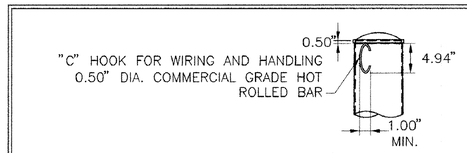


DETAIL 6 | POLE BASE

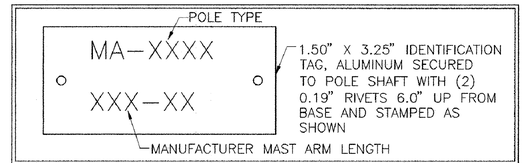
MATERIAL DATA

COMPONENT	DESIGNATION	YIELD (KSI)	COMPONENT	DESIGNATION	YIELD (KSI)
POLE TUBE	ASTM A595 GR. A	55	ARM TUBE	ASTM A595 GR. A	55
POLE BASE PLATE	AASHTO M270	50	ARM CONNECTION PLATE	AASHTO M270	50
ANCHOR BOLTS	AASHTO M314	55	ARM CONNECTING BOLTS	AASHTO M164 **	
GALVANIZING	AASHTO M111 OR M232				

** BOLTS WHICH ACCUMULATE RUST OR DIRT SHALL BE DISCARDED.



DETAIL 2 | POLE TOP



DETAIL 4 | I.D. TAG

POLE AND SIGNAL ARM DATA – LIGHT LOADS

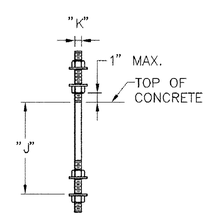
LOCATIONS	SIGNAL ARM TUBE				POLE TUBE				POLE BASE				ANCHOR BOLT		SIGNAL ARM ATTACHMENT DATA					
	SPAN (FT)	FIXED END DIA. (IN)	FREE END DIA. (IN)	WALL THK.	BASE DIA. (IN)	TOP DIA. (IN)	LENGTH (FT)	WALL THK.	PLATE CIRCLE "S" (IN)	BOLT CIRCLE "Y" (IN)	THK. "M" (IN)	HOLE "Z" (IN)	DIA. "K" (IN)	EMBED. LENGTH "J" (IN)	"A" (IN)	"B" (IN)	"C" (IN)	"D" (IN)	"E" (IN)	"F" (IN)
	15.00	9.00	6.90	7 GA.	12.00	9.06	21.00	7 GA.	29.50	24.00	1.50	1.813	1.50	36.00	19.00	15.00	7.50	1.00	1.00	0.188
	20.00	9.00	6.20	7 GA.	12.00	9.06	21.00	7 GA.	29.50	24.00	1.50	1.813	1.50	36.00	19.00	15.00	7.50	1.00	1.00	0.188
	25.00	10.00	6.50	7 GA.	13.00	10.06	21.00	7 GA.	29.50	24.00	1.50	1.813	1.50	36.00	20.00	16.00	8.00	1.00	1.00	0.188
	30.00	12.50	8.30	3 GA.	15.50	12.56	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	23.50	19.00	9.50	1.25	1.25	0.250
	35.00	13.00	8.10	3 GA.	16.00	13.06	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	24.50	20.00	10.00	1.25	1.25	0.250
	40.00	13.00	7.40	3 GA.	16.00	13.06	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	24.50	20.00	10.00	1.25	1.25	0.250
	45.00	13.50	7.20	3 GA.	16.50	13.56	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	27.50	22.00	11.00	1.50	1.50	0.313

POLE AND SIGNAL ARM DATA – MEDIUM LOADS

LOCATIONS	SIGNAL ARM TUBE				POLE TUBE				POLE BASE				ANCHOR BOLT		SIGNAL ARM ATTACHMENT DATA					
	SPAN (FT)	FIXED END DIA. (IN)	FREE END DIA. (IN)	WALL THK.	BASE DIA. (IN)	TOP DIA. (IN)	LENGTH (FT)	WALL THK.	PLATE CIRCLE "S" (IN)	BOLT CIRCLE "Y" (IN)	THK. "M" (IN)	HOLE "Z" (IN)	DIA. "K" (IN)	EMBED. LENGTH "J" (IN)	"A" (IN)	"B" (IN)	"C" (IN)	"D" (IN)	"E" (IN)	"F" (IN)
	15.00	9.00	6.90	7 GA.	12.00	9.06	21.00	7 GA.	29.50	24.00	1.50	1.813	1.50	36.00	19.00	15.00	7.50	1.00	1.00	0.188
	20.00	10.00	7.20	3 GA.	13.00	10.06	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	20.00	16.00	8.00	1.00	1.00	0.250
	25.00	11.00	7.50	3 GA.	14.00	11.06	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	23.50	19.00	9.50	1.25	1.25	0.250
	30.00	13.00	8.80	3 GA.	16.00	13.06	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	23.50	19.00	9.50	1.25	1.25	0.250
	35.00	14.00	9.10	3 GA.	17.00	14.06	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	27.50	22.00	11.00	1.50	1.50	0.250
	40.00	15.00	9.40	3 GA.	18.00	15.06	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	27.50	22.00	11.00	1.50	1.50	0.250
	45.00	16.00	9.70	0 GA.	19.00	16.06	21.00	0 GA.	29.50	24.00	1.50	1.813	1.50	36.00	29.50	24.00	12.00	1.75	1.50	0.313

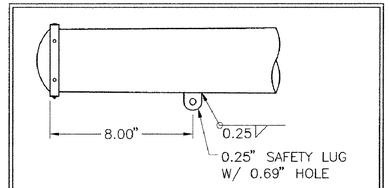
POLE AND SIGNAL ARM DATA – HEAVY LOADS

LOCATIONS	SIGNAL ARM TUBE				POLE TUBE				POLE BASE				ANCHOR BOLT		SIGNAL ARM ATTACHMENT DATA					
	SPAN (FT)	FIXED END DIA. (IN)	FREE END DIA. (IN)	WALL THK.	BASE DIA. (IN)	TOP DIA. (IN)	LENGTH (FT)	WALL THK.	PLATE CIRCLE "S" (IN)	BOLT CIRCLE "Y" (IN)	THK. "M" (IN)	HOLE "Z" (IN)	DIA. "K" (IN)	EMBED. LENGTH "J" (IN)	"A" (IN)	"B" (IN)	"C" (IN)	"D" (IN)	"E" (IN)	"F" (IN)
	15.00	9.00	6.90	7 GA.	12.00	9.06	21.00	7 GA.	29.50	24.00	1.50	1.813	1.50	36.00	19.00	15.00	7.50	1.00	1.00	0.188
	20.00	12.50	9.70	3 GA.	15.50	12.56	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	24.00	19.00	9.50	1.25	1.25	0.250
	25.00	14.00	10.50	3 GA.	17.00	14.06	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	27.50	22.00	11.00	1.50	1.50	0.250
	30.00	15.50	11.30	3 GA.	18.50	15.56	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	27.50	22.00	11.00	1.50	1.50	0.250
	35.00	16.50	11.60	0 GA.	19.50	16.56	21.00	0 GA.	34.50	28.00	1.75	2.063	1.75	36.00	29.50	24.00	12.00	1.75	1.50	0.313
	40.00	17.50	11.90	0 GA.	20.50	17.56	21.00	0 GA.	34.50	28.00	1.75	2.063	1.75	36.00	29.50	24.00	12.00	1.75	1.50	0.313
	45.00	18.50	12.20	0 GA.	21.50	18.56	21.00	0 GA.	34.50	28.00	1.75	2.063	1.75	36.00	31.50	26.00	13.00	2.00	1.50	0.313

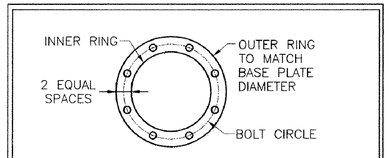


(8) ANCHOR BOLTS WITH (4) HEX NUTS, (4) FLAT WASHERS, AND (1) LOCK-WASHER PER BOLT.

DETAIL 5 | ANCHOR BOLT



DETAIL 7 | SAFETY HANGER LUG



DETAIL 8 | ANCHOR PLATE

MONTH_DD,_YYYY	ISSUED FOR CONSTRUCTION

massDOT Highway

STANDARD DRAWINGS

TYPE II MAST ARMS DETAILS

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

Frank A. Tramontozzi 2/24/2011
CHIEF ENGINEER

BRIDGE ENGINEER | TRAFFIC ENGINEER

PIER FOUNDATIONS FOR 110 MPH WIND SPEED ZONE

LIGHT LOADING CONDITIONS

SOIL TYPE	15' & 20' MAST ARMS			25' & 30' MAST ARMS			35' & 40' MAST ARMS			45' MAST ARMS			
	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	
DRY SAND	3'-6"	6'-0"	18-#8	3'-6"	8'-0"	18-#8	3'-6"	8'-0"	18-#8	3'-6"	9'-0"	18-#8	FDN #32
WET SAND	3'-6"	7'-0"	18-#8	3'-6"	9'-0"	18-#8	3'-6"	9'-0"	18-#8	3'-6"	9'-0"	18-#8	FDNS #1,2,5,6,10,11*,13,14,17*,18*,25*,26*,27*
CLAY (MEDIUM STIFF)	3'-6"	11'-0"	18-#8	3'-6"	12'-0"	18-#8	3'-6"	12'-0"	18-#8	3'-6"	12'-0"	18-#8	
ALLUVIAL	3'-6"	8'-0"	18-#8	3'-6"	10'-0"	18-#8	3'-6"	10'-0"	18-#8	3'-6"	11'-0"	18-#8	

MEDIUM LOADING CONDITIONS

SOIL TYPE	15' & 20' MAST ARMS			25' & 30' MAST ARMS			35' & 40' MAST ARMS			45' MAST ARMS			
	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	
DRY SAND	3'-6"	7'-0"	18-#8	3'-6"	9-0"	18-#8	4'-0"	9-0"	18-#9	4'-6"	8'-0"	18-#10	FDN #33A*
WET SAND	3'-6"	8'-0"	18-#8	3'-6"	9'-0"	18-#8	4'-0"	10'-0"	18-#9	4'-6"	9'-0"	18-#10	FDNS #3,8,12,20*,34
CLAY (MEDIUM STIFF)	3'-6"	11'-0"	18-#8	3'-6"	12'-0"	18-#8	4'-0"	13'-0"	18-#9	4'-6"	14'-0"	18-#10	
ALLUVIAL	3'-6"	9'-0"	18-#8	3'-6"	10'-0"	18-#8	4'-0"	11'-0"	18-#9	4'-6"	10'-0"	18-#10	

HEAVY LOADING CONDITIONS

SOIL TYPE	15' & 20' MAST ARMS			25' & 30' MAST ARMS			35' & 40' MAST ARMS			45' MAST ARMS			
	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	
DRY SAND	3'-6"	8'-0"	18-#8	4'-0"	9'-0"	18-#9	4'-6"	10'-0"	18-#10	5'-0"	9'-0"	23-#10	FDNS #4,7,9,16,19*,21*,23*,24*, 28*,29*,30*,31*
WET SAND	3'-6"	8'-0"	18-#8	4'-0"	10'-0"	18-#9	4'-6"	11'-0"	18-#10	5'-0"	10'-0"	23-#10	
CLAY (MEDIUM STIFF)	3'-6"	12'-0"	18-#8	4'-0"	14'-0"	18-#9	4'-6"	15'-0"	18-#10	5'-0"	16'-0"	23-#10	FDN #22*
ALLUVIAL	3'-6"	10'-0"	18-#8	4'-0"	11'-0"	18-#9	4'-6"	12'-0"	18-#10	5'-0"	12'-0"	23-#10	

PIER FOUNDATIONS FOR 130 MPH WIND SPEED ZONE

LIGHT LOADING CONDITIONS

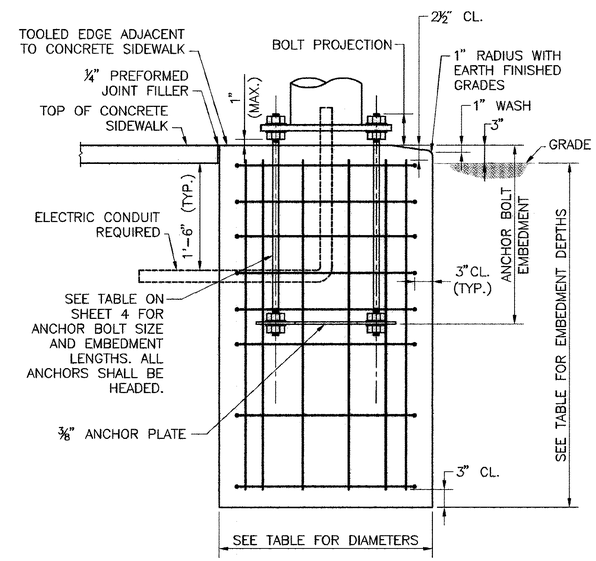
SOIL TYPE	15' & 20' MAST ARMS			25' & 30' MAST ARMS			35' & 40' MAST ARMS			45' MAST ARMS		
	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS
DRY SAND	3'-6"	7'-0"	18-#8	3'-6"	9'-0"	18-#8	3'-6"	10'-0"	18-#8	3'-6"	10'-0"	18-#8
WET SAND	3'-6"	8'-0"	18-#8	3'-6"	10'-0"	18-#8	3'-6"	11'-0"	18-#8	3'-6"	11'-0"	18-#8
CLAY (MEDIUM STIFF)	3'-6"	12'-0"	18-#8	3'-6"	13'-0"	18-#8	3'-6"	13'-0"	18-#8	3'-6"	13'-0"	18-#8
ALLUVIAL	3'-6"	9'-0"	18-#8	3'-6"	12'-0"	18-#8	3'-6"	12'-0"	18-#8	3'-6"	13'-0"	18-#8

MEDIUM LOADING CONDITIONS

SOIL TYPE	15' & 20' MAST ARMS			25' & 30' MAST ARMS			35' & 40' MAST ARMS			45' MAST ARMS		
	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS
DRY SAND	3'-6"	8'-0"	18-#8	3'-6"	10'-0"	18-#8	4'-0"	11'-0"	18-#9	4'-6"	10'-0"	18-#10
WET SAND	3'-6"	8'-0"	18-#8	3'-6"	11'-0"	18-#8	4'-0"	12'-0"	18-#9	4'-6"	11'-0"	18-#10
CLAY (MEDIUM STIFF)	3'-6"	12'-0"	18-#8	3'-6"	14'-0"	18-#8	4'-0"	15'-0"	18-#9	4'-6"	15'-0"	18-#10
ALLUVIAL	3'-6"	10'-0"	18-#8	3'-6"	13'-0"	18-#8	4'-0"	13'-0"	18-#9	4'-6"	12'-0"	18-#10

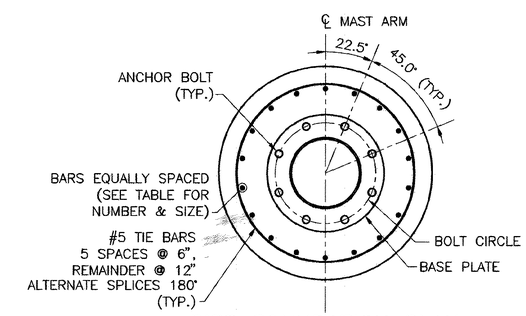
HEAVY LOADING CONDITIONS

SOIL TYPE	15' & 20' MAST ARMS			25' & 30' MAST ARMS			35' & 40' MAST ARMS			45' MAST ARMS		
	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS
DRY SAND	3'-6"	9'-0"	18-#8	4'-0"	11'-0"	18-#9	4'-6"	12'-0"	18-#10	5'-0"	11'-0"	23-#10
WET SAND	3'-6"	10'-0"	18-#8	4'-0"	12'-0"	18-#9	4'-6"	13'-0"	18-#10	5'-0"	12'-0"	23-#10
CLAY (MEDIUM STIFF)	3'-6"	14'-0"	18-#8	4'-0"	15'-0"	18-#9	4'-6"	16'-0"	18-#10	5'-0"	17'-0"	23-#10
ALLUVIAL	3'-6"	11'-0"	18-#8	4'-0"	13'-0"	18-#9	4'-6"	15'-0"	18-#10	5'-0"	14'-0"	23-#10



PIER FOUNDATION DETAIL

NO SCALE



PIER FOUNDATION PLAN

NO SCALE

NOTES:

1. FOUNDATIONS SHALL BE 4000 PSI, 1½", 565 CEMENT CONCRETE.
2. REINFORCEMENT SHALL BE ASTM A615 GRADE 60.
3. ANCHOR BOLTS SHALL BE SET BY TEMPLATE.
4. PROVIDE FOR ELECTRICAL CONDUIT.
5. EXCAVATION SHALL BE BY THE AUGER METHOD TO THE NEAT LINES OF THE OUTSIDE DIMENSION OF THE FOUNDATIONS WITHOUT DISTURBING THE SOIL AROUND AND BELOW THE PROPOSED FOUNDATION BOTTOM. ALTERNATE METHODS OF EXCAVATION MAY BE SUBMITTED TO MASSHIGHWAY FOR APPROVAL IF THEY MEET THE REQUIREMENTS LISTED IN NOTES 6, 7, AND 8.
6. THE EARTH WALLS OF THE FOUNDATION SHALL BE ADEQUATELY AND SECURELY PROTECTED AT ALL TIMES AGAINST CAVE-INS, DISPLACEMENT OF THE SURROUNDING EARTH AND FOR THE EXCLUSION OF GROUND WATER. THIS MAY BE DONE BY THE USE OF STEEL CYLINDER LINERS OR CASINGS THAT ARE APPROVED BY MASSHIGHWAY. IF LINERS ARE USED THEY MAY BE RECLAIMED PROVIDED THAT THEY ARE WITHDRAWN AS THE CONCRETE IS BEING PLACED, MAINTAINING A SUFFICIENT HEAD OF CONCRETE WITHIN THE LINER TO PREVENT REDUCTION IN THE FOUNDATION DIAMETER AND TO PREVENT EXTRANEOUS MATERIAL FROM FALLING IN FROM THE SIDES AND MIXING WITH THE CONCRETE.
7. IF THE SOIL IS DISTURBED OR REMOVED BEYOND THE NEAT LINES OF THE OUTSIDE DIMENSION OF THE FOUNDATION, IT SHALL BE REPLACED WITH CONCRETE. ANY ADDITIONAL COST FOR THE CONCRETE SHALL BE PAID FOR BY THE CONTRACTOR.
8. SPECIAL CARE SHOULD BE GIVEN TO AREAS WHERE WET SOIL IS ENCOUNTERED, TO INSURE THAT THE PREAUGERED HOLE DOES NOT COLLAPSE. THIS MAY REQUIRE THE USE OF STEEL CYLINDER LINERS OR CASINGS TO HOLD THE SOIL IN PLACE UNTIL READY FOR CONCRETE PLACEMENT. THE STEEL CYLINDERS OR CASINGS SHALL BE WITHDRAWN AS THE FOUNDATION CONCRETE IS PLACED.
9. DETERMINATION OF EXISTING SOIL CONDITIONS SHALL BE MADE BY THE DESIGN ENGINEER.
10. IF LEDGE OR POOR SOIL IS ENCOUNTERED (i.e. ONE WHICH DOES NOT APPLY TO THE DESIGN TABLES SHOWN ON THIS SHEET), AN ALTERNATIVE DESIGN SHALL BE PROVIDED BY THE DESIGN ENGINEER. DECISIONS MADE IN NOTES 8 AND 9 SHALL BE SUBMITTED TO MASSHIGHWAY FOR APPROVAL. 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 ENGINEER.

* SEE TABLE BELOW FOR DEPTH OF FOUNDATION

FOUNDATION	DEPTH
11, 17, 18, 20, 25, 26, 27, 33A	11'-0"
19, 28, 29, 30	12'-0"
21, 23, 24, 31	13'-0"
22	16'-0"

MONTH_DD,_YYYY	ISSUED FOR CONSTRUCTION

Moving Massachusetts Forward. massDOT Highway

STANDARD DRAWINGS

TYPE II MAST ARMS
CORED PIER FOUNDATIONS

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

Frank A. Tramontozzi 2/24/2011
CHIEF ENGINEER

BRIDGE ENGINEER

Neil E. Boudreau
TRAFFIC ENGINEER

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	169	240
PROJ. FILE NO. 604688			

TRAFFIC MANAGEMENT PLAN

NOTES:

1. ALL TEMPORARY TRAFFIC CONTROL WORK SHALL CONFORM TO THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AND ALL REVISIONS.
2. ALL SIGN LEGENDS, BORDERS AND MOUNTING SHALL BE IN ACCORDANCE WITH THE MUTCD.
3. TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK.
4. TEMPORARY CONSTRUCTION SIGNING, BARRICADES AND ALL OTHER NECESSARY WORK ZONE TRAFFIC CONTROL DEVICES SHALL BE REMOVED FROM THE HIGHWAY OR COVERED WHEN THEY ARE NOT REQUIRED FOR CONTROL OF TRAFFIC.
5. SIGNS AND SIGN SUPPORTS LOCATED ON OR NEAR THE TRAVELED WAY, AND REFLECTORIZED PLASTIC DRUMS WITH LIGHTING DEVICES MOUNTED ON THEM, MUST PASS THE CRITERIA SET FORTH IN NCHRP REPORT 350, "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES."
6. CONTRACTORS SHALL NOTIFY EACH ABUTTER 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.
7. THE FIRST THREE PLASTIC DRUMS OF A TAPER MAY BE MOUNTED WITH TYPE A LIGHTS. (INCIDENTAL TO ITEM 859)
8. THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER.
9. DISTANCES ARE A GUIDE AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.
10. MAXIMUM SPACING OF TRAFFIC DEVICES IN A TAPER (DRUMS OR CONES) IS EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
11. MINIMUM LANE WIDTH IS TO BE 11 FEET (3.3m) UNLESS OTHERWISE SHOWN. MINIMUM LANE WIDTH TO BE MEASURED FROM THE EDGE OF DRUMS OR MEDIAN BARRIER.
12. ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS.

LEGEND:

- REFLECTORIZED PLASTIC DRUM
- POLICE DETAIL
- TYPE III BARRICADE
- CHANGEABLE MESSAGE SIGN
- FLASHING ARROW PANEL
- WORK ZONE
- DIRECTION OF TRAFFIC
- IMPACT ATTENUATOR
- MEDIAN BARRIER
- MEDIAN BARRIER WITH WARNING LIGHTS
- WORK VEHICLE
- MOVEABLE IMPACT ATTENUATOR
- TRAFFIC OR PEDESTRIAN SIGNAL
- SIGN
- REFL CONE (±36 IN)

THE IDEAL CAPACITY OF A MAJOR HIGHWAY IS GENERALLY CONSIDERED TO BE 1900 PASSENGER CARS PER HOUR PER LANE (PCPHPL). IN WORK ZONES ON A MULTI-LANE DIVIDED HIGHWAY, THE FOLLOWING VOLUME GUIDELINES HAVE BEEN SUGGESTED:

MEASURED AVERAGE WORK ZONE CAPACITIES

Number of Lanes		Number of Studies	Average Capacity	
NORMAL (existing)	OPEN (to traffic)		VPH	VPHPL
3	1	7	1,170	1,170
2	1	8	1,340	1,340
5	2	8	2,740	1,370
4	2	4	2,960	1,480
3	2	9	2,980	1,490
4	3	4	4,560	1,520

Source: Dudek, C., Notes on Work Zone Capacity and Level of Service. Texas Transportation Institute, Texas A&M University, College Station, Texas (1984)

OBTAINING HOURLY TRAFFIC COUNTS FOR A PARTICULAR ROADWAY (WITH A MINIMUM OF A 48-HOUR AUTOMATIC TRAFFIC RECORDER (ATR) COUNT) WILL HELP TO DETERMINE AT WHAT TIMES OF THE DAY OR NIGHT A CERTAIN NUMBER OF LANES MAY BE CLOSED.

massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | FIGURE Gen-1 GENERAL GUIDELINES NOT TO SCALE

SUGGESTED WORK ZONE WARNING SIGN SPACING

Road Type	Distance Between Signs**		
	A	B	C
LOCAL OR LOW VOLUME ROADWAYS*	350 (100)	350 (100)	350 (100)
MOST OTHER ROADWAYS*	500 (150)	500 (150)	500 (150)
FREEWAYS AND EXPRESSWAYS*	1,000 (300)	1,500 (450)	2,640 (800)

* SPEED CATEGORY TO BE DETERMINED BY HIGHWAY AGENCY

** DISTANCES ARE SHOWN IN FEET (METERS). THE COLUMN HEADINGS A, B, AND C ARE THE DIMENSIONS SHOWN IN THE DETAIL/ TYPICAL SETUP FIGURES. THE A DIMENSION IS THE DISTANCE FROM THE TRANSITION OR POINT OF RESTRICTION TO THE FIRST SIGN. THE B DIMENSION IS THE DISTANCE BETWEEN THE FIRST AND SECOND SIGNS. THE C DIMENSION IS THE DISTANCE BETWEEN THE SECOND AND THIRD SIGNS. (THE "THIRD" SIGN IS THE FIRST ONE TYPICALLY ENCOUNTERED BY A DRIVER APPROACHING A TEMPORARY TRAFFIC CONTROL (TTC) ZONE.)

THE "THIRD" SIGN ABOVE IS TYPICALLY REFERRED TO AS AN "ADVANCE WARNING" SIGN ON THE TMP SETUPS. IT IS THE ONE WHICH MAY OFTEN HAVE THE "STANDARD RED OR RED-ORANGE FLAGS (16 in. X 16 in.)" MOUNTED ON IT. THESE ADVANCE WARNING SIGNS ARE LOCATED AT THE PROJECT LIMITS ON ALL APPROACHES (i.e. THE W20-1 SERIES (ROAD WORK XX FT) SIGNS), AND USUALLY REMAIN FOR THE DURATION OF THE PROJECT. ADDITIONAL SIGNS (i.e. "RIGHT LANE CLOSED 1 MILE" AND "LEFT LANE CLOSED 1 MILE") HAVE BEEN SHOWN IN SOME FIGURES AS EXAMPLES OF REINFORCEMENT SIGN PLACEMENT, BUT ARE USED ONLY IN RARE OCCASIONS.

THE FIRST AND SECOND WARNING SIGNS ABOVE ARE REFERRED TO AS THE OPERATIONAL (DAY-TO-DAY) WORK ZONE SIGNS AND MAY BE MOVED DEPENDING ON WHERE THE SPECIFIC ROADWAY WORK FOR THAT DAY IS LOCATED.

R2-10a SIGNS SHALL BE PLACED BETWEEN THE SECOND AND THIRD SIGNS.

R2-10a AND W20-1 SERIES SIGNS ARE TO BE INCLUDED ON ALL DETAILS/TYPICAL SETUPS.

Based on: Table 6C-1 2009 MUTCD

STOPPING SIGHT DISTANCE AS A FUNCTION OF SPEED

SPEED* (km/h)	DISTANCE (m)
30	35
40	50
50	65
60	85
70	105
80	130
90	160
100	185
110	220
120	250

SPEED* (mph)	DISTANCE (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820

*POSTED SPEED, OFF-PEAK 85TH-PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICIPATED OPERATING SPEED

THESE VALUES MAY BE USED TO DETERMINE THE LENGTH OF LONGITUDINAL BUFFER SPACES.

THE DISTANCES IN THE ABOVE CHART REPRESENT THE MINIMAL VALUES FOR BUFFER SPACING.

Source: Table 6C-2 2009 MUTCD

massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | FIGURE Gen-2 NOTES ON WORK ZONE DISTANCES NOT TO SCALE

CONVENTIONAL ROADWAY– A STREET OR HIGHWAY OTHER THAN A LOW-VOLUME ROAD, EXPRESSWAY, OR FREEWAY.

EXPRESSWAY– A DIVIDED HIGHWAY WITH PARTIAL CONTROL OF ACCESS.

FREEWAY– A DIVIDED HIGHWAY WITH FULL CONTROL OF ACCESS.

LOW-VOLUME ROAD– A FACILITY LYING OUTSIDE OF BUILT-UP AREAS OF CITIES, TOWNS, AND COMMUNITIES, AND IT SHALL HAVE A TRAFFIC VOLUME OF LESS THAN 400 AADT. IT SHALL NOT BE A FREEWAY, EXPRESSWAY, INTERCHANGE RAMP, FREEWAY SERVICE ROAD, OR A ROAD ON A DESIGNATED STATE HIGHWAY SYSTEM.

Source: 2009 MUTCD

TAPER LENGTH CRITERIA FOR TEMPORARY TRAFFIC CONTROL ZONES

Type of Taper	Taper Length (L)*
MERGING TAPER	AT LEAST L
SHIFTING TAPER	AT LEAST 0.5L
SHOULDER TAPER	AT LEAST 0.33L
ONE-LANE, TWO-WAY TRAFFIC TAPER	100 FT (30 m) MAXIMUM
DOWNSTREAM TAPER	100 FT (30 m) PER LANE

Source: Table 6C-3 2009 MUTCD

FORMULAS FOR DETERMINING TAPER LENGTHS

Speed Limit (S)	Taper Length (L) Feet
40 MPH OR LESS	$L = \frac{WS^2}{60}$
45 MPH OR MORE	L= WS

Speed Limit (S)	Taper Length (L) Meters
60 KM/H OR LESS	$L = \frac{WS^2}{155}$
70 KM/H OR MORE	$L = \frac{WS}{1.6}$

WHERE: L = TAPER LENGTH IN FEET (METERS)

W = WIDTH OF OFFSET IN FEET (METERS)

S = POSTED SPEED LIMIT, OR OFF-PEAK 85TH-PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICIPATED OPERATING SPEED IN MPH (KM/H)

Source: Table 6C-4 2009 MUTCD

massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | FIGURE Gen-3 NOTES ON WORK ZONE DISTANCES NOT TO SCALE

TRAFFIC MANAGEMENT NOTES

GENERAL:

1. ALL TEMPORARY CONSTRUCTION SIGNING, DRUMS, BARRICADES AND OTHER WORKZONE TRAFFIC CONTROL DEVICES SHALL BE FURNISHED AND INSTALLED IN CONFORMANCE WITH THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" – 2009 EDITION (M.U.T.C.D.),THE MASSDOT STANDARD SPECIFICATIONS; THE MASSDOT "STANDARD DETAILS AND DRAWINGS FOR THE DEVELOPMENT OF TRAFFIC MANAGEMENT PLANS", DATED JULY 2005, AND THE LATEST REVISIONS; AND THE FOLLOWING:
2. MAINTAIN CONTINUOUS ACCESS & EGRESS TO ON-AND-OFF RAMPS, ALL STREETS AND DRIVES.
3. UNLESS WRITTEN PERMISSION FROM MASSDOT IS OBTAINED, THE TRAVELWAY CAN ONLY BE OCCUPIED BETWEEN THE HOURS OF 08:30AM AND 03:30PM (MONDAY THROUGH FRIDAY FROM SEPTEMBER THRU JUNE*). APPROVAL FROM MASSDOT'S AND BELMONT'S REPRESENTATIVES ARE REQUIRED FOR ANY CHANGES TO THESE HOURS.
   *DURING JULY AND AUGUST THESE HOURS ARE EXPANDED TO 08:00AM AND 04:30PM.
4. WARNING SIGNS SHALL HAVE AN ORANGE BACKGROUND, AND REGULATORY SIGNS SHALL BE BLACK TEXT ON A WHITE BACKGROUND.
5. AT ALL TIMES MAINTAIN TRAFFIC SIGNAL CONTROLS AND STREET LIGHTING IN AN OPERATING CONDITION.
6. AT ALL TIMES, MAINTAIN AN ADA-ACCESSIBLE WALKING PATH.
7. MAINTAIN CONTINUOUS ACCESS AND EGRESS TO ALL BUSINESSES DURING THEIR HOURS OF OPERATION.

CONSTRUCTION SIGNING:

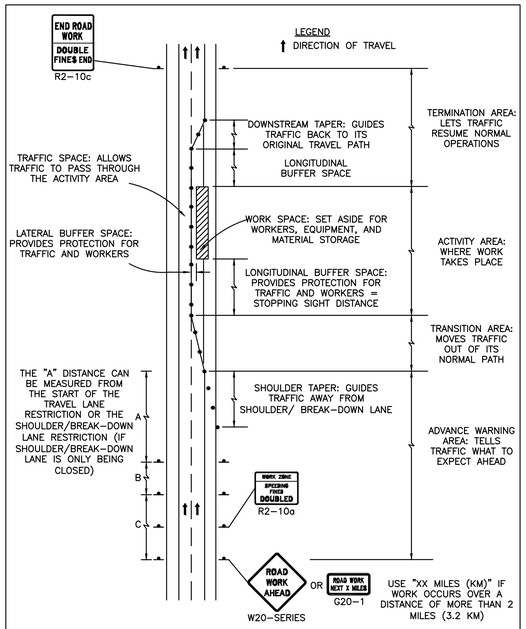
1. FINAL LOCATION OF SIGNS, DRUMS, AND OTHER TRAFFIC CONTROL DEVICES SHALL BE DETERMINED IN THE FIELD BY THE ENGINEER.
2. ADVISORY SPEED PLATES (W13-1(XX)) SHALL BE USED IF APPROPRIATE AND AS DIRECTED. THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER.
3. NON-ESSENTIAL TEMPORARY CONSTRUCTION TRAFFIC CONTROL DEVICES SHALL BE COVERED OR REMOVED FROM THE HIGHWAY WHEN THEY ARE NOT REQUIRED FOR CONTROL OF TRAFFIC.
4. COVER OR REMOVE ALL EXISTING REGULATORY AND WARNING SIGNS THAT CONFLICT WITH THE INTENT OF THIS TRAFFIC MANAGEMENT PLAN OR ARE NOT REPRESENTATIVE OF ACTUAL WORK CONDITIONS, ESPECIALLY W5-1, W20-4, W20-5, W20-8, AND W2-5a PANELS. SIGNS SHALL REMAIN COVERED WHILE THIS TRAFFIC MANAGEMENT PLAN IS IN EFFECT.
5. SEVEN DAYS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION, THE CONTRACTOR SHALL PLACE TWO PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS) ON THE PROJECT SITE.

TRAFFIC OPERATIONS:

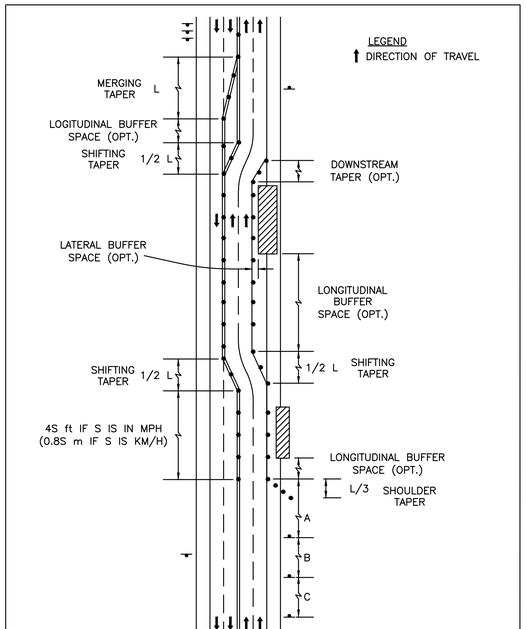
1. TRAFFIC MANAGEMENT
   a. AT ALL TIMES MAINTAIN A MINIMUM OF ONE-WAY ALTERNATING TRAFFIC ON ALL STREETS.
   b. AT ALL TIMES MAINTAIN ONE OPEN SIDEWALK ON EITHER SIDE OF ALL STREETS.
   c. AT ALL TIMES MAINTAIN ALL EXISTING TURNING MOVEMENTS AT INTERSECTIONS.
   d. AT ALL TIMES MAINTAIN A MINIMUM OF TWO 11-FOOT TRAVEL LANES ON TRAPELO ROAD, BELMONT STREET, ARLINGTON STREET, COMMON STREET, GROVE STREET, LEXINGTON STREET, MILL STREET, AND PLEASANT STREET AS DIRECTED BY THE ENGINEER.
   e. AT ALL TIMES MAINTAIN A MINIMUM OF ONE 10-FOOT TRAVEL LANE ON ALL SIDE STREETS AS DIRECTED BY THE ENGINEER.
2. BUS STOPS
   a. ADJACENT BUS STOPS IN THE SAME DIRECTION MAY NOT BE CLOSED AT THE SAME TIME. (SEE SPECIFICATIONS)

MISCELLANEOUS:

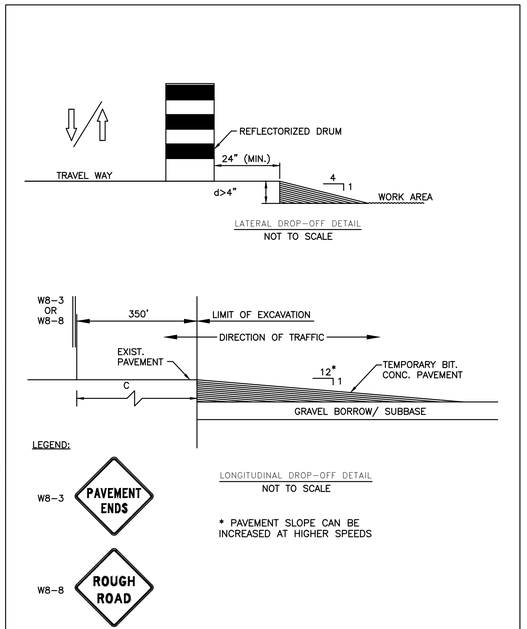
1. THE WORKSITE SHALL BE ADEQUATELY PROTECTED (DURING BOTH WORKING AND NON-WORKING HOURS) TO ENSURE SAFETY OF VEHICULAR AND PEDESTRIAN TRAFFIC.
2. PEDESTRIAN ACTIVITY SHALL BE CONTROLLED BY THE POLICE OFFICER(S), FLAGMEN, AND CONSTRUCTION OFFICIALS ON DUTY.



massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | FIGURE Gen-4 COMPONENT PARTS OF A TEMPORARY TRAFFIC CONTROL (TTC) ZONE NOT TO SCALE



massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | FIGURE Gen-5 TYPES OF TAPERS AND BUFFER SPACES NOT TO SCALE

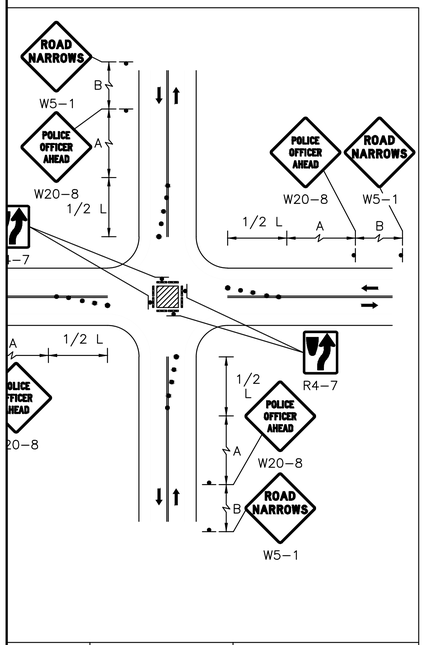


massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | FIGURE Gen-6 LATERAL AND LONGITUDINAL DROP-OFF DETAILS NOT TO SCALE

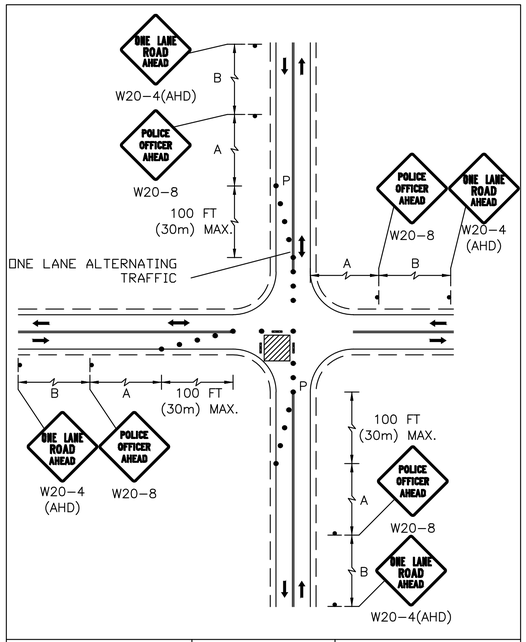
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	170	240
PROJ. FILE NO. 604688			

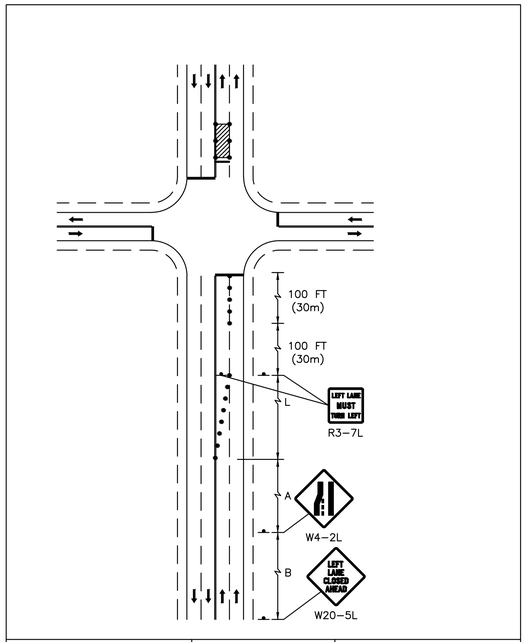
TRAFFIC MANAGEMENT PLAN



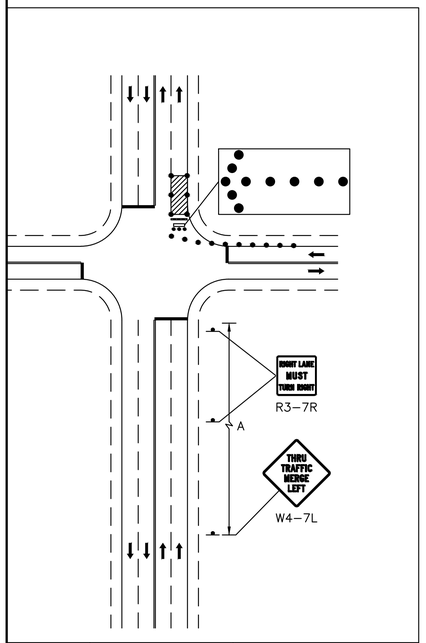
massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE Int-1** SINGLE LANE APPROACH CENTER CLOSURE NOT TO SCALE



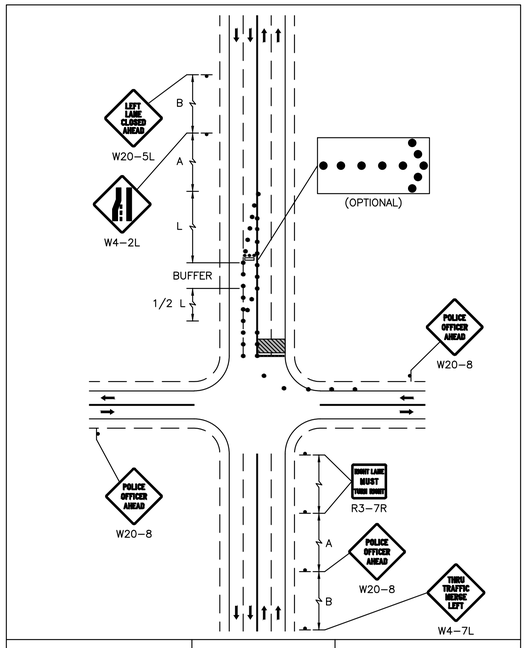
massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE Int-2** SINGLE LANE APPROACH ONE QUADRANT CLOSURE NOT TO SCALE



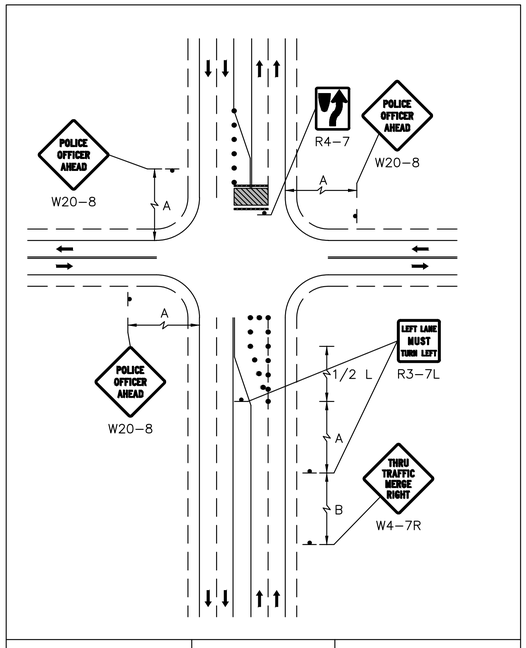
massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE Int-3** DOUBLE LANE APPROACH FAR SIDE CLOSURE INSIDE LANE NOT TO SCALE



massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE Int-4** DOUBLE LANE APPROACH FAR SIDE CLOSURE RIGHT LANE NOT TO SCALE



massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE Int-5** DOUBLE LANE APPROACH HALF ROAD CLOSURE NOT TO SCALE



massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE Int-6** MULTI-LANE APPROACH MULTIPLE LANE CLOSURE NOT TO SCALE

GENERAL CONSTRUCTION STAGES*

1. CONSTRUCTION SEGMENTS

   THE PROJECT SHALL BE BROKEN UP IN AT LEAST FIVE APPROXIMATELY EQUAL LONG SEGMENTS. ANY PARTICULAR PHASE OF WORK ON THE SUBSEQUENT SEGMENT SHALL NOT BEGIN UNTIL THAT PHASE OF WORK ON THE PREVIOUS SEGMENT HAS BEEN COMPLETED WITHOUT THE APPROVAL OF THE ENGINEER AND THE TOWN OF BELMONT.

2. UTILITY WORK

   CONSTRUCT ALL PROPOSED UTILITIES AND ADJUST, ABANDON, REMOVE, OR REMOVE AND RESET, ALL EXISTING UTILITIES, AS SHOWN ON THE PLANS.

3. ROADWAY MICRO-MILLING AND OVERLAY

   A. BEFORE THE MILLING CAN PROCEED, ALL CASTINGS SHALL BE ADJUSTED TO A GRADE BELOW THE FINISHED MILLED SURFACE THAT IS DEEP ENOUGH SO THAT THE CASTING IS NOT DAMAGED BY THE MILLING MACHINE. BUT NOT SO DEEP THAT IT ENDS UP BEING MORE THAN ONE INCH BELOW THE FINISHED MILLED SURFACE.

   B. MICRO-MILL ROADWAY, ONE HALF AT A TIME, THE LENGTH OF WHICH WILL BE DETERMINED BY THE CONTRACTOR'S ABILITY TO MILL AND MAKE THE ENTIRE WIDTH OF ROADWAY SUITABLE FOR TRAFFIC BY THE END OF THE DAY.

      a. DURING THE FIRST HALF OF THE DAY, MICRO-MILL ONE HALF OF THE ROADWAY AND MAKE THE AREA SUITABLE FOR TRAFFIC, (WHILE MAINTAINING TRAFFIC IN EACH DIRECTION), BYPASSING THE WORK ZONE AS DIRECTED BY POLICE OFFICER(S), FLAGMEN, AND CONSTRUCTION OFFICIALS.

      b. DURING THE SECOND HALF OF THE DAY, SWITCH TRAFFIC TO THE PREVIOUSLY MICRO-MILLED PORTION OF ROADWAY AND REPEAT THE SEQUENCE ON THE REMAINING HALF OF ROADWAY.

4. INTERMEDIATE COURSE

   PLACE THE INTERMEDIATE COURSE FOR THE ENTIRE LENGTH OF THE SEGMENT AND BRING ALL CASTINGS UP TO THE INTERMEDIATE GRADE.

5. CURB WORK

   INSTALL ALL PROPOSED CURBING; REMOVE AND RESET EXISTING CURBING.

6. SIDEWALKS AND ISLANDS

   CONSTRUCT SIDEWALKS AND TRAFFIC ISLANDS.

7. TRAFFIC CONTROL

   INSTALL ALL TRAFFIC SIGNAL EQUIPMENT AND SIGNING.

8. TOP COURSE AND BINDER COURSE

   RAISE THE UTILITY CASTING TO THE FINISHED SURFACE GRADE AND PLACE TOP COURSE FOR THE ENTIRE LENGTH OF THE PROJECT.

9. PAVEMENT MARKINGS

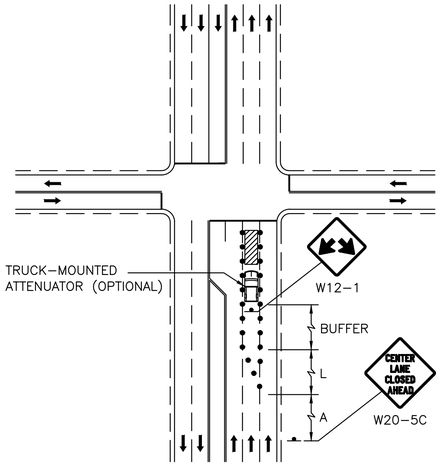
   INSTALL PAVEMENT MARKINGS.

* SEE SUBSECTION 8.03 OF THE SPECIAL PROVISIONS FOR SPECIFIC GUIDELINES.

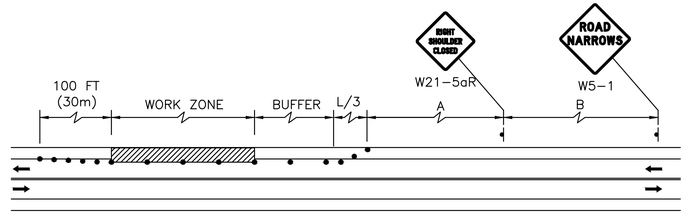
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	171	240
PROJ. FILE NO. 604688			

TRAFFIC MANAGEMENT PLAN

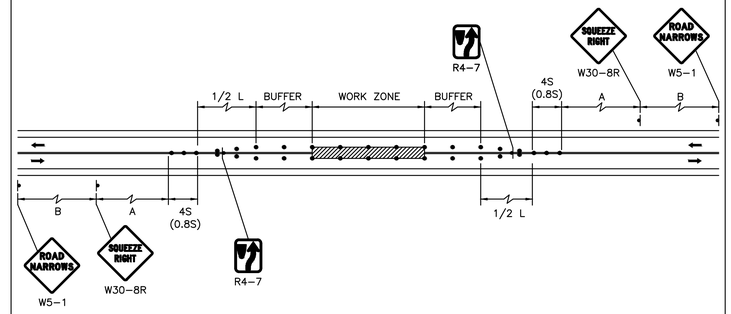


massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE Int-7** **MULTI-LANE APPROACH NEAR SIDE CLOSURE** NOT TO SCALE

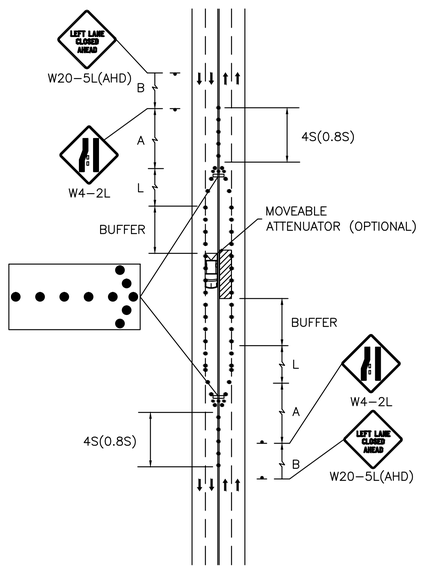


DRUM SPACING DEPENDENT ON SPEED

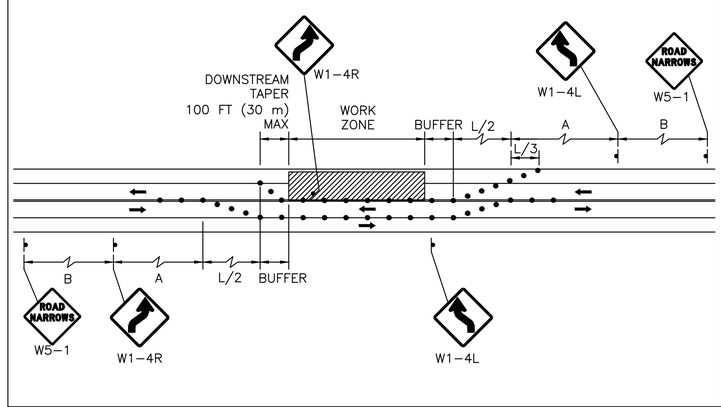
massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE TLR-1** **TWO LANE ROAD SHOULDER CLOSED** NOT TO SCALE



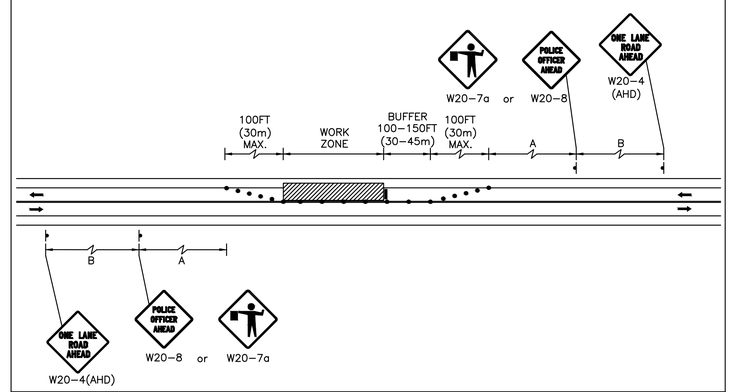
massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE TLR-3** **TWO LANE ROAD CENTER OF ROAD CLOSURE** NOT TO SCALE



massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE MLR-1** **MULTIPLE LANE ROAD INTERIOR LANE CLOSURE** NOT TO SCALE



massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE TLR-2** **TWO LANE ROAD SHOULDER AND TRAVEL LANE CLOSED** NOT TO SCALE

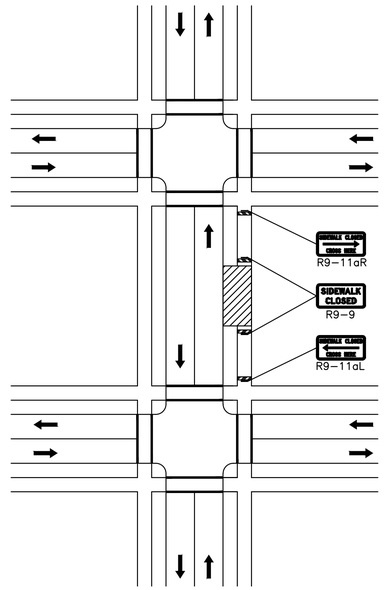


massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE TLR-5** **TWO LANE ROAD ONE LANE ALTERNATING TRAFFIC WITH POLICE DETAIL** NOT TO SCALE

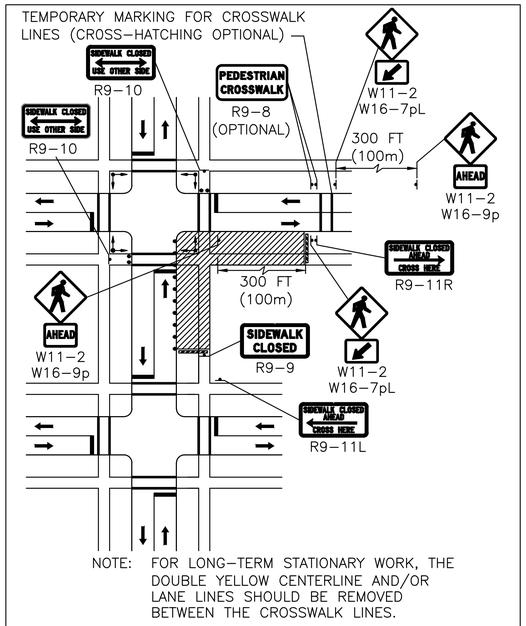
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	172	240
PROJ. FILE NO. 604688			

TRAFFIC MANAGEMENT PLAN

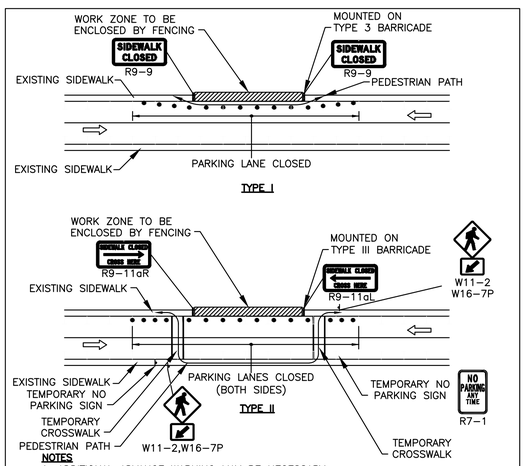


massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE Ped-1**
SIDEWALK CLOSED WITH DETOUR
NOT TO SCALE



NOTE: FOR LONG–TERM STATIONARY WORK, THE DOUBLE YELLOW CENTERLINE AND/OR LANE LINES SHOULD BE REMOVED BETWEEN THE CROSSWALK LINES.

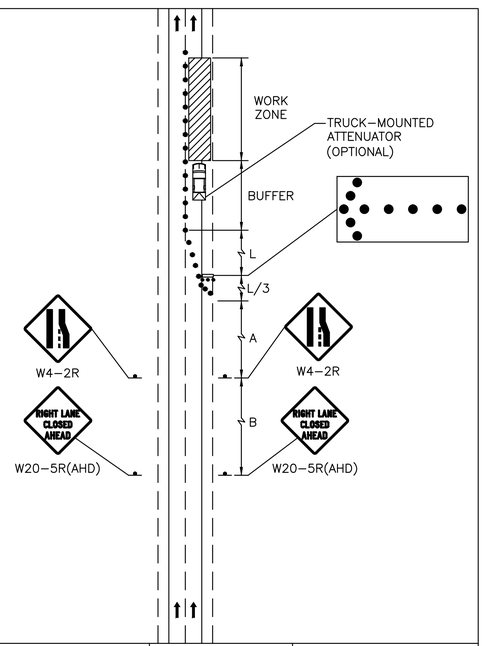
massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE Ped-2**
PEDESTRIAN DETOUR
NOT TO SCALE



NOTES

1. ADDITIONAL ADVANCE WARNING MAY BE NECESSARY.
2. CONTROLS ONLY FOR PEDESTRIAN TRAFFIC ARE SHOWN. VEHICULAR TRAFFIC SHOULD BE HANDLED AS SHOWN ELSEWHERE.
3. STREET LIGHTING SHOULD BE CONSIDERED WHEN LOCATING CONTROL DEVICES.
4. IF THE WORK ZONE DOES NOT PERMIT PEDESTRIANS TO TRAVEL ADJACENT TO IT AS SHOWN IN PEDESTRIAN BYPASS TYPE I, TEMPORARY CROSSWALKS WITH APPROPRIATE SIGNS SHOULD BE INSTALLED TO CROSS PEDESTRIANS TO THE OPPOSITE SIDE OF THE STREET AS SHOWN IN PEDESTRIAN BYPASS TYPE II, AND AS DIRECTED BY THE ENGINEER.
5. BYPASS IS TO BE USED IN CONJUNCTION WITH THE PROPOSED LANE CLOSURE DETAILS AND DURING CONSTRUCTION STAGING, AS DIRECTED BY THE ENGINEER.
6. ATT ALL TIMES MAINTAIN A PEDESTRIAN PATH THAT CONFORMS TO ALL RELEVANT ADA AND AAB STANDARDS.

massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE Ped-3**
PEDESTRIAN BYPASS
NOT TO SCALE

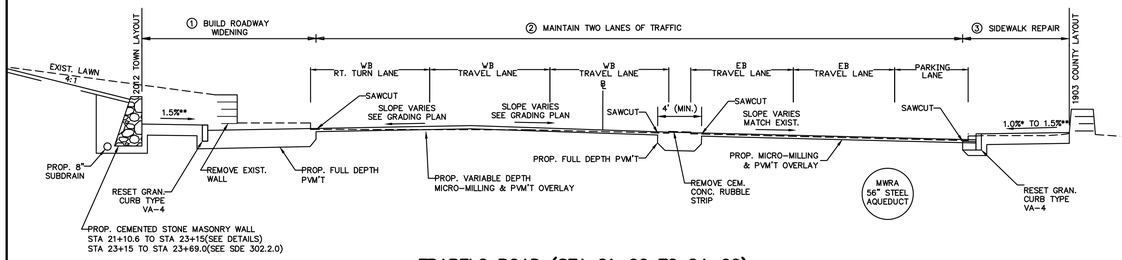


massDOT Highway | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE Div-2**
DIVIDED HIGHWAY/ LANE CLOSURE (SHORT TERM)
NOT TO SCALE

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

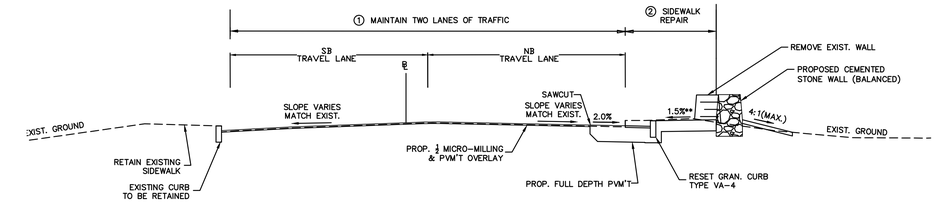
STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	173	240
PROJ. FILE NO. 604688			

TRAFFIC MANAGEMENT PLAN

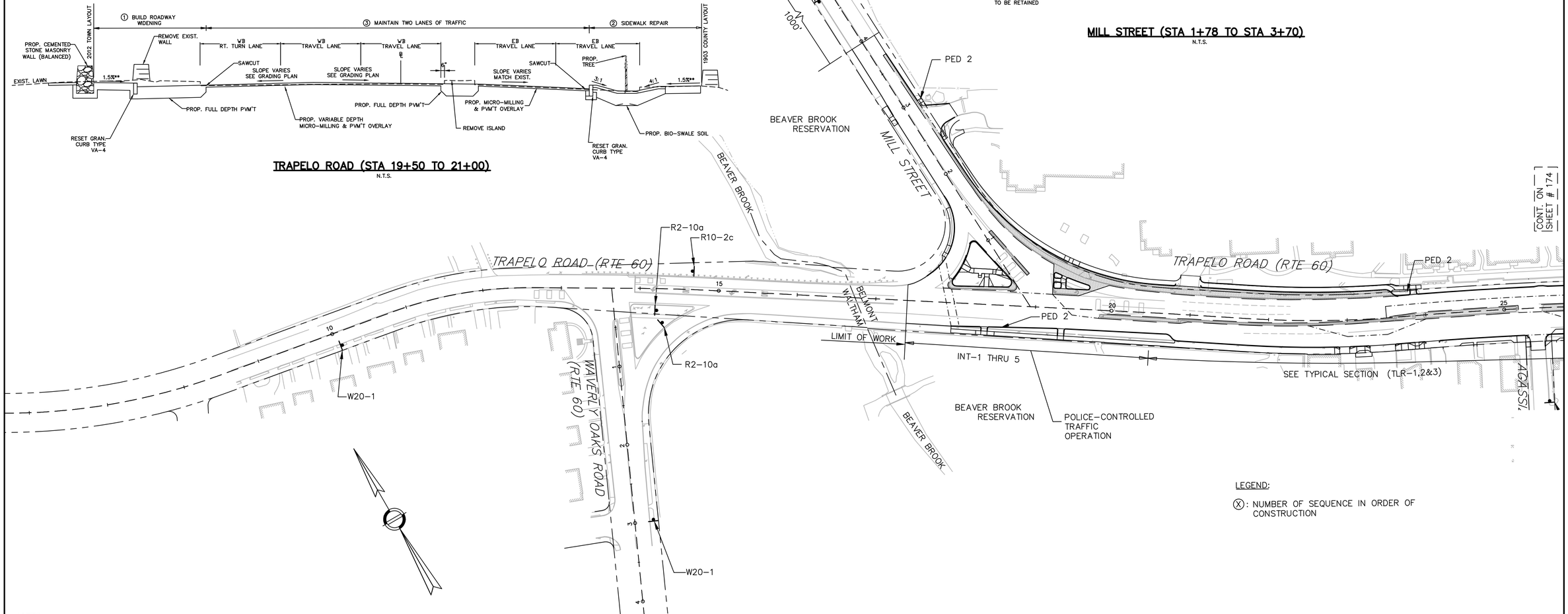


TRAPELO ROAD (STA 21+00 TO 24+00)
N.T.S.

TRAPELO ROAD (STA 19+50 TO 21+00)
N.T.S.



MILL STREET (STA 1+78 TO STA 3+70)
N.T.S.



LEGEND:

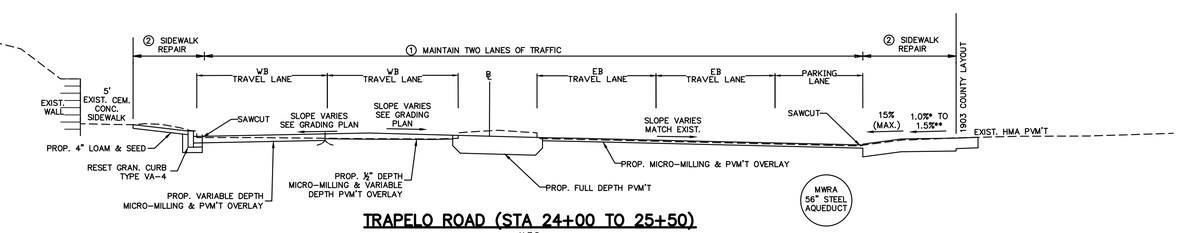
(X): NUMBER OF SEQUENCE IN ORDER OF CONSTRUCTION

NOTES:

1. REFER TO "STANDARD DETAILS AND DRAWINGS FOR THE DEVELOPMENT OF TRAFFIC MANAGEMENT PLANS" FOR:

a. GEN – FIGURE GEN-1 THRU 6 (GENERAL)
b. INT – FIGURE INT-1 THRU 7 (INTERSECTION)
c. TLR – FIGURE TLR-1,2,3 AND 5 (TWO LANE ROADS)
d. DIV – FIGURE DIV-2 (DIVIDED HIGHWAY)
e. PEDS – FIGURE PED-1 THRU 3 (PEDESTRIANS)

HOR. SCALE IN FEET
0 60 150 300

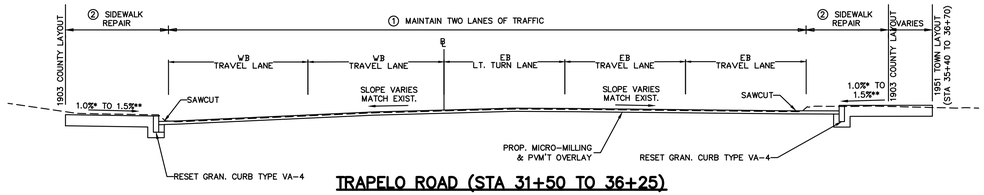


TRAPELO ROAD (STA 24+00 TO 25+50)
N.T.S.

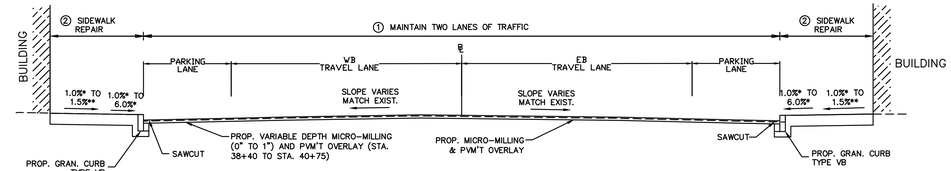
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	174	240
PROJ. FILE NO. 604688			

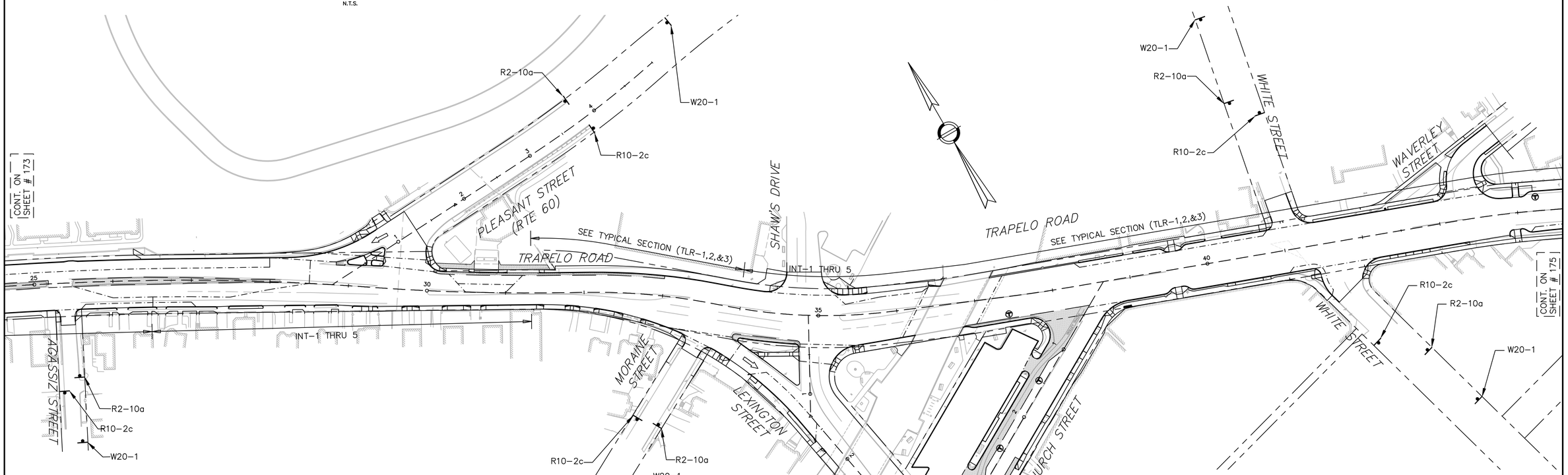
TRAFFIC MANAGEMENT PLAN

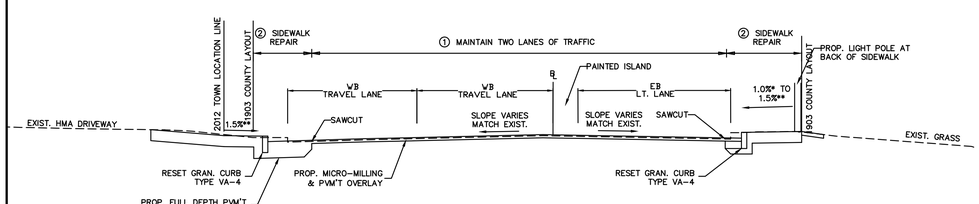


TRAPELO ROAD (STA 31+50 TO 36+25)
N.T.S.

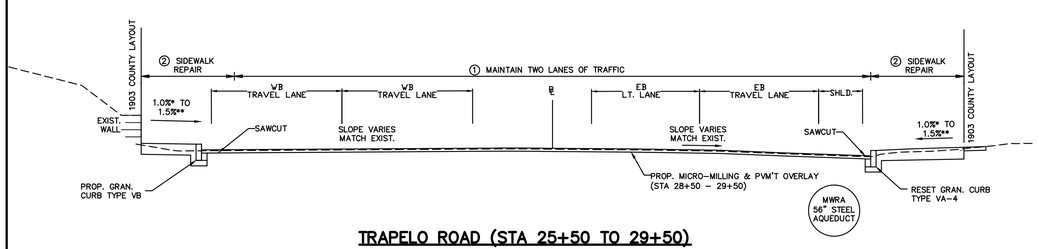


TRAPELO ROAD (STA 38+35 TO 43+00)
N.T.S.

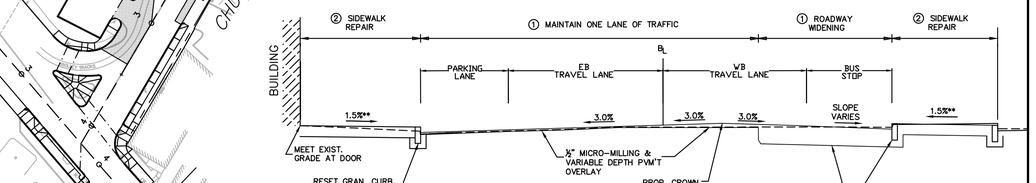




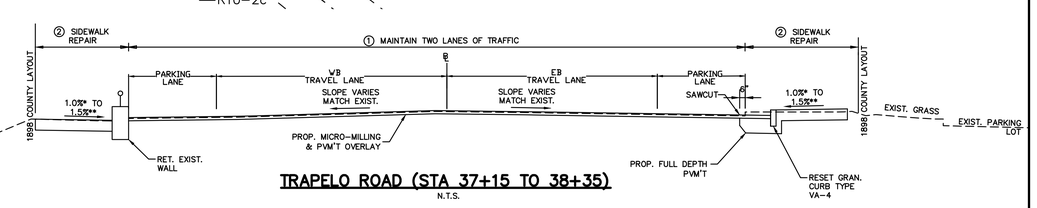
TRAPELO ROAD (STA 29+50 TO 31+50)
N.T.S.



TRAPELO ROAD (STA 25+50 TO 29+50)
N.T.S.



CHURCH STREET (STA 1+23 TO STA 2+80)
N.T.S.

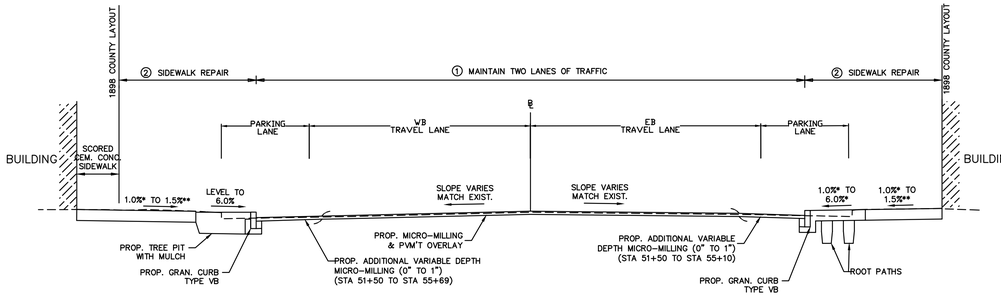


TRAPELO ROAD (STA 37+15 TO 38+35)
N.T.S.

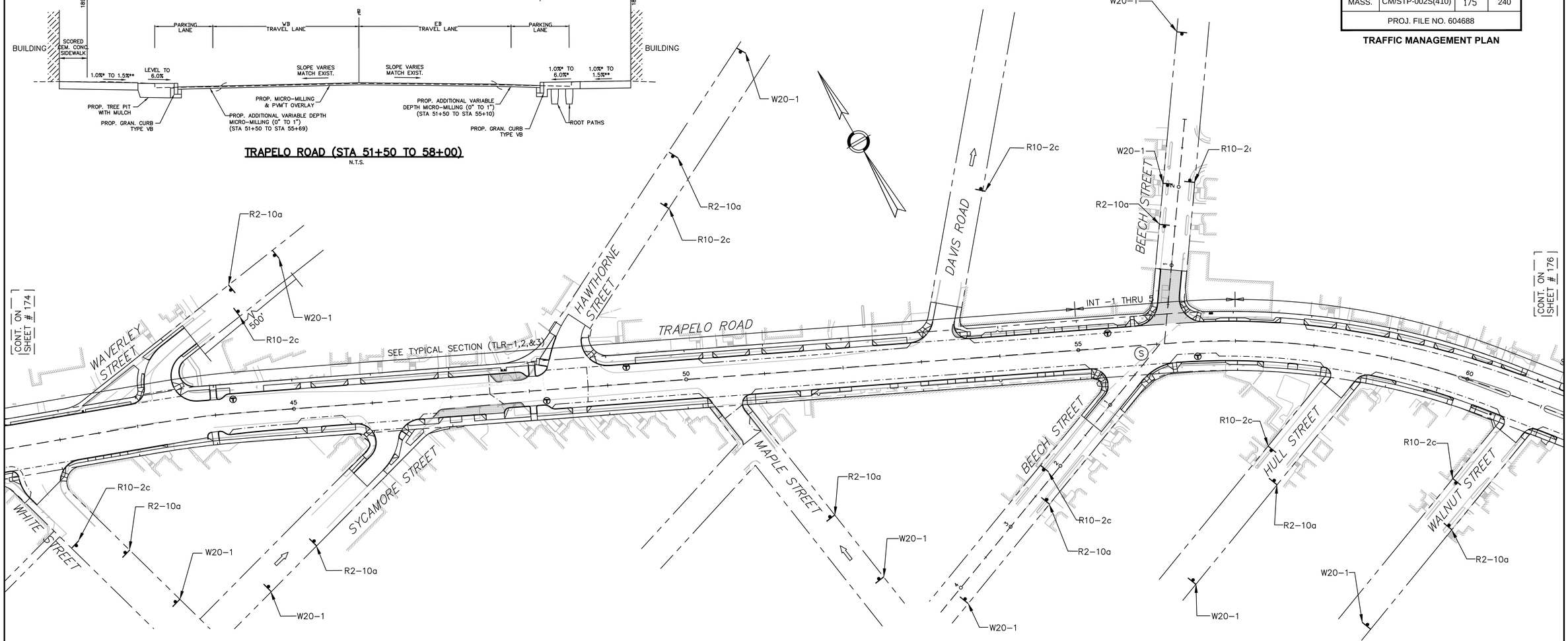
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

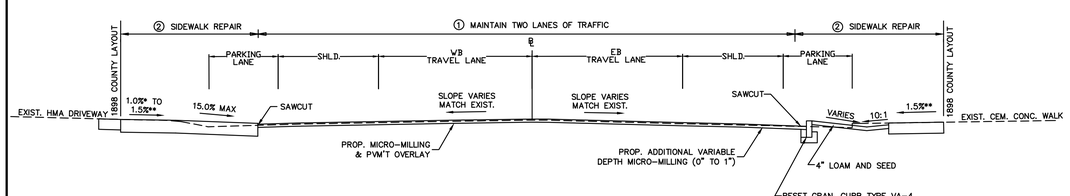
STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	175	240
PROJ. FILE NO. 604688			

TRAFFIC MANAGEMENT PLAN

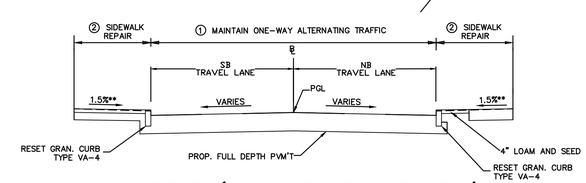


TRAPELO ROAD (STA 51+50 TO 58+00)
N.T.S.

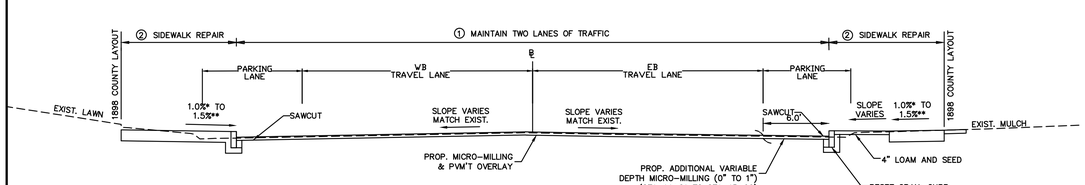




TRAPELO ROAD (STA 45+00 TO 51+50)
N.T.S.

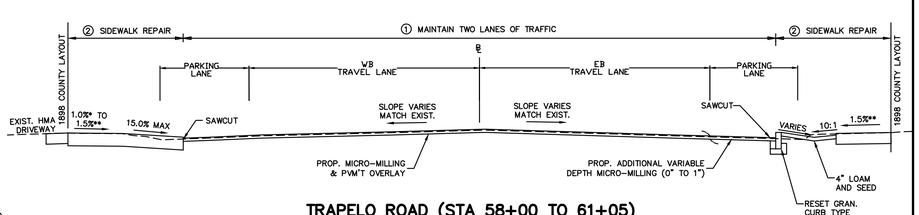


SIDE STREET (FULL DEPTH RECONSTRUCTION)
N.T.S.
BEECH STREET (STA 0+25 TO STA 0+94)



TRAPELO ROAD (STA 43+00 TO 45+00)
N.T.S.

HOR. SCALE IN FEET
0 60 150 300

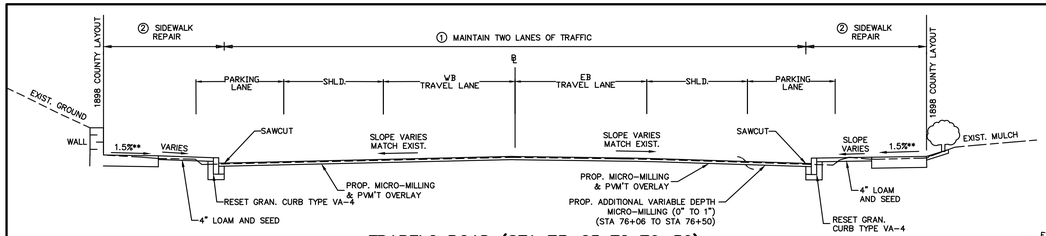


TRAPELO ROAD (STA 58+00 TO 61+05)
N.T.S.

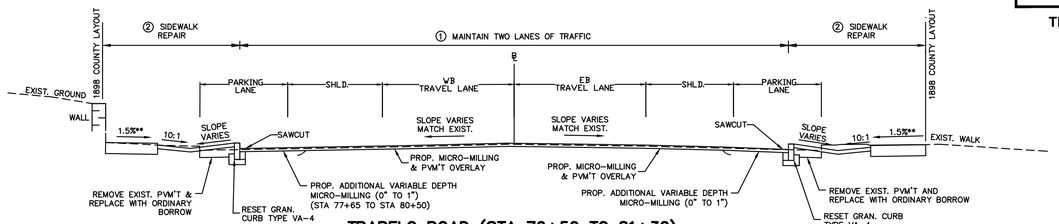
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	176	240
PROJ. FILE NO. 604688			

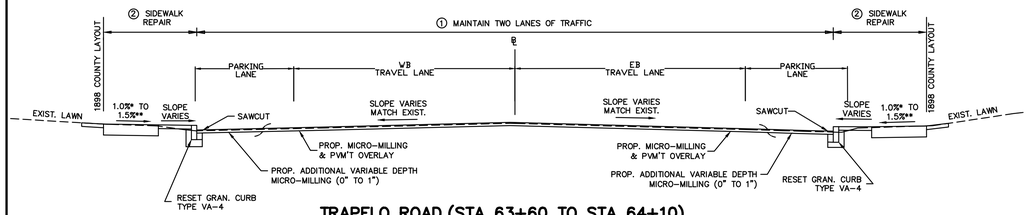
TRAFFIC MANAGEMENT PLAN



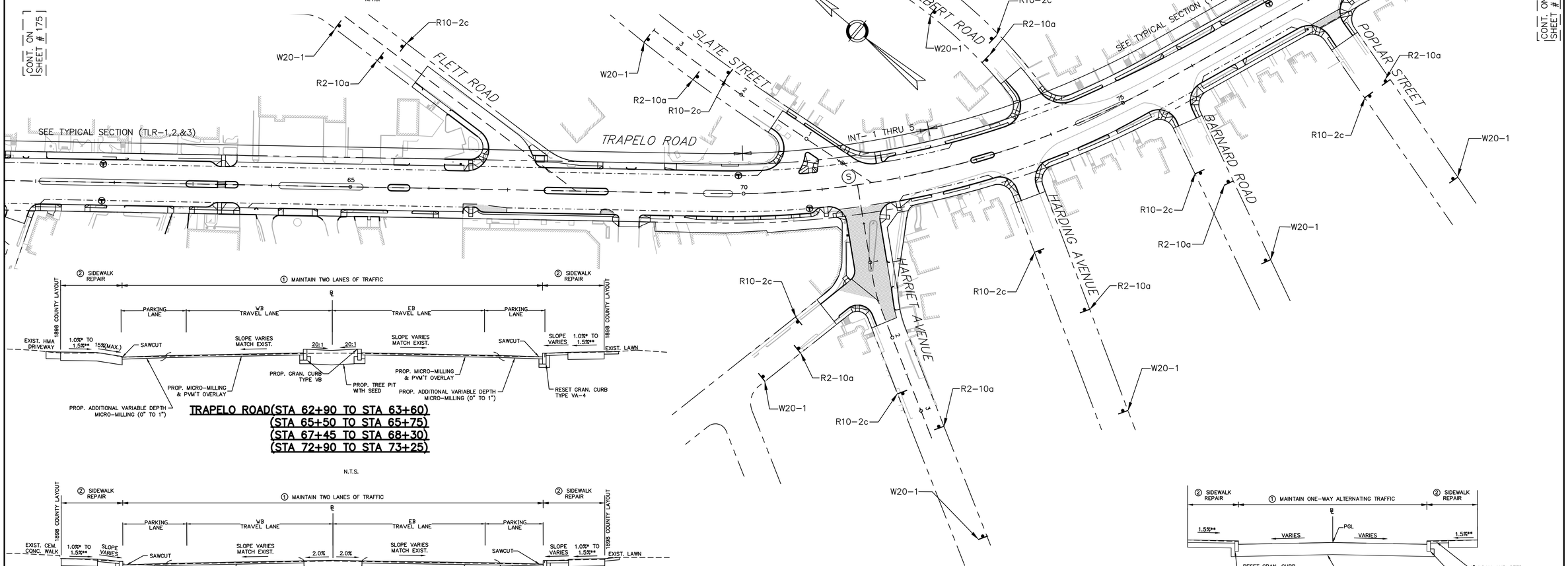
TRAPELO ROAD (STA 73+25 TO 76+50)
N.T.S.



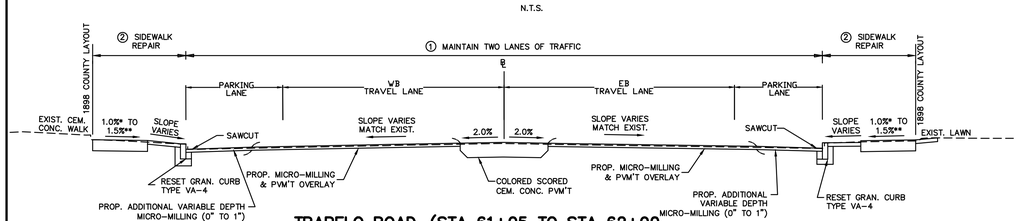
TRAPELO ROAD (STA 76+50 TO 81+30)
N.T.S.



TRAPELO ROAD (STA 63+60 TO STA 64+10)
(STA 65+15 TO STA 65+50)
(STA 65+75 TO STA 67+45)
(STA 68+30 TO STA 69+50)
(STA 69+85 TO STA 72+90)
N.T.S.

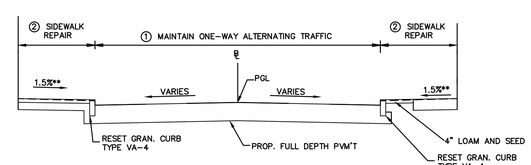


TRAPELO ROAD(STA 62+90 TO STA 63+60)
(STA 65+50 TO STA 65+75)
(STA 67+45 TO STA 68+30)
(STA 72+90 TO STA 73+25)
N.T.S.



TRAPELO ROAD (STA 61+05 TO STA 62+90)
(STA 64+10 TO STA 65+15)
(STA 69+50 TO STA 69+85)
N.T.S.

HOR. SCALE IN FEET
0 60 150 300

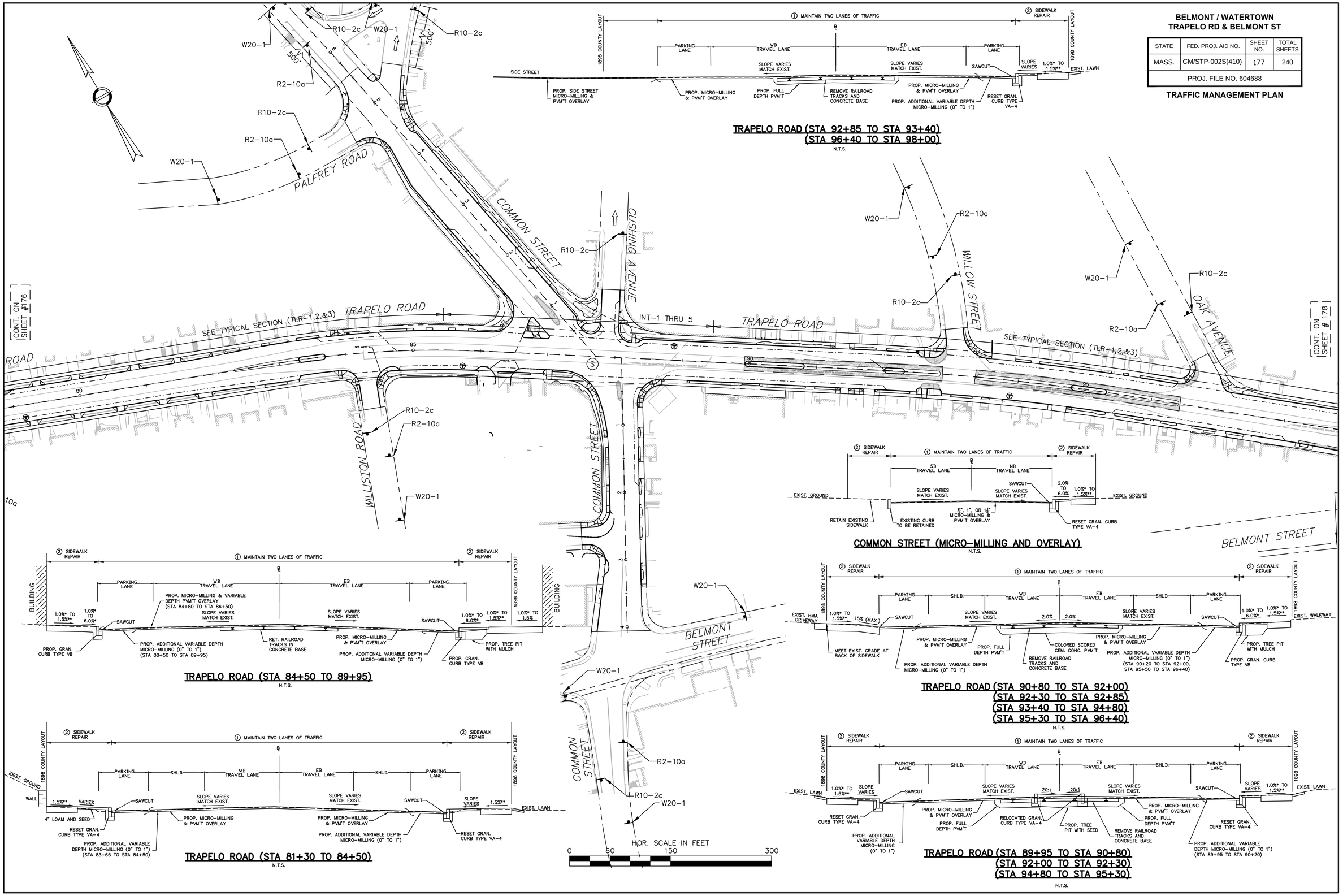


HARRIET AVENUE (STA 0+30 TO STA 1+78)
N.T.S.
SIDE STREET (FULL DEPTH RECONSTRUCTION)

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	177	240
PROJ. FILE NO. 604688			

TRAFFIC MANAGEMENT PLAN



TRAPELO ROAD (STA 92+85 TO STA 93+40)
(STA 96+40 TO STA 98+00)
N.T.S.

TRAPELO ROAD (STA 84+50 TO 89+95)
N.T.S.

TRAPELO ROAD (STA 81+30 TO 84+50)
N.T.S.

COMMON STREET (MICRO-MILLING AND OVERLAY)
N.T.S.

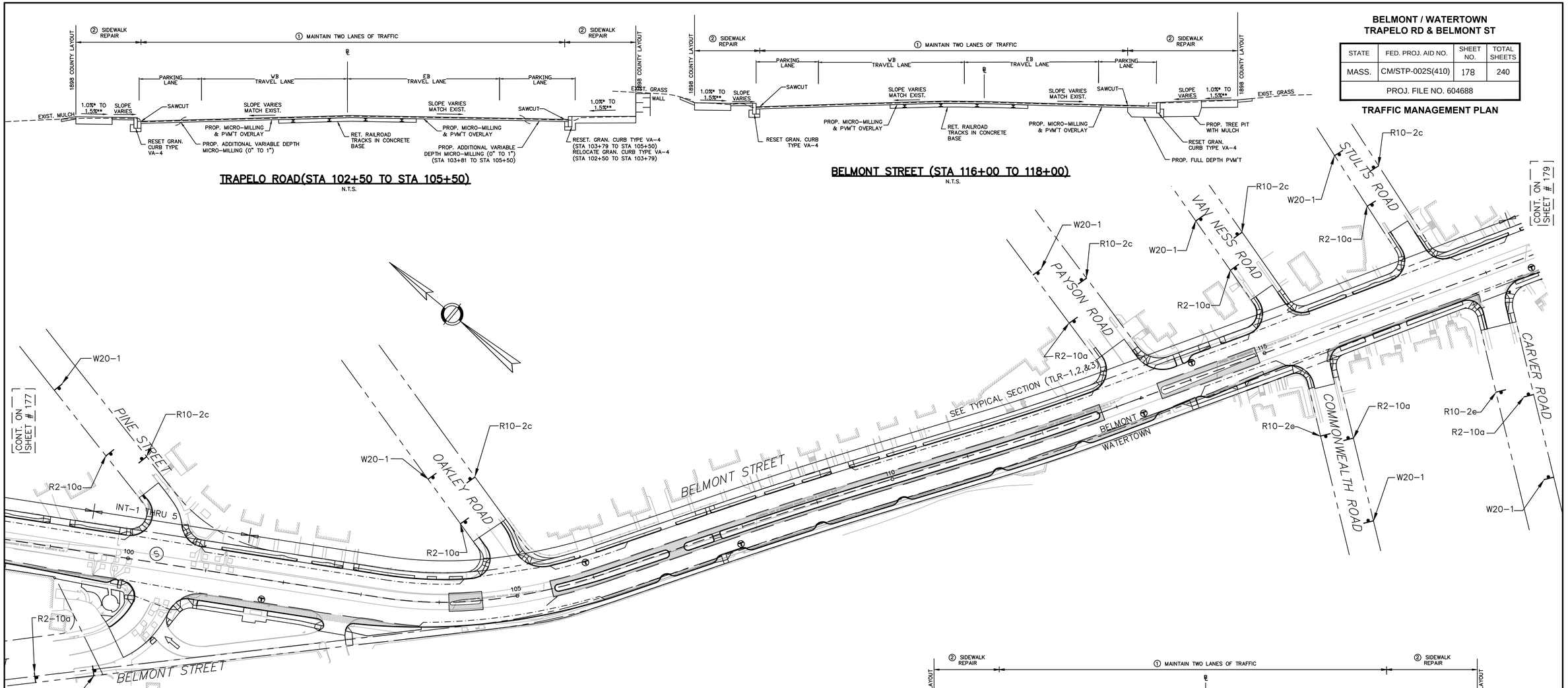
TRAPELO ROAD (STA 90+80 TO STA 92+00)
(STA 92+30 TO STA 92+85)
(STA 93+40 TO STA 94+80)
(STA 95+30 TO STA 96+40)
N.T.S.

TRAPELO ROAD (STA 89+95 TO STA 90+80)
(STA 92+00 TO STA 92+30)
(STA 94+80 TO STA 95+30)
N.T.S.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

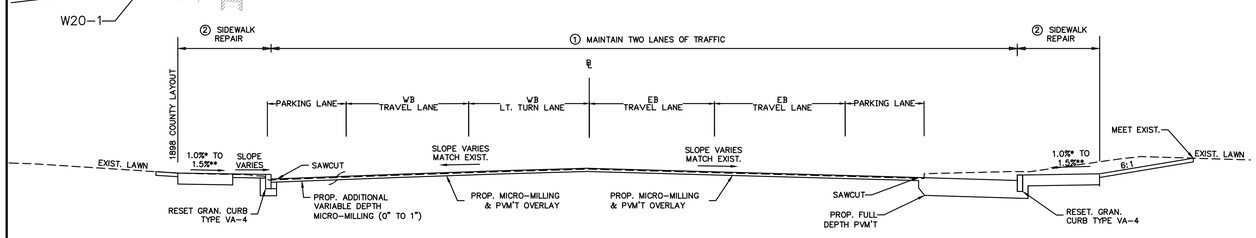
STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	178	240
PROJ. FILE NO. 604688			

TRAFFIC MANAGEMENT PLAN

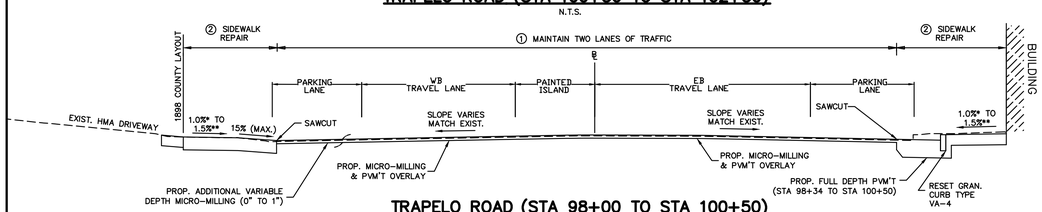


TRAPELO ROAD(STA 102+50 TO STA 105+50)
N.T.S.

BELMONT STREET (STA 116+00 TO 118+00)
N.T.S.

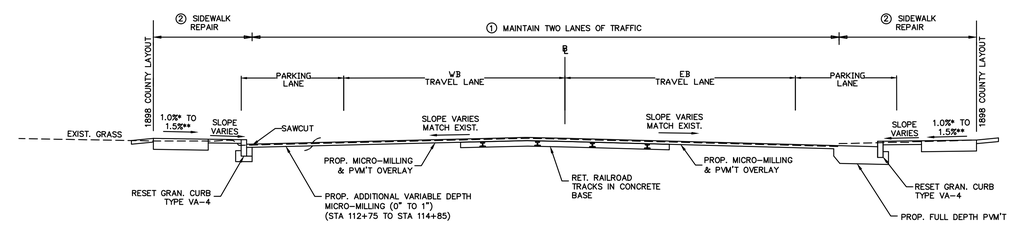


TRAPELO ROAD (STA 100+50 TO STA 102+50)
N.T.S.

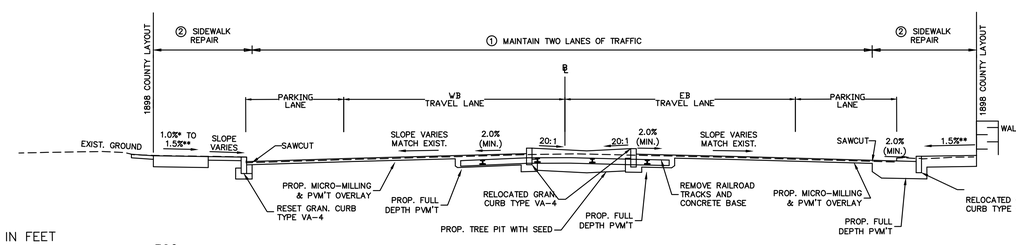


TRAPELO ROAD (STA 98+00 TO STA 100+50)
N.T.S.

HOR. SCALE IN FEET
0 60 150 300



BELMONT STEET (STA 112+75 TO 116+00)
N.T.S.

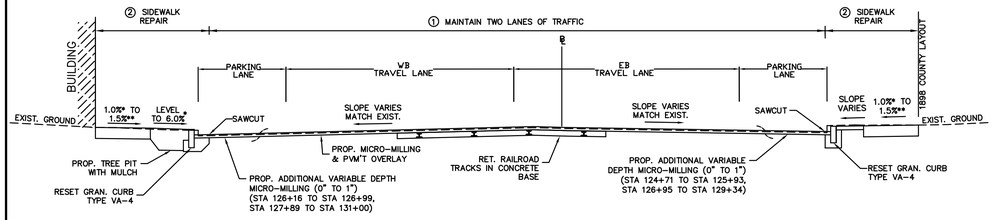


BELMONT STREET (STA 106+00 TO 112+75)
N.T.S.

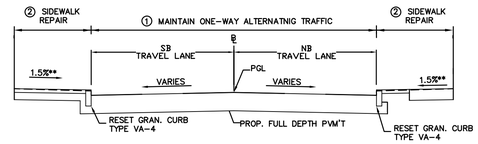
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	179	240
PROJ. FILE NO. 604688			

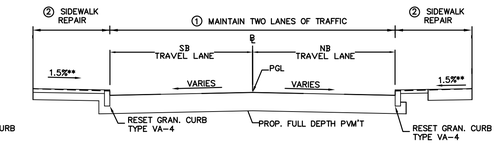
TRAFFIC MANAGEMENT PLAN



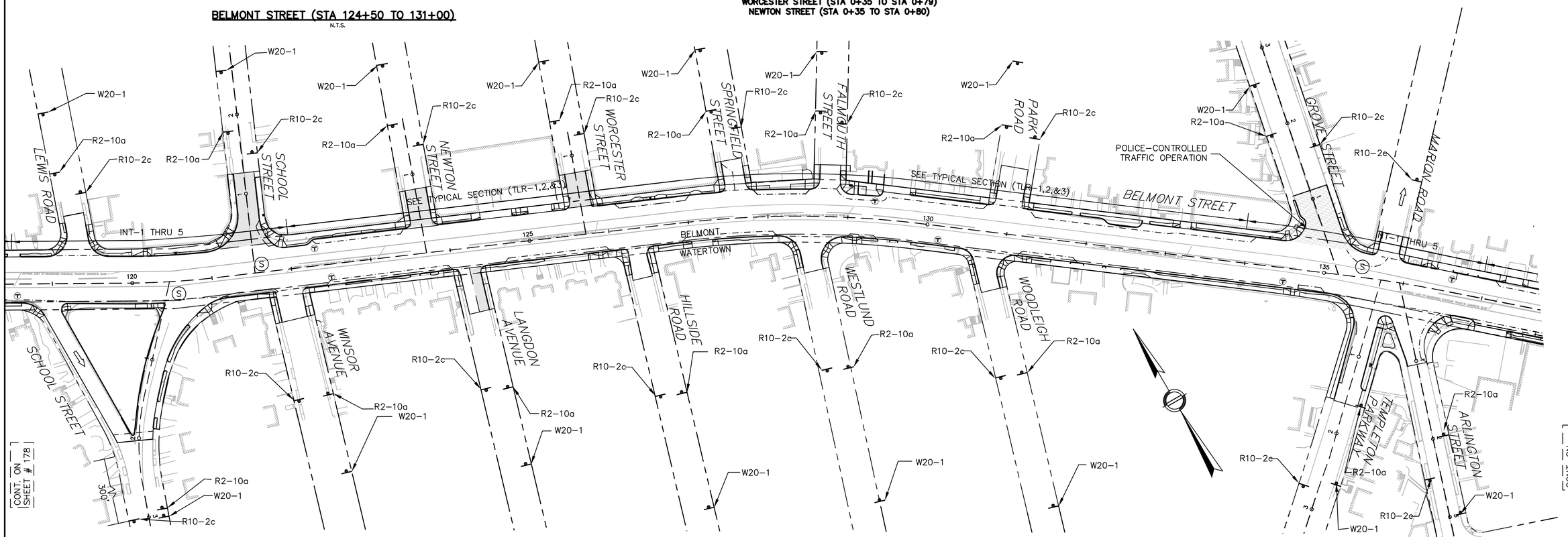
BELMONT STREET (STA 124+50 TO 131+00)
N.T.S.

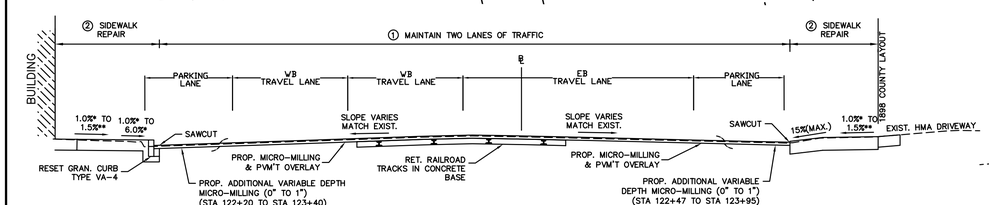


SIDE STREET (FULL DEPTH RECONSTRUCTION)
N.T.S.
SCHOOL STREET (STA 0+35 TO STA 1+25)
WORCESTER STREET (STA 0+35 TO STA 0+79)
NEWTON STREET (STA 0+35 TO STA 0+80)

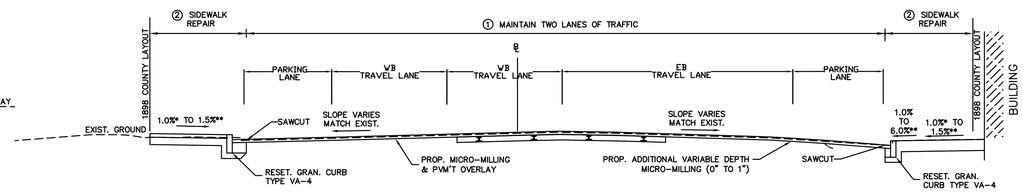


SIDE STREET (FULL DEPTH RECONSTRUCTION)
N.T.S.
GROVE STREET (STA 0+36 TO STA 1+11)

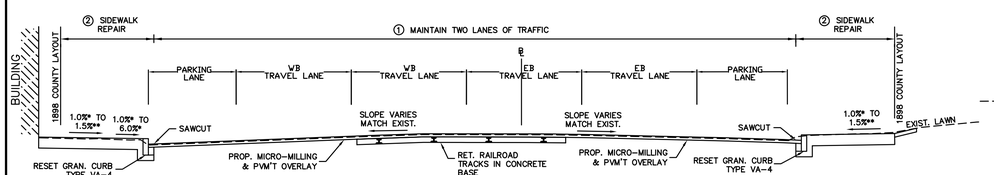




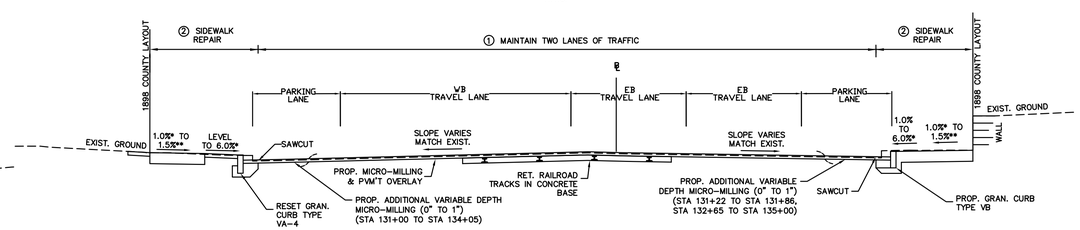
BELMONT STREET (STA 121+50 TO 124+50)
N.T.S.



BELMONT STREET (STA 135+00 TO 138+00)
N.T.S.



BELMONT STREET (STA 118+00 TO 121+50)
N.T.S.



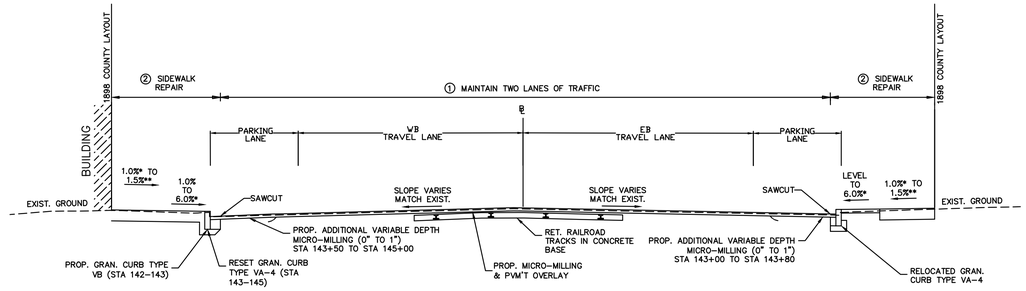
BELMONT STREET (STA 131+00 TO 135+00)
N.T.S.

HOR. SCALE IN FEET
0 60 150 300

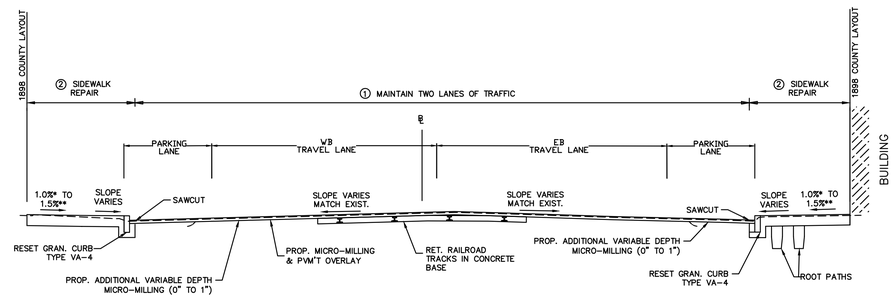
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	180	240
PROJ. FILE NO. 604688			

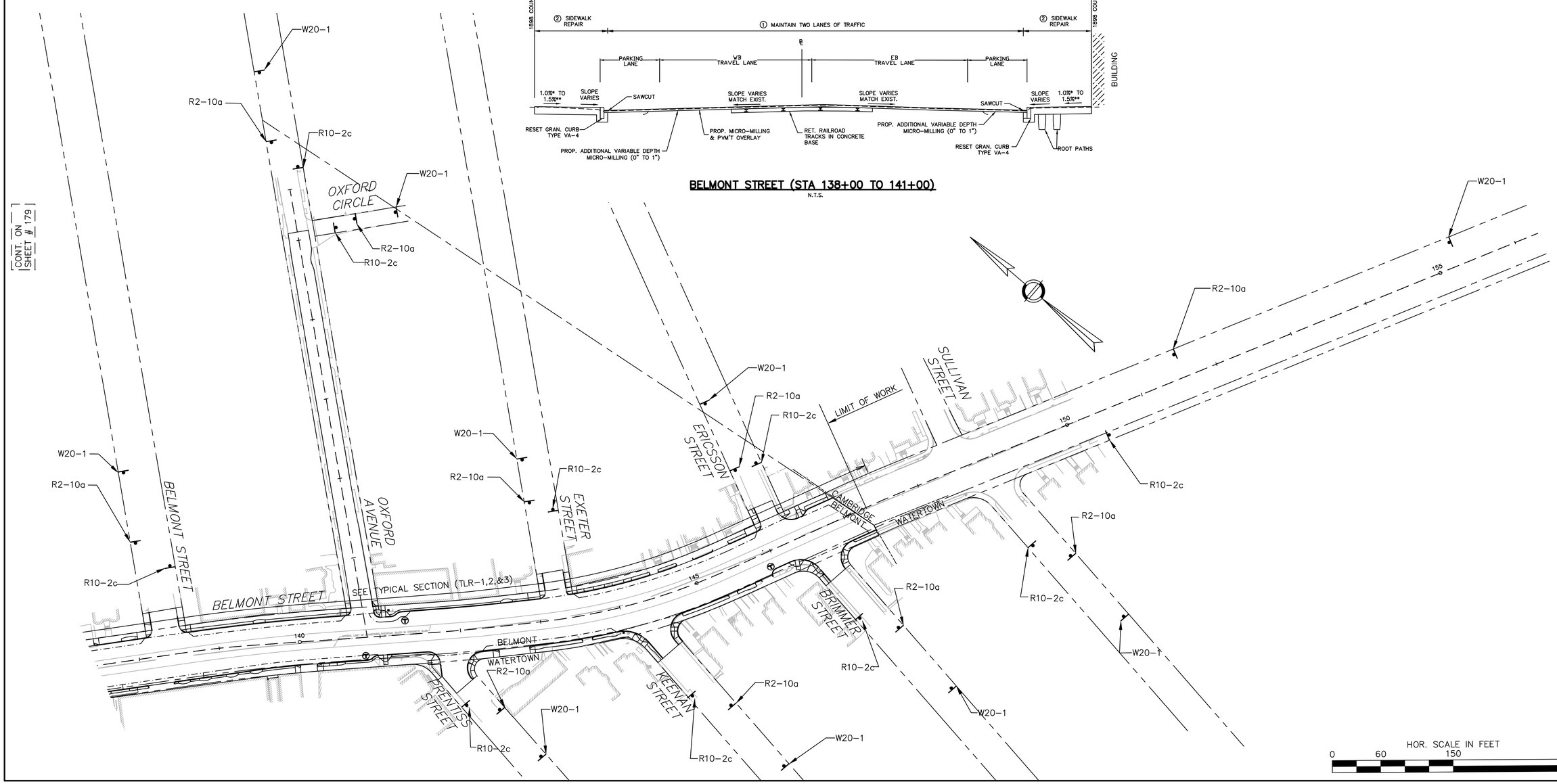
TRAFFIC MANAGEMENT PLAN



BELMONT STREET (STA 141+00 TO 147+30)
N.T.S.



BELMONT STREET (STA 138+00 TO 141+00)
N.T.S.



BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	181	240
PROJ. FILE NO. 604688			

TRAFFIC MANAGEMENT PLAN

TRAFFIC SIGN SUMMARY (CONSTRUCTION)

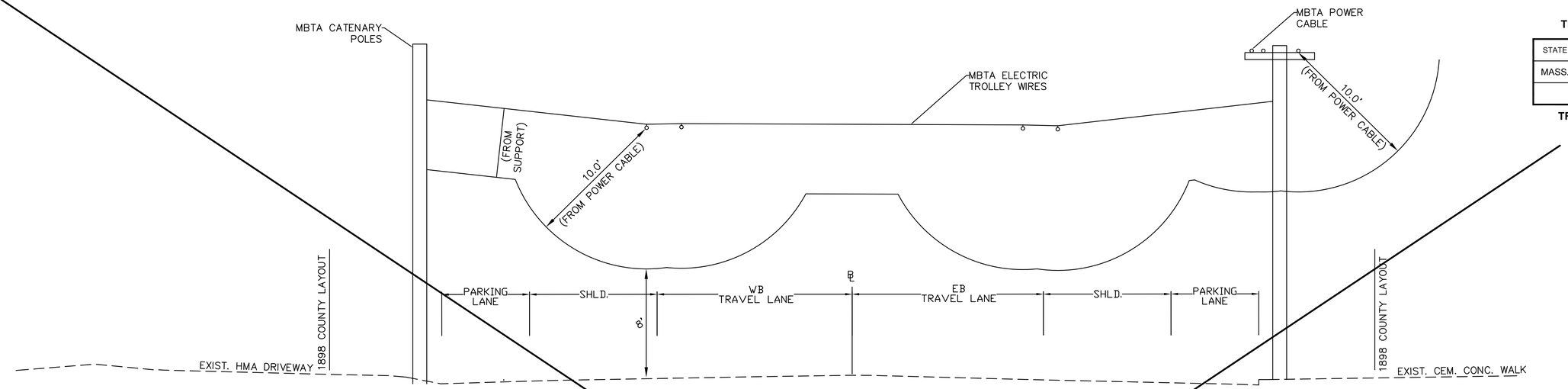
IDENTIFI-CATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (in)			NUMBER OF SIGNS REQUIRED	COLOR			UNIT AREA (S.F.)	AREA (S.F.)
	WIDTH (in)	HEIGHT (in)		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACK-GROUND	LEGEND	BORDER		
R2-10a	48	36	WORK ZONE / SPEEDING FINES DOUBLED	SEE MASSDOT STANDARDS			66	SEE MASSDOT STANDARDS			12.00	630.00
R2-10c	36	48	END ROAD WORK / DOUBLE FINES END	SEE MASSDOT STANDARDS			66	SEE MASSDOT STANDARDS			12.00	630.00
R3-7R/L	30	30	RIGHT LANE MUST TURN RIGHT / LEFT LANE MUST TURN LEFT	SEE 2009 M.U.T.C.D.			2 / 2	SEE 2009 M.U.T.C.D.			6.25	12.50 / 12.50
R4-7	24	30					4				5.00	20.00
R7-1	12	18	NO PARKING ANY TIME				10				1.50	15.00
R9-8	36	18	PEDESTRIAN CROSSWALK				4				4.50	18.00
R9-9	24	12	SIDEWALK CLOSED				8				2.00	16.00
R9-10	24	12	SIDEWALK CLOSED / USE OTHER SIDE				8				2.00	16.00
R9-11R/L	24	18	SIDEWALK CLOSED AHEAD / CROSS HERE				8				3.00	24.00
R9-11aR/L	24	12	SIDEWALK CLOSED / CROSS HERE				8				2.00	16.00
W1-4R/L	36	36					4 / 4				9.00	36.00 / 36.00
W4-2R/L	36	36					2 / 2				9.00	18.00 / 18.00
W4-7R/L	36	36	THRU TRAFFIC MERGE RIGHT / THRU TRAFFIC MERGE LEFT	SEE MASSDOT STANDARDS			2 / 2	SEE MASSDOT STANDARDS			9.00	18.00 / 18.00
W5-1	36	36	ROAD NARROWS	SEE 2009 M.U.T.C.D.			4	SEE 2009 M.U.T.C.D.			9.00	36.00
W8-3	36	36	PAVEMENT ENDS				4				9.00	36.00
W8-8	36	36	ROUGH ROAD				4				9.00	36.00
W11-2	36	36					4				9.00	36.00
W12-1	36	36					2				9.00	18.00
W16-7pR/L	24	12					2 / 2				2.00	4.00 / 4.00
W16-9p(AHD)	24	12	AHEAD				4				2.00	8.00
W20-1(AHD)	36	36	ROAD WORK AHEAD				71				9.00	639.00

IDENTIFI-CATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (in)			NUMBER OF SIGNS REQUIRED	COLOR			UNIT AREA (S.F.)	AREA (S.F.)
	WIDTH (in)	HEIGHT (in)		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACK-GROUND	LEGEND	BORDER		
W20-4(AHD)	36	36	ONE LANE ROAD AHEAD	SEE 2009 M.U.T.C.D.			4	SEE 2009 M.U.T.C.D.			9.00	36.00
W20-5R/C/L (AHD)	36	36	RIGHT LANE CLOSED AHEAD / CENTER LANE CLOSED AHEAD / LEFT LANE CLOSED AHEAD				2 / 1 / 2				9.00	18.00 / 9.00 / 18.00
W20-7a	36	36					4				9.00	36.00
W20-8 (AHD)	36	36	POLICE OFFICER AHEAD	SEE MASSDOT STDS			4	SEE MASSDOT STDS			9.00	36.00
W21-5aR	36	36	RIGHT SHOULDER CLOSED	SEE 2009 M.U.T.C.D.			4	SEE 2009 M.U.T.C.D.			9.00	36.00
W30-8R	36	36	SQUEEZE RIGHT	SEE MASSDOT STDS			4	SEE MASSDOT STDS			9.00	36.00

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

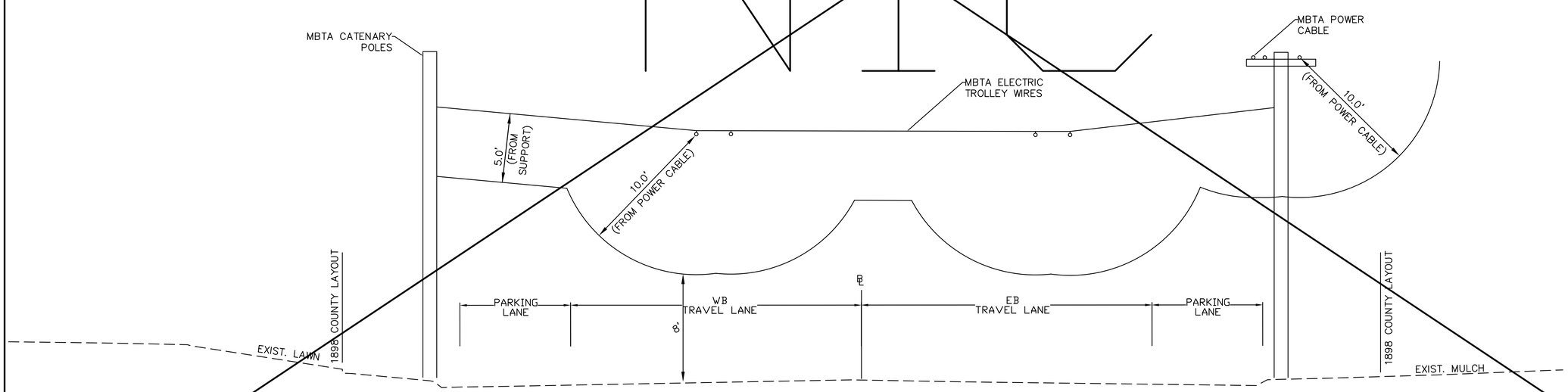
STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	182	240
PROJ. FILE NO. 604688			

TRAFFIC MANAGEMENT PLAN



MBTA CLEARANCE ENVELOPE– ROADWAY NARROWING

N.T.S.



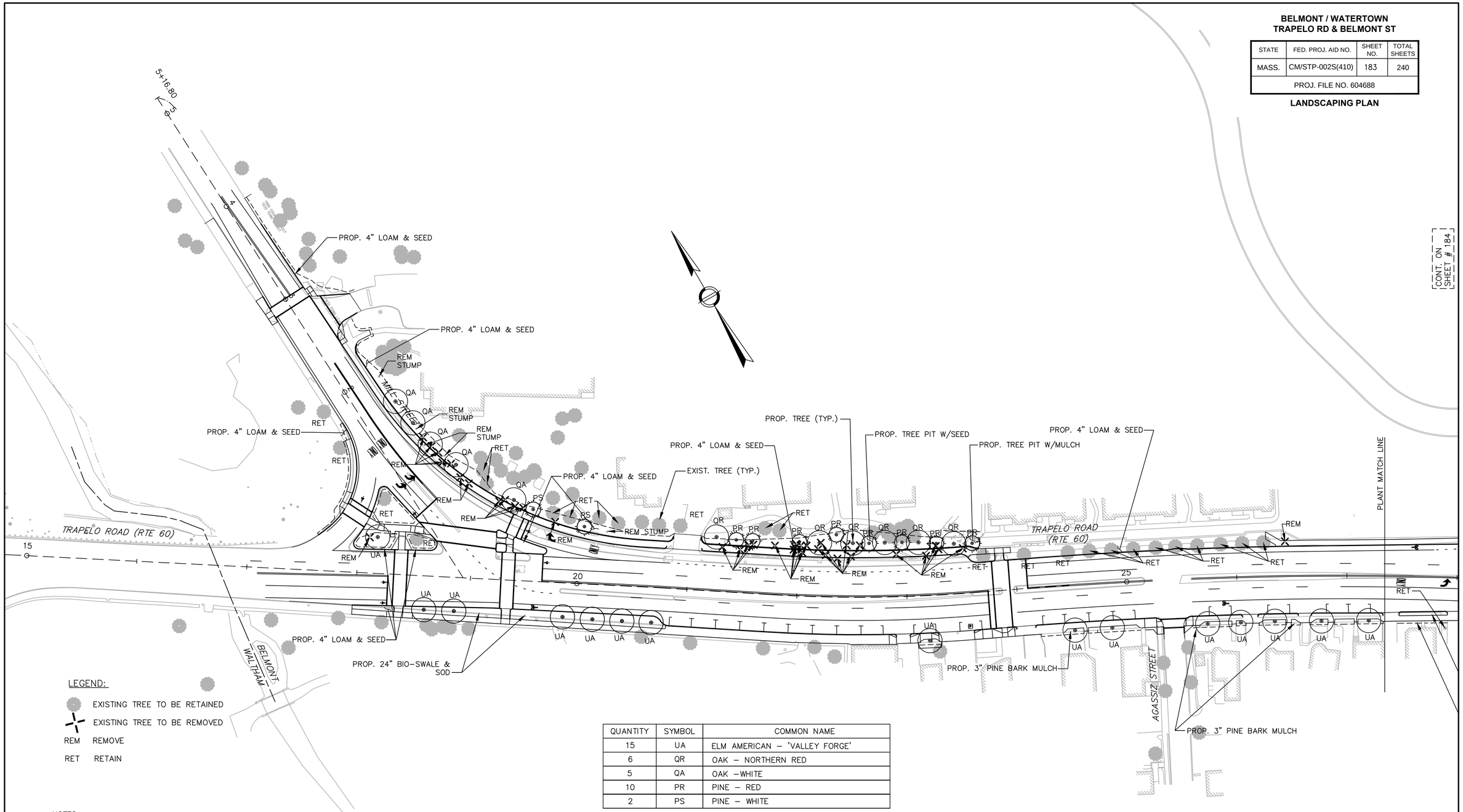
MBTA CLEARANCE ENVELOPE

N.T.S.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	183	240
PROJ. FILE NO. 604688			

LANDSCAPING PLAN



LEGEND:

- EXISTING TREE TO BE RETAINED
- EXISTING TREE TO BE REMOVED
- REM REMOVE
- RET RETAIN

QUANTITY	SYMBOL	COMMON NAME
15	UA	ELM AMERICAN – 'VALLEY FORGE'
6	QR	OAK – NORTHERN RED
5	QA	OAK –WHITE
10	PR	PINE – RED
2	PS	PINE – WHITE

NOTES:

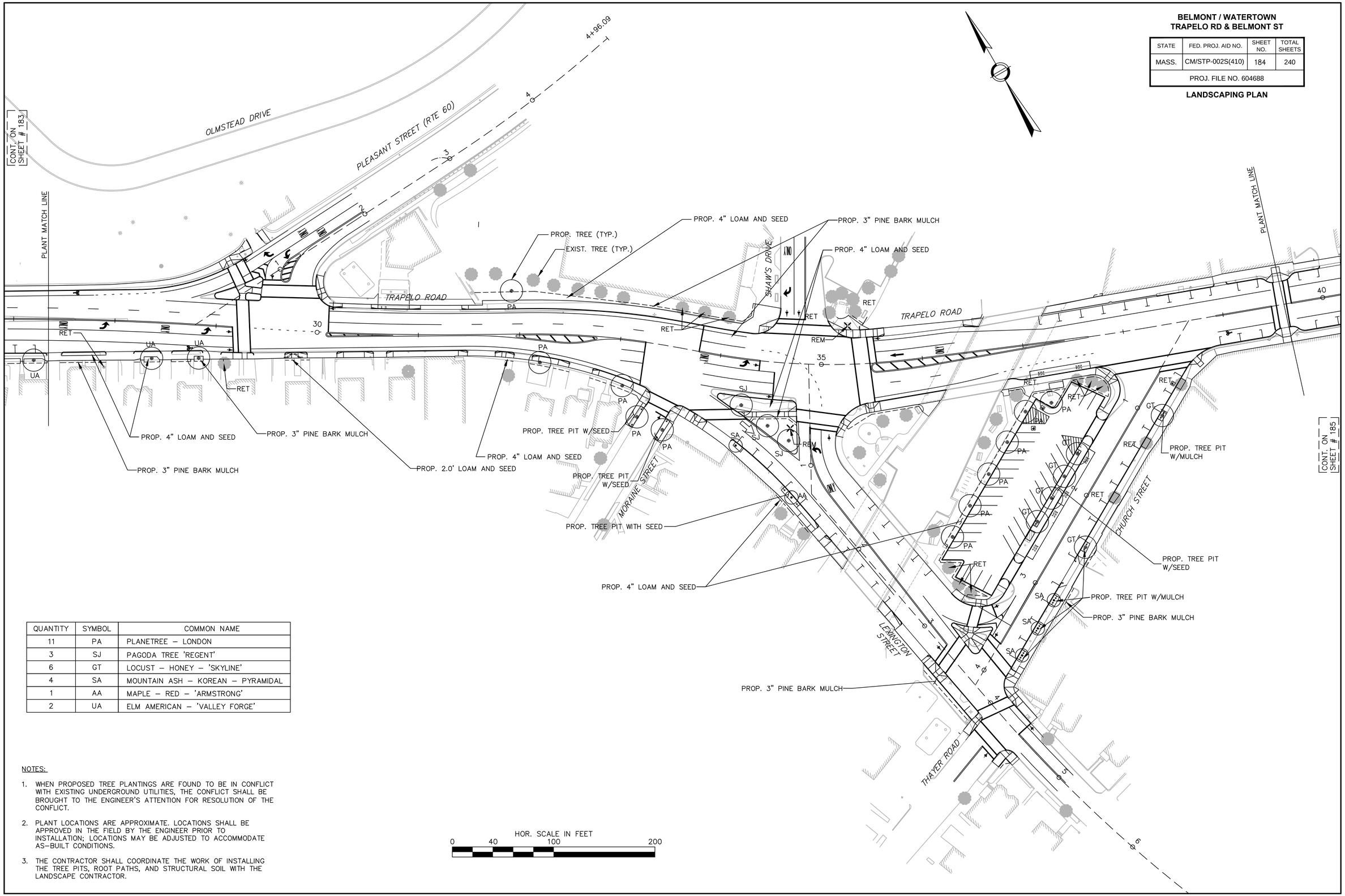
1. WHEN PROPOSED TREE PLANTINGS ARE FOUND TO BE IN CONFLICT WITH EXISTING UNDERGROUND UTILITIES, THE CONFLICT SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION FOR RESOLUTION OF THE CONFLICT.
2. PLANT LOCATIONS ARE APPROXIMATE. LOCATIONS SHALL BE APPROVED IN THE FIELD BY THE ENGINEER PRIOR TO INSTALLATION; LOCATIONS MAY BE ADJUSTED TO ACCOMMODATE AS–BUILT CONDITIONS.
3. THE CONTRACTOR SHALL COORDINATE THE WORK OF INSTALLING THE TREE PITS, ROOT PATHS, AND STRUCTURAL SOIL WITH THE LANDSCAPE CONTRACTOR.

HOR. SCALE IN FEET
0 40 100 200

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	184	240
PROJ. FILE NO. 604688			

LANDSCAPING PLAN



QUANTITY	SYMBOL	COMMON NAME
11	PA	PLANETREE – LONDON
3	SJ	PAGODA TREE 'REGENT'
6	GT	LOCUST – HONEY – 'SKYLINE'
4	SA	MOUNTAIN ASH – KOREAN – PYRAMIDAL
1	AA	MAPLE – RED – 'ARMSTRONG'
2	UA	ELM AMERICAN – 'VALLEY FORGE'

NOTES:

1. WHEN PROPOSED TREE PLANTINGS ARE FOUND TO BE IN CONFLICT WITH EXISTING UNDERGROUND UTILITIES, THE CONFLICT SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION FOR RESOLUTION OF THE CONFLICT.
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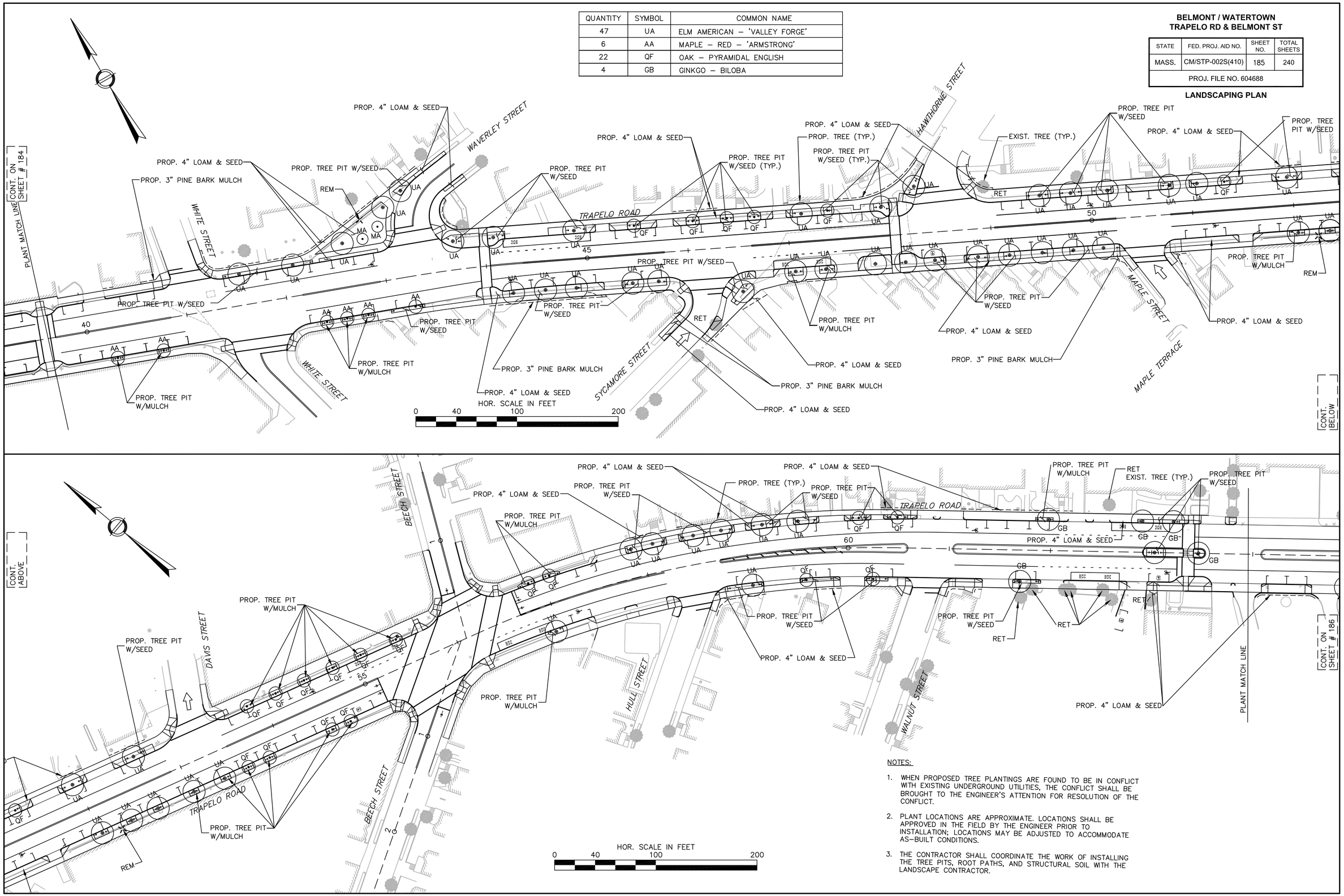
QUANTITY	SYMBOL	COMMON NAME
47	UA	ELM AMERICAN – 'VALLEY FORGE'
6	AA	MAPLE – RED – 'ARMSTRONG'
22	QF	OAK – PYRAMIDAL ENGLISH
4	GB	GINKGO – BILOBA

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	185	240
PROJ. FILE NO. 604688			

LANDSCAPING PLAN



NOTES:

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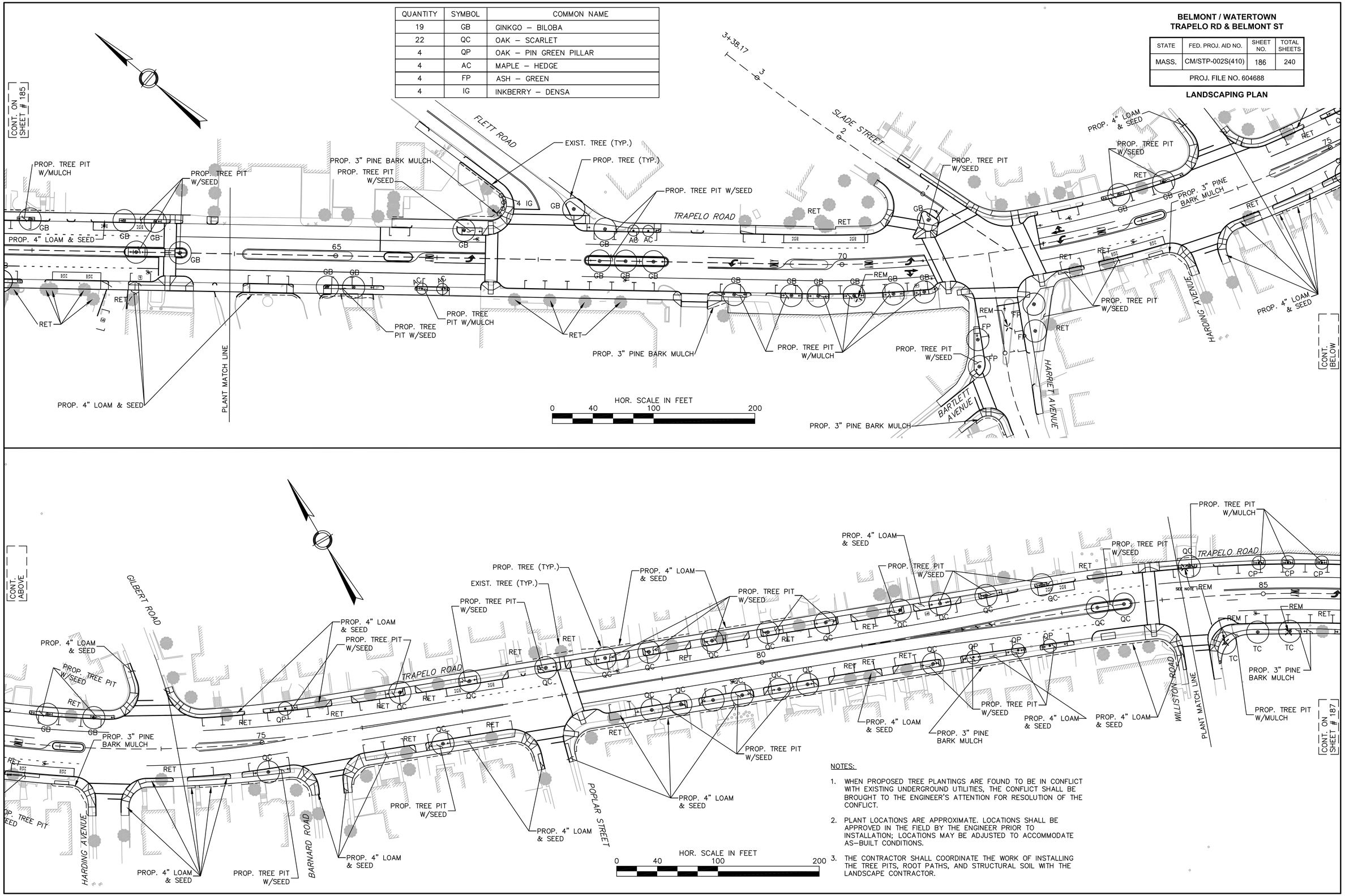
2. PLANT LOCATIONS ARE APPROXIMATE. LOCATIONS SHALL BE APPROVED IN THE FIELD BY THE ENGINEER PRIOR TO INSTALLATION; LOCATIONS MAY BE ADJUSTED TO ACCOMMODATE AS–BUILT CONDITIONS.
3. THE CONTRACTOR SHALL COORDINATE THE WORK OF INSTALLING THE TREE PITS, ROOT PATHS, AND STRUCTURAL SOIL WITH THE LANDSCAPE CONTRACTOR.

QUANTITY	SYMBOL	COMMON NAME
19	GB	GINKGO – BILOBA
22	QC	OAK – SCARLET
4	QP	OAK – PIN GREEN PILLAR
4	AC	MAPLE – HEDGE
4	FP	ASH – GREEN
4	IG	INKBERRY – DENSA

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	186	240
PROJ. FILE NO. 604688			

LANDSCAPING PLAN



NOTES:

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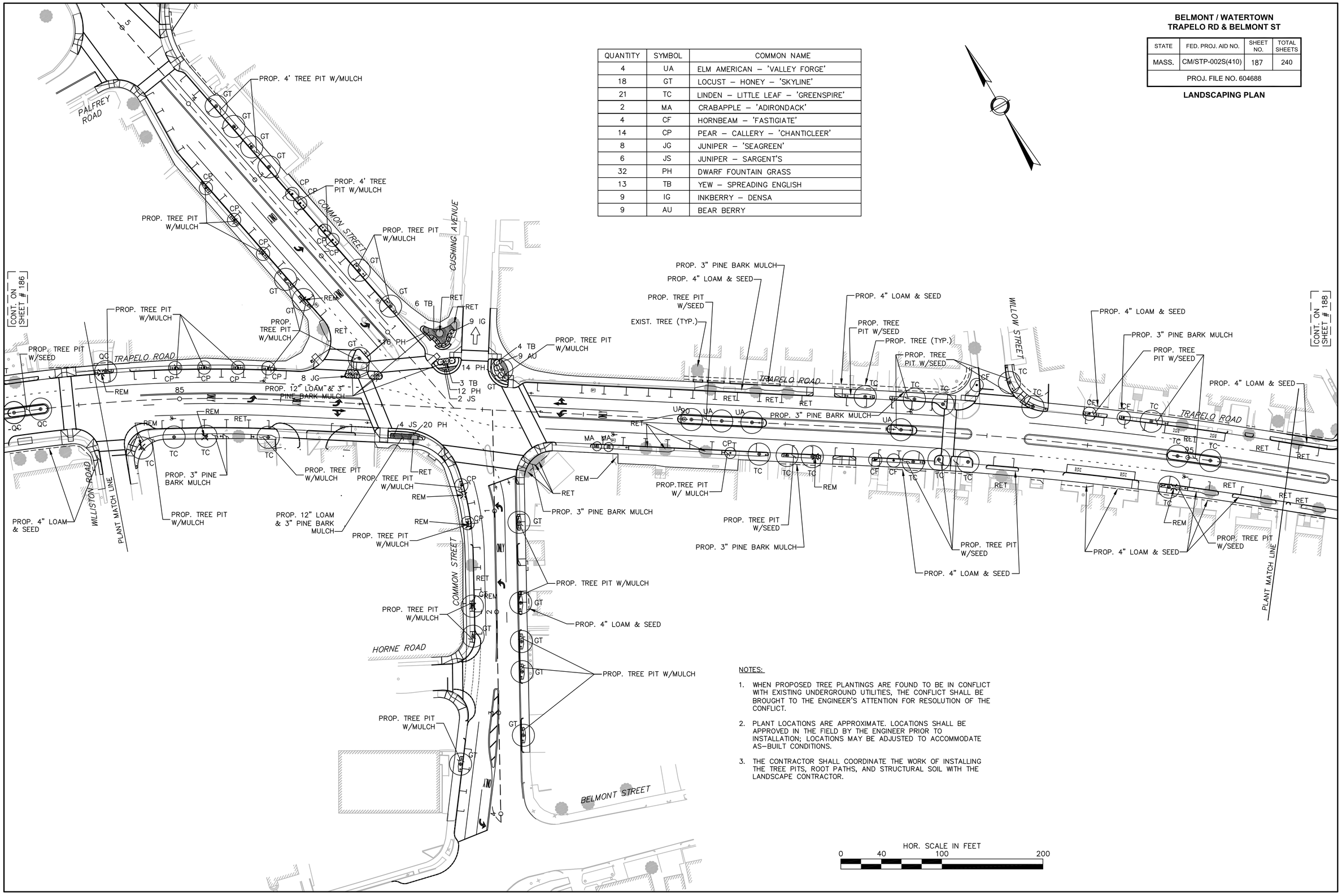
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	187	240
PROJ. FILE NO. 604688			

LANDSCAPING PLAN

QUANTITY	SYMBOL	COMMON NAME
4	UA	ELM AMERICAN – 'VALLEY FORGE'
18	GT	LOCUST – HONEY – 'SKYLINE'
21	TC	LINDEN – LITTLE LEAF – 'GREENSPIRE'
2	MA	CRABAPPLE – 'ADIRONDACK'
4	CF	HORNBEAM – 'FASTIGIATE'
14	CP	PEAR – CALLERY – 'CHANTICLEER'
8	JG	JUNIPER – 'SEAGREEN'
6	JS	JUNIPER – SARGENT'S
32	PH	DWARF FOUNTAIN GRASS
13	TB	YEW – SPREADING ENGLISH
9	IG	INKBERRY – DENSA
9	AU	BEAR BERRY



NOTES:

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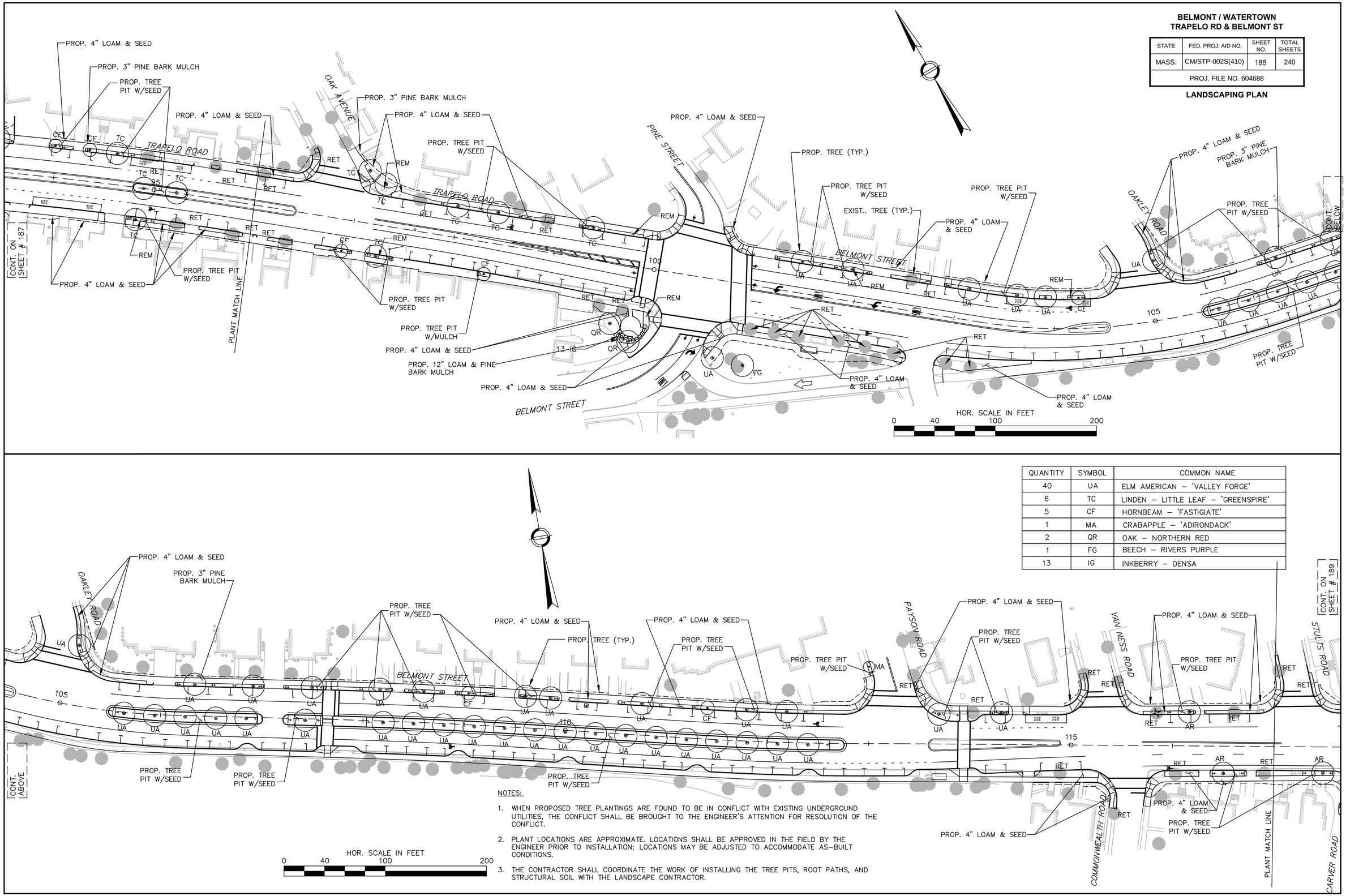
HOR. SCALE IN FEET
0 40 100 200

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	188	240
PROJ. FILE NO. 604688			

LANDSCAPING PLAN



QUANTITY	SYMBOL	COMMON NAME
40	UA	ELM AMERICAN – 'VALLEY FORGE'
6	TC	LINDEN – LITTLE LEAF – 'GREENSPIRE'
5	CF	HORNBEAM – 'FASTIGIATE'
1	MA	CRABAPPLE – 'ADIRONDACK'
2	QR	OAK – NORTHERN RED
1	FG	BEECH – RIVERS PURPLE
13	IG	INKBERRY – DENSA

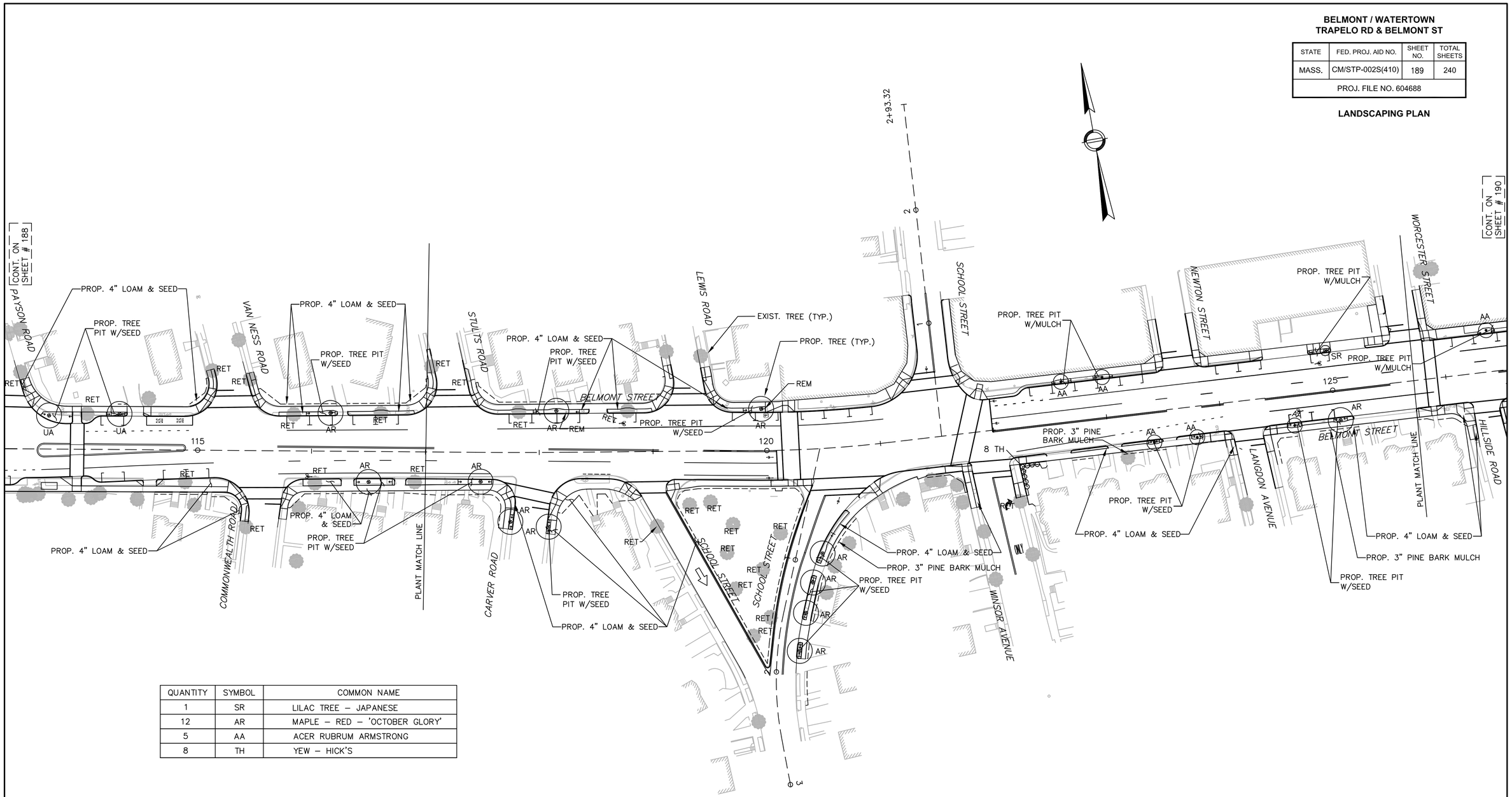
NOTES:

1. WHEN PROPOSED TREE PLANTINGS ARE FOUND TO BE IN CONFLICT WITH EXISTING UNDERGROUND UTILITIES, THE CONFLICT SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION FOR RESOLUTION OF THE CONFLICT.
2. PLANT LOCATIONS ARE APPROXIMATE. LOCATIONS SHALL BE APPROVED IN THE FIELD BY THE ENGINEER PRIOR TO INSTALLATION; LOCATIONS MAY BE ADJUSTED TO ACCOMMODATE AS-BUILT CONDITIONS.
3. THE CONTRACTOR SHALL COORDINATE THE WORK OF INSTALLING THE TREE PITS, ROOT PATHS, AND STRUCTURAL SOIL WITH THE LANDSCAPE CONTRACTOR.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	189	240
PROJ. FILE NO. 604688			

LANDSCAPING PLAN



QUANTITY	SYMBOL	COMMON NAME
1	SR	LILAC TREE – JAPANESE
12	AR	MAPLE – RED – 'OCTOBER GLORY'
5	AA	ACER RUBRUM ARMSTRONG
8	TH	YEW – HICK'S

HOR. SCALE IN FEET
0 40 100 200

NOTES:

1. WHEN PROPOSED TREE PLANTINGS ARE FOUND TO BE IN CONFLICT WITH EXISTING UNDERGROUND UTILITIES, THE CONFLICT SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION FOR RESOLUTION OF THE CONFLICT.
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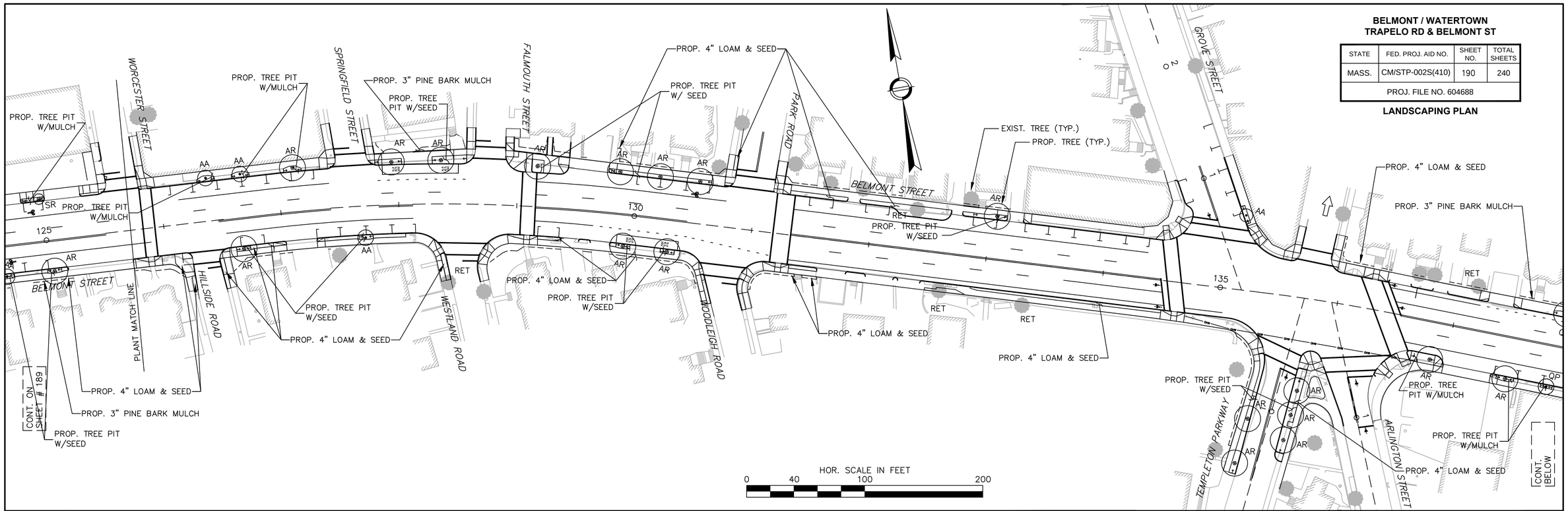
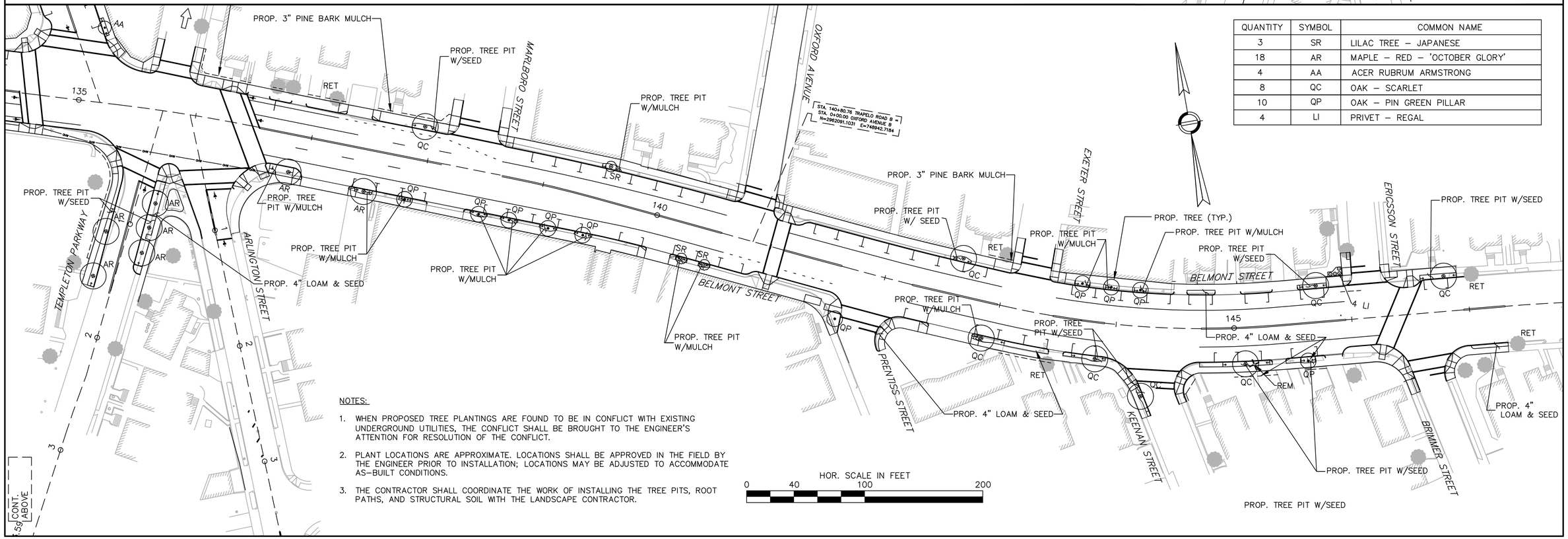
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	190	240
PROJ. FILE NO. 604688			

LANDSCAPING PLAN



QUANTITY	SYMBOL	COMMON NAME
3	SR	LILAC TREE – JAPANESE
18	AR	MAPLE – RED – 'OCTOBER GLORY'
4	AA	ACER RUBRUM ARMSTRONG
8	QC	OAK – SCARLET
10	QP	OAK – PIN GREEN PILLAR
4	LI	PRIVET – REGAL



NOTES:

1. WHEN PROPOSED TREE PLANTINGS ARE FOUND TO BE IN CONFLICT WITH EXISTING UNDERGROUND UTILITIES, THE CONFLICT SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION FOR RESOLUTION OF THE CONFLICT.
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PROP. TREE PIT W/SEED

PLANT SUMMARY TABLE

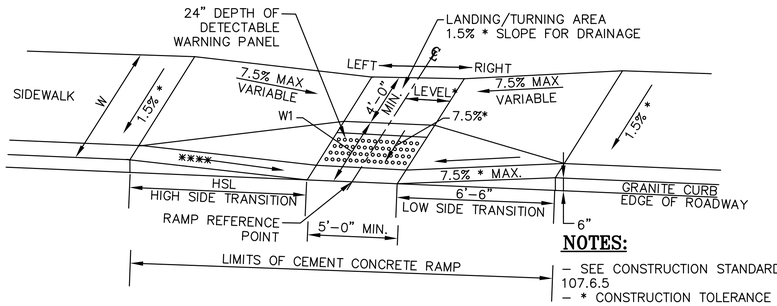
QT.	SYMBOL	COMMON NAME	SCIENTIFIC NAME	SIZE
CANOPY TREES				
108	UA	ELM AMERICAN – 'VALLEY FORGE'	ULMUS AMERICANA 'VALLEY FORGE'	2–2.5" CALIPER
8	QR	OAK – NORTHERN RED	QUERCUS RUBRA	2–2.5" CALIPER
5	QA	OAK – WHITE	QUERCUS ALBA	2–2.5" CALIPER
11	PA	PLANETREE – LONDON	PLATANUS ACERIFOLIA 'BLOOD GOOD'	2–2.5" CALIPER
3	SJ	PAGODA TREE 'REGENT'	SOPHORA JAPONICA 'REGENT'	2–2.5" CALIPER
24	GT	LOCUST – HONEY – 'SKYLINE'	GLEDITSIA TRIACANTHOS INERMIS 'SKYLINE'	2–2.5" CALIPER
22	GB	GINKGO – BILOBA	GINKGO BILOBA	2–2.5" CALIPER
4	FP	ASH – GREEN	FRAXINUS PENSYLVANICA	2–2.5" CALIPER
31	QC	OAK – SCARLET	QUERCUS COCCINEA	2–2.5" CALIPER
14	QP	OAK – PIN GREEN PILLAR	QUERCUS PALUSTRIS 'GREEN PILLAR'	2–2.5" CALIPER
25	TC	LINDEN – LITTLE LEAF – 'GREENSPIRE'	TILLIA CORDATA 'GREENSPIRE'	2–2.5" CALIPER
30	AR	MAPLE – RED – 'OCTOBER GLORY'	ACER RUBRUM 'OCTOBER GLORY'	2–2.5" CALIPER
NOTE: CANOPY TREES SHALL BE WELL ROOTED B&B, AND SHALL BE MATCHED SPECIMINES				
EVERGREEN TREES				
8	PR	PINE – RED	PINUS RESINOSA	8–10' HEIGHT
2	PS	PINE – WHITE	PINUS STROBUS	5–6' HEIGHT
NOTE: EVERGREEN TREES SHALL BE CONTAINER GROWN UNLESS OTHERWISE APPROVED				
COLUMNAR TREES				
16	AA	MAPLE – RED – 'ARMSTRONG'	ACER RUBRUM 'ARMSTRONG'	2–2.5" CALIPER
22	QF	OAK – PYRAMIDAL ENGLISH	QUERCUS ROBUR 'FASTIGIATA'	2–2.5" CALIPER
14	CP	PEAR – CALLERY – 'CHANTICLEER'	PYRUS CALLERYANA 'CHANTICLEAR'	2–2.5" CALIPER
10	CF	HORNBEAM – 'FASTIGIATE'	CARPINUS BETULUS 'FASTIGIATA'	2"–2.5" CALIPER
NOTE: COLUMNAR TREES SHALL BE WELL ROOTED B&B, AND SHALL BE MATCHED SPECIMINES				
ORNAMENTAL TREES				
5	MA	CRABAPPLE – 'ADIRONDACK'	MALUS 'ADIRONDACK'	1.5–2" CALIPER
5	SR	LILAC TREE – JAPANESE	SYRINGA RETICULATA 'IVORY SILK'	1.5–2" CALIPER
4	AC	MAPLE –HEDGE	ACER CAMPESTRE	1.5–2" CALIPER
4	SA	MOUNTAIN ASH – KOREAN – PYRAMIDAL	SORBUS ALNIFOLIA FASTIGIATA	1.5"–2" CALIPER
1	FG	BEECH – RIVERS PURPLE	FAGUS SYLVATICA 'RIVERSII'	2–2.5" CALIPER
NOTE: ORNAMENTAL TREES SHALL BE MATCHED SPECIMINES WHERE GROUPED				
SHRUBS				
4	LI	PRIVET – REGAL	LIGUSTRUM IBOLIUM 'REGAL'	18–24" HEIGHT
8	JG	JUNIPER – 'SEAGREEN'	JUNIPARUS CHINENSIS 'SEA GREEN'	18–24" HEIGHT
26	IG	INKBERRY – DENSA	ILEX GLABRA 'DENSA'	2–3' HEIGHT
8	TH	YEW – HICK'S	TAXUS 'MEDIA HICKSII'	30–36" HEIGHT
GROUNDCOVER				
13	TB	YEW – SPREADING ENGLISH	TAXUS BACCATA REPANDENS	15–18" SPREAD
6	JS	JUNIPER – SARGENT'S	JUNIPARUS CHINENSIS 'SARGENTII'	15–18" SPREAD
9	AU	BEAR BERRY	ARCTOSTAPHYLOS UVA–URSI	1 GALLON
62	PH	DWARF FOUNTAIN GRASS	PENNISETUM ALOPECUROIDES 'HAMELN'	1 GALLON

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	191	240
PROJ. FILE NO. 604688			

LANDSCAPING PLAN

WHEELCHAIR RAMP
STYLE "A" – PARALLEL PERPENDICULAR



NOTES:

- SEE CONSTRUCTION STANDARD E 107.2.0 AND 107.6.5
- * CONSTRUCTION TOLERANCE ± 0.5%
- ** ABUTS <6" CURB REVEAL
- *** SIDEWALK ENDS
- **** SEE CONSTRUCTION STANDARD E 107.9.0

WCR #	℄ RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	WIDTH OF SIDEWALK (W)	LENGTH OF PRIMARY RAMP (W1)	WIDTH OF PRIMARY RAMP	DEPTH OF LEVEL LANDING Min. 4'-0"	TRANSITION LENGTH AND ROADWAY GUTTER SLOPE (%)			
						LEFT SIDE		RIGHT SIDE	
						L	%	L	%
A8	23+86.10/34.00RT	VARIES	2.22	5.0	4.0	6.5	N/A	9.0	1.73
A10	29+98.28/39.31LT	7.9	3.9	5.0	4.0	15.0	7.21	6.5	N/A
A12	33+90.39/62.95RT	9.5	5.5	5.0	4.0	N/A	N/A	4.5**	1.53
A15	35+17.25/59.56RT	VARIES	4.16	5.0	4.0	5.5**	2.21	9.0	1.84
A16	35+46.25/38.89RT	VARIES	5.50	5.0	4.0	6.5	N/A	3.25**	0.31
A17	LEXINGTON ST. 3+43.70/15.00RT	10.0	6.0	5.0	4.0	6.5	N/A	7.0**	3.93
A18	LEXINGTON ST. 4+10.78/16.50LT	8.5	4.5	5.0	4.0	11.0	2.54	6.5	N/A
A19	CHURCH ST. 3+48.75/37.45RT	VARIES	5.58	5.0	4.0	15.0	4.83	6.5	N/A
A21	37+83.54/38.62RT	VARIES	5.38	5.0	4.2	6.5	N/A	15.0	5.31
A24	41+22.13/38.83LT	5.0	2.23	5.0	4.92	6.5	N/A	6.5	N/A
A27	43+14.00/39.03LT	8.5	2.57	5.0	5.29	7.66	0.19	6.5	N/A
A29	53+10.38/35.72LT	VARIES	6.39	5.0	4.44	6.5	N/A	9.0	1.78
A31	55+24.18/27.99RT	12.5	7.42	5.0	4.09	3.25**	N/A	7.5**	1.64
A32	55+34.59/46.53RT	7.47	3.47	5.0	4.00	6.5	N/A	5.5**	2.52
A33	55+82.39/40.81RT	VARIES	6.81	5.0	4.14	6.5	N/A	6.5	N/A
A36	56+35.38/40.89LT	VARIES	3.11	5.0	4.0	7.66	0.36	3.25**	N/A
A37	55+99.21/37.30LT	VARIES	3.85	5.0	4.0	7.66	0.42	7.66	0.93
A39	66+73.70/41.21LT	VARIES	4.78	5.0	4.0	6.5	N/A	7.66	0.09
A40	70+50.77/42.98LT	VARIES	2.52	5.0	4.0	7.66	0.63	6.5	N/A
A42	HARRIET AVE. 1+47.47/27.11RT	7.0	3.83	5.0	4.03	15.0	7.84	6.5	N/A
A46	73+35.54/41.78RT	8.5	4.95	5.0	4.0	14.0	3.23	6.5	N/A
A47	73+64.49/1.93RT	8.5	4.47	5.0	4.0	15.0	6.09	6.5	N/A
A49	73+70.77/38.94LT	8.5	4.78	5.0	4.0	6.5	N/A	15.0	10.08
A50	75+43.34/34.79RT	VARIES	7.48	5.0	4.28	9.0	1.48	6.5	N/A
A51	75+78.12/34.60RT	12.5	7.67	5.0	4.40	15.0	5.18	6.5	N/A
A52	83+89.00/29.00LT	8.5	4.5	5.0	4.0	6.5	N/A	9.0	1.47
A53	84+45.45/44.95RT	8.5	4.81	5.0	4.0	15.0	4.29	9.0	1.14
A54	N. COMMON ST. 5+14.55/40.25LT	7.5	3.91	5.0	4.0	9.0	1.46	6.5	N/A
A55	N. COMMON ST. 4+67.90/42.63LT	8.0	3.23	5.0	4.0	6.5	N/A	15.0	4.85
A56	N. COMMON ST. 4+40.67/26.36LT	8.0	3.88	5.0	4.0	6.5	N/A	6.5	N/A
A60	88+39.12/50.54RT	8.0	4.93	5.0	4.0	3.83**	0.58	4.5**	1.71
A61	88+59.16/31.22RT	8.5	4.96	5.0	4.0	9.0	1.65	4.79**	0.84
A62	S. COMMON ST. 2+50.00/41.79RT	VARIES	4.37	5.0	4.59	11.0	2.75	6.5	N/A
A63	S. COMMON ST. 2+79.98/42.28RT	VARIES	4.67	5.0	4.07	15.0	5.21	6.5	N/A
A64	93+27.78/37.67LT	8.5	5.93	5.0	4.03	6.5	N/A	6.5	N/A

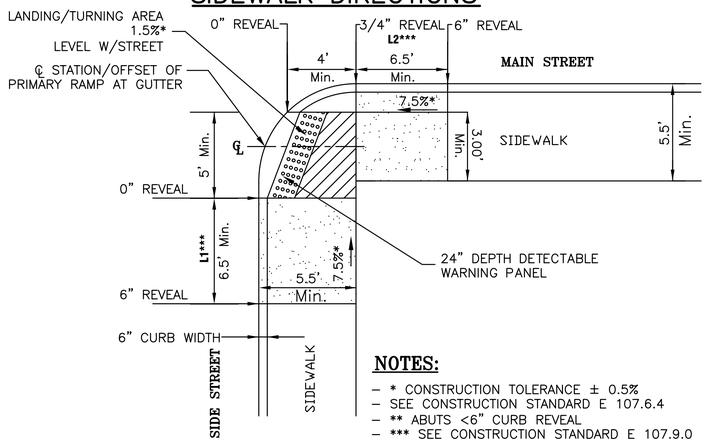
WCR #	C RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	WIDTH OF SIDEWALK (W)	LENGTH OF PRIMARY RAMP (W1)	WIDTH OF PRIMARY RAMP (W1)	DEPTH OF LEVEL LANDING Min. 4'-0"	TRANSITION LENGTH AND ROADWAY GUTTER SLOPE (%)			
						LEFT SIDE		RIGHT SIDE	
						L	%	L	%
A65	96+53.30/38.89LT	8.5	4.08	5.0	4.01	6.5	N/A	14.0	3.61
A70	100+84.36/29.65LT	8.5	4.42	5.0	4.0	4.5**	1.90	6.5	N/A
A71	100+65.19/43.00LT	8.5	4.15	5.0	4.0	7.66	0.86	3.25**	N/A
A73	99+95.78/29.04LT	8.5	4.46	5.0	4.00	9.00	1.34	3.25**	N/A
A74	104+68.94/43.85LT	8.5	4.50	5.0	4.0	15.0	4.98	6.5	N/A
A75	105+15.81/43.13LT	8.5	4.59	5.0	4.0	7.66	0.57	6.5	N/A
A76	113+02.06/44.48LT	8.5	3.38	5.0	4.0	15.0	5.54	6.5	N/A
A77	115+12.88/44.09LT	8.0	3.16	5.0	4.03	14.0	3.15	7.66	0.91
A78	113+49.16/43.49LT	VARIES	6.57	6.0	4.82	7.66	0.24	6.5	N/A
A79	115+40.76/37.78RT	VARIES	2.52	5.0	4.0	7.66	0.81	14.0	3.02
A80	115+74.72/38.92RT	VARIES	3.39	5.0	4.13	6.5	N/A	9.0	1.83
A81	117+06.38/46.47LT	7.5	4.03	5.0	4.0	9.0	1.86	6.5	N/A
A84	118+10.19/41.69RT	VARIES	5.31	5.0	4.0	6.5	N/A	15.0	5.25
A85	118+82.87/31.58RT	VARIES	4.52	5.0	4.0	7.66	0.67	6.5	N/A
A86	119+15.03/47.52LT	7.5	3.95	5.0	4.0	14.0	3.58	9.0	1.77
A87	119+48.10/47.33LT	8.5	4.63	5.0	4.0	15.0	6.47	6.5	N/A
A88	120+17.29/33.35LT	7.5	5.91	5.0	4.0	15.0	5.28	6.5	N/A
A90	121+28.83/46.84LT	VARIES	6.54	5.0	4.34	15.0	4.73	6.5	N/A
A91	121+70.92/9.28LT	8.0	4.0	5.0	4.0	6.5	N/A	4.5**	1.45
A94	125+92.70/24.50RT	7.5	4.0	5.0	4.0	6.5	N/A	11.0	2.26
A97	128+71.18/39.19RT	7.5	4.41	5.0	4.0	6.5	N/A	9.0	1.96
A98	129+09.94/24.50RT	7.5	3.75	5.0	4.06	6.5	N/A	14.0	3.81
A99	130+65.02/44.00RT	7.0	2.82	5.0	4.0	14.0	3.36	6.5	N/A
A100	130+93.57/43.69RT	7.5	5.24	5.0	4.01	6.5	N/A	15.0	4.27
A101	131+25.83/25.00RT	7.5	3.5	5.0	4.0	6.5	N/A	11.0	2.87
A102	134+63.86/24.99RT	7.5	3.57	5.0	4.0	6.5	N/A	9.0	1.24
A105	135+22.20/44.79LT	VARIES	4.33	5.0	4.0	6.5	N/A	7.66	0.81
A106	136+27.97/25.32LT	7.5	3.5	5.0	4.0	7.66	0.31	6.5	N/A
A110	144+18.45/42.97RT	8.0	4.86	5.0	4.0	9.0	1.23	6.5	N/A
A111	144+51.84/42.82RT	8.5	4.63	5.0	4.0	6.5	N/A	11.0	2.17
A113	146+46.67/45.66RT	VARIES	4.56	5.0	4.0	6.5	N/A	11.0	1.31
A114	146+76.67/43.28RT	7.0	4.05	5.0	4.11	7.66	0.15	6.5	N/A
A117	77+64.16/36.66RT	12.5	6.56	5.0	4.0	6.5	N/A	6.5	N/A
A119	29+10.87/60.04LT	VARIES	5.57	5.0	4.0	6.5	N/A	11.0	2.28
A120	ARLINGTON ST. 3+21.44/17.45LT	7.50	2.36	5.0	4.10	7.66	0.83	6.5	N/A
A121	87+70.11/45.48RT	VARIES	4.20	5.0	4.0	9.0	1.36	6.5	N/A

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	193	240
PROJ. FILE NO. 604688			

CONSTRUCTION DETAILS
WHEELCHAIR RAMPS

WHEELCHAIR RAMP
STYLE "C" – SINGLE STREET CROSSING SERVING TWO SIDEWALK DIRECTIONS

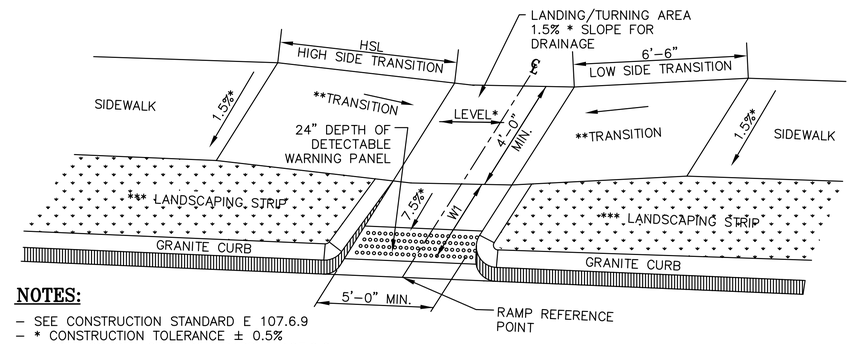


NOTES:

- * CONSTRUCTION TOLERANCE ± 0.5%
- SEE CONSTRUCTION STANDARD E 107.6.4
- ** ABUTS <6" CURB REVEAL
- *** SEE CONSTRUCTION STANDARD E 107.9.0

WCR #	℄ RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	LEVEL LANDING LENGTH	RAMP WIDTH	ROADWAY 1 WIDTH OF SIDEWALK	TRANSITION 1		ROADWAY 2 WIDTH OF SIDEWALK	TRANSITION 2	
					GUTTER GRADE	L1		GUTTER GRADE	L2
C1	25+31.23/39.99RT	5.73	5.00	6.00	N/A	6.5	8.50	2.41	11.00
C3	33+37.55/52.44RT	7.06	6.25	8.00	N/A	6.5	6.00	3.30	14.00
C4	33+62.55/60.03RT	8.42	5.00	8.50	1.10	9.00	9.50	5.47	7.50**
C5	40+89.18/35.00LT	7.91	5.00	9.0	N/A	6.5	8.50	1.08	9.00
C6	50+32.86/35.00RT	7.46	5.00	6.30	2.06	11.00	12.50	N/A	6.50
C7	50+69.14/35.00RT	6.14	5.00	7.00	2.34	11.00	12.50	2.16	11.00
C8	58+26.52/35.00RT	6.42	5.00	7.00	N/A	6.5	12.50	2.73	7.00**
C9	58+60.24/35.93RT	5.87	5.00	5.75	0.82	7.66	11.00	N/A	7.00
C10	60+63.73/35.00RT	6.49	5.00	7.23	N/A	6.5	8.50	0.60	7.66
C11	60+93.24/35.87RT	6.69	5.32	6.79	N/A	6.5	8.50	N/A	6.50
C12	122+10.96/30.00RT	7.91	5.00	9.06	6.37	15.0	7.50	N/A	6.50
C13	123+54.11/40.38LT	6.21	5.00	6.68	1.43	9.0	7.50	4.45	15.0
C14	123+81.98/40.01LT	5.78	5.00	6.00	N/A	6.5	8.50	2.41	11.00
C16	124+35.32/29.98RT	5.82	5.00	6.60	4.26	15.0	7.50	N/A	6.50
C17	125+64.65/40.00LT	6.18	5.00	6.80	0.66	7.66	7.50	3.06	7.00**
C19	126+44.68/30.00RT	8.45	5.00	9.17	3.73	14.0	7.50	N/A	6.50
C20	127+48.28/39.88LT	6.26	5.00	7.20	0.09	7.66	8.50	1.81	9.00
C21	127+74.88/40.16LT	6.55	5.00	7.00	2.91	11.00	7.91	N/A	6.50
C22	128+63.92/44.18LT	7.23	5.00	7.34	N/A	6.5	VARIES	2.41	11.00
C23	130+80.35/40.00LT	7.82	5.00	8.34	N/A	6.5	7.50	0.26	7.66
C24	135+62.71/34.63LT	5.70	5.00	6.00	N/A	6.5	7.60	0.34	7.66
C25	135+90.18/33.15LT	6.13	5.00	7.50	1.38	9.00	7.50	N/A	6.50
C26	138+19.62/31.00LT	6.73	5.00	8.11	N/A	6.5	7.50	0.17	7.66
C27	138+55.02/30.98LT	6.95	5.00	8.00	N/A	6.5	8.00	N/A	6.50
C28	140+66.36/35.00LT	5.73	5.00	6.14	N/A	6.5	8.00	N/A	6.50
C30	143+10.18/35.00LT	6.61	5.00	7.00	N/A	6.5	8.00	1.20	9.00
C31	143+37.69/35.00LT	6.63	5.00	7.00	N/A	6.5	VARIES	N/A	6.50
C32	146+02.75/35.00LT	7.65	5.00	8.00	N/A	6.5	8.50	1.40	9.00
C33	146+29.06/35.00LT	5.94	5.00	7.60	N/A	6.5	VARIES	N/A	6.50
C34	LEXINGTON ST. 4+43.04/22.50RT	7.50	5.00	8.50	2.48	11.00	9.50	N/A	6.50
C35	126+21.17/32RT	8.18	5.00	VARIES	N/A	6.5	8.00	N/A	6.5

WHEELCHAIR RAMP
STYLE "B" – PARALLEL PERPENDICULAR W/ LANDSCAPING STRIP

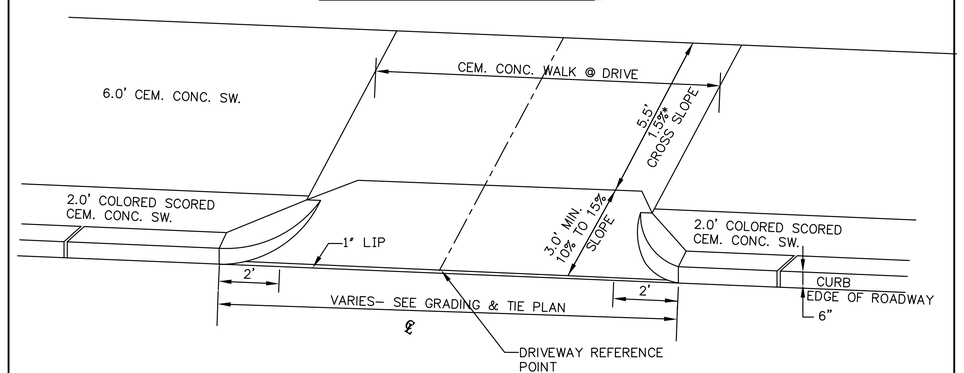


NOTES:

- SEE CONSTRUCTION STANDARD E 107.6.9
- * CONSTRUCTION TOLERANCE ± 0.5%
- ** SEE CONSTRUCTION STANDARD E 107.9.0
- *** NON-WALKING SURFACE

WCR #	C RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	WIDTH OF SIDEWALK (W)	LENGTH OF PRIMARY RAMP (W1)	WIDTH OF PRIMARY RAMP	DEPTH OF LEVEL LANDING Min. 4'-0"	TRANSITION LENGTH AND ROADWAY GUTTER SLOPE (%)			
						LEFT SIDE		RIGHT SIDE	
						L	%	L	%
B4	18+39.47/28.49RT	5.0	5.42	8.0	4.94	9.0	1.62	6.50	1.50
B9	23+86.53/26.97RT	5.0	6.81	8.0	4.97	7.66	0.83	6.50	2.14
B31	107+65.16/29.00LT	5.0	3.50	5.0	5.0	14.0	3.61	6.50	3.70

SIDEWALK THROUGH DRIVEWAYS – TYPE I

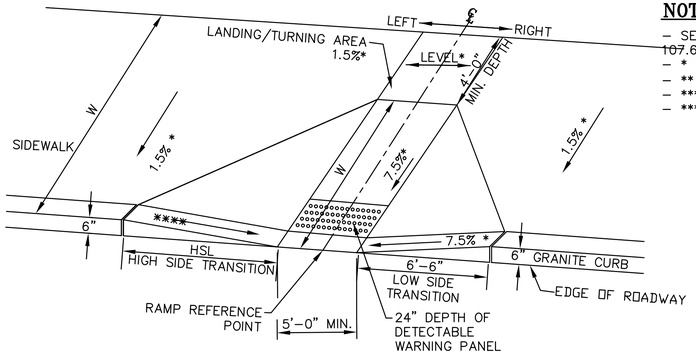


NOTES:

- * CONSTRUCTION TOLERANCE ± 0.5%

DRIVEWAY #	DRIVEWAY REFERENCE POINT		WIDTH OF SIDEWALK	WIDTH OF TRAVEL PATH ACROSS OPENING	LEFT SIDE TRANSITION LENGTH	RIGHT SIDE TRANSITION LENGTH	ROADWAY GUTTER SLOPE
	STATION	OFFSET					
I1	39+03	29.0 LT	8.5	5.5	N/A	N/A	N/A
I2	40+12	29.0 LT	8.5	5.5	N/A	N/A	N/A

WHEELCHAIR RAMP
STYLE "D" – PERPENDICULAR RAMP FOR WIDE SIDEWALKS



NOTES:

- SEE CONSTRUCTION STANDARD E 107.3.0 AND 107.6.5R
- * CONSTRUCTION TOLERANCE ± 0.5%
- ** ABUTS <6" CURB REVEAL
- *** SIDEWALK ENDS
- **** SEE CONSTRUCTION STANDARD E 107.9.0

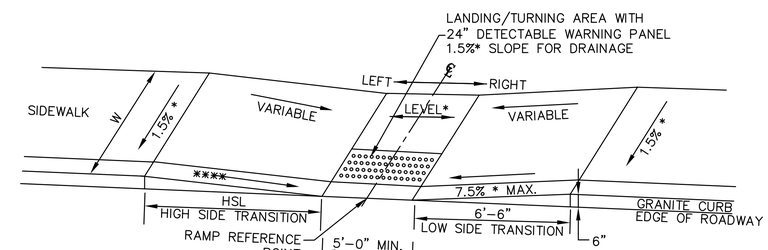
WCR #	℄ RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	WIDTH OF SIDEWALK (W)	LENGTH OF PRIMARY RAMP (W1)	WIDTH OF PRIMARY RAMP (W1)	DEPTH OF LEVEL LANDING Min. 4'-0"	TRANSITION LENGTH AND ROADWAY GUTTER SLOPE (%)			
						LEFT SIDE		RIGHT SIDE	
						L	%	L	%
D6	38+65.66/37.33RT	VARIES	8.25	5.0	4.0	6.5	N/A	6.5	N/A
D7	43+53.42/39.43LT	VARIES	8.31	5.0	4.0	6.5	N/A	7.66	0.59
D11	48+77.84/37.36LT	12.5	8.09	5.0	4.0	6.5	N/A	11.0	2.44
D13	134+50.65/34.69LT	7.5	8.0	5.0	4.0	9.0	1.32	3.25**	N/A
D15	66+53.71/23.00RT	8.5	8.0	5.0	4.0	9.0	1.04	7.66	0.80
D16	68+42.07/35.00RT	8.5	8.0	5.0	4.0	6.5	N/A	6.33	N/A
D17	68+67.90/35.00RT	8.5	8.0	5.0	4.0	6.33	N/A	6.5	N/A
D18	71+02.26/23.00RT	VARIES	8.0	5.0	4.0	7.5**	5.38	6.5	N/A
D21	77+95.27/36.96RT	VARIES	10.89	5.0	4.0	11.0	2.55	6.5	N/A
D22	83+88.62/23.00RT	14.5	8.0	5.0	4.0	9.0	1.28	6.5	N/A
D24	N. Common St. 4+39.32/12.67RT	8.0	8.42	5.0	4.0	9.0	1.57	6.5	N/A
D25	86+38.12/38.34LT	VARIES	6.5	5.0	4.0	6.5	N/A	14.0	3.21
D30	97+01.89/35.77LT	VARIES	8.44	5.0	4.91	11.0	2.31	7.66	0.63
D33	107+65.66/26.00RT	VARIES	7.5	6.0	4.0	6.5	N/A	14.0	3.79
D37	128+88.83/43.76LT	VARIES	6.95	5.0	4.0	6.5	N/A	7.66	0.64
D38	134+67.46/48.38LT	VARIES	8.13	5.0	4.0	7.0**	3.18	6.5	N/A
D40	135+95.95/52.78RT	VARIES	8.0	5.0	N/A	6.5	N/A	14.0	3.79
D41	136+44.98/46.19RT	VARIES	9.04	5.0	4.0	3.83**	0.75	6.5	N/A
D44	146+52.00/23.00LT	VARIES	8.32	5.0	4.0	3.83**	0.81	6.5	N/A
D48	18+39.46/22.53LT	6.0	8.09	6.0	4.0	6.5	N/A*	6.5	N/A*
D50	34+50.81/37.02LT	VARIES	8.13	5.0	4.0	6.5	N/A	14.0	3.96
D51	41+40.19/38.81RT	VARIES	8.28	5.0	4.0	6.5	N/A	9.0	1.74
D52	45+96.12/34.40RT	12.5	6.18	5.0	4.0	7.66	0.74	9.0	1.81
D54	56+04.08/28.37RT	VARIES	8.35	5.0	4.0	7.66	0.33	7.66	0.52
D55	56+52.74/26.14LT	12.5	6.69	5.0	4.0	4.5**	1.28	6.5	N/A
D56	55+71.10/25.00LT	VARIES	8.5	5.0	4.0	7.66	0.69	6.5	N/A
D57	70+78.61/35.08LT	N/A	5.44	5.0	4.0	8.96	N/A	8.97	N/A
D58	70+87.42/22.00LT	N/A	6.10	5.0	4.0	10.46	N/A	4.0	N/A
D59	70+97.48/29.93LT	N/A	5.56	5.0	4.0	4.0	N/A	4.16	N/A
D60	71+66.91/44.25RT	VARIES	8.17	5.0	4.0	15.0	4.77	6.5	N/A
D61	71+91.89/28.94RT	VARIES	8.0	5.0	4.0	15.0	5.58	6.5	N/A
D62	78+14.21/19.51RT	VARIES	8.16	5.0	4.0	15.0	4.28	6.5	N/A
D66	100+15.18/48.34RT	VARIES	8.46	5.0	4.0	9.0	1.64	7.5	4.95
D67	121+88.75/28.56LT	VARIES	9.43	5.0	4.0	4.5**	1.19	6.50	N/A
D68	141+06.18/23.50LT	14.0	8.0	5.0	6.0	3.83*	0.22	6.5	N/A
D69	141+04.91/23.50RT	14.0	8.0	5.0	4.0	6.5	N/A	7.66	0.36
D70	146+25.25/24.01RT	VARIES	8.14	5.0	4.0	6.5	N/A	9.0	1.09
D73	39+58.46/23.00RT	5.5	9.0	8.0	5.87	9.95	N/A	7.95	0.97
D74	39+58.46/23.00LT	8.25	8.0	8.0	4.0	7.95	0.35	7.95	N/A
D75	Church St. 3+69.77/32.68RT	N/A	5.69	5.0	4.0	15.0	4.23	7.0	5.50
D76	Church St. 3+76.73/13.00RT	N/A	13.68	5.0	4.0	6.75	1.34	12.50	0.0
D77	Church St. 3+85.20/33.12RT	N/A	8.0	5.0	4.0	15.0	3.45	7.0	3.98
D78	120+88.62/34.71RT	12.0	8.0	5.0	4.0	6.5	N/A	10.0**	7.47
D79	41+94.62/43.06RT	8.5	4.23	5.0	4.10	7.66	0.24	6.5	N/A
D80	100+67.35/48.29RT	8.0	8.0	5.0	4.06	6.5	N/A	6.5	N/A

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	194	240
PROJ. FILE NO. 604688			

CONSTRUCTION DETAILS
WHEELCHAIR RAMPS

WHEELCHAIR RAMP
STYLE "G" – NARROW SIDEWALK



NOTES:

- SEE CONSTRUCTION STANDARD E 107.2.0 AND 107.6.5
- * CONSTRUCTION TOLERANCE ± 0.5%
- ** ABUTS <6" CURB REVEAL
- *** SIDEWALK ENDS
- **** SEE CONSTRUCTION STANDARD E 107.9.0

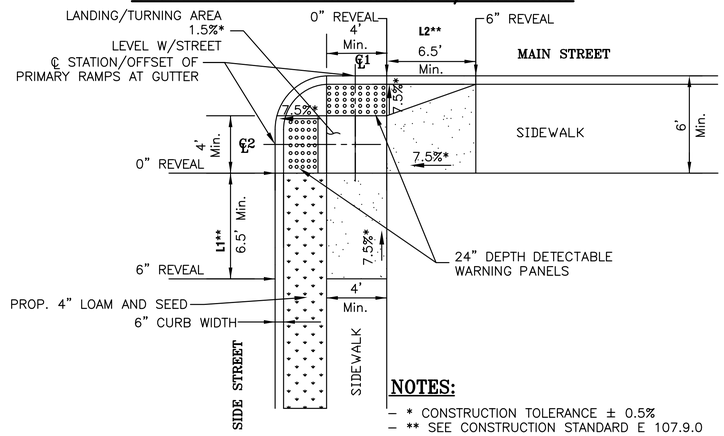
WCR #	℄ RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	WIDTH OF SIDEWALK (W)	TRANSITION LENGTH AND ROADWAY GUTTER SLOPE (%)			
			LEFT SIDE		RIGHT SIDE	
			L	%	L	%
G1	17+87.31/59.24LT	5.5	6.5	N/A	11.0	2.92
G2	MILL ST. 2+95.59/19.75LT	5.25	6.5	N/A	15.0	8.35
G3	MILL ST. 2+96.29/20.83RT	5.5	15.0	6.02	3.25**	N/A
G4	MILL ST. 2+79.51/33.23RT	5.5	6.5	N/A	15.0	4.06
G5	19+44.45/58.67LT	6	6.5	N/A	9.0	1.79
G6	100+19.08/43.80LT	5.8	7.5**	4.58	11.0	2.22
G7	29+29.97/24.40RT	VARIES	N/A	N/A	11.0	2.05
G8	35+42.63/26.00LT	VARIES	7.66	0.92	7.66	0.70
G9	29+29.97/24.40RT	9.5	6.5	N/A	9.0	1.05
G10	120+20.25/26.16RT	5.5	3.25**	N/A	15.0	4.90

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	195	240
PROJ. FILE NO. 604688			

CONSTRUCTION DETAILS
WHEELCHAIR RAMPS

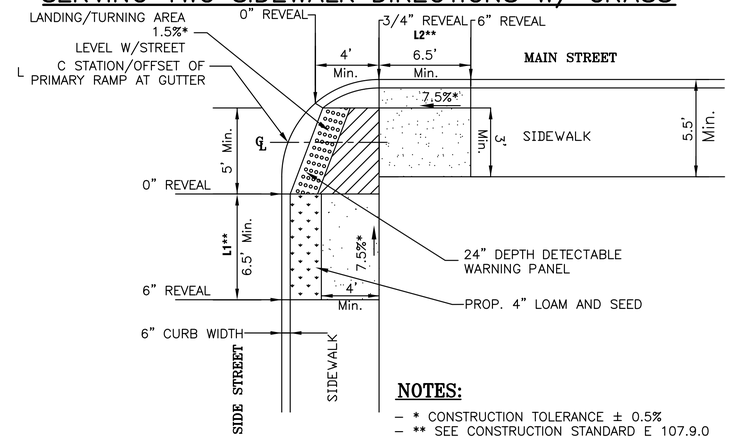
WHEELCHAIR RAMP
STYLE "J" – DOUBLE STREET CROSSING SERVING TWO SIDEWALK DIRECTIONS W/ GRASS



NOTES:
- * CONSTRUCTION TOLERANCE ± 0.5%
- ** SEE CONSTRUCTION STANDARD E 107.9.0

WCR #	℄1 RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	℄2 RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	RAMP 1 WIDTH	RAMP 2 WIDTH	ROADWAY 1 WIDTH OF SIDEWALK	TRANSITION 1		ROADWAY 2 WIDTH OF SIDEWALK	TRANSITION 2	
						GUTTER GRADE	L1		GUTTER GRADE	L2
J1	121+71.42/26.50RT	121+77.03/31.02RT	5.13	5.0	6.5	4.83	15.0	N/A	1.28	9.0

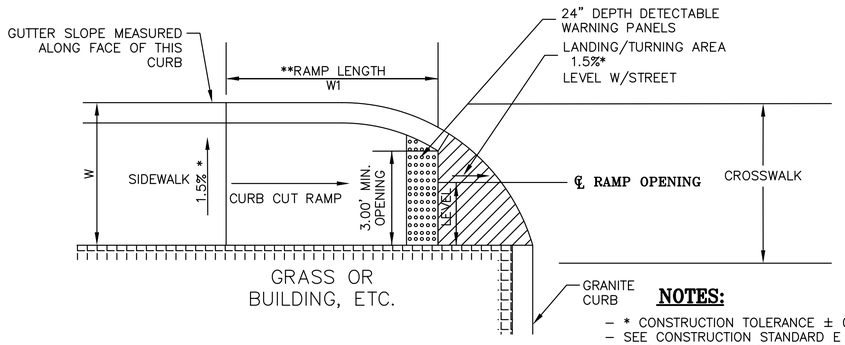
WHEELCHAIR RAMP
STYLE "K" – DIRECTIONAL SINGLE STREET CROSSING SERVING TWO SIDEWALK DIRECTIONS W/ GRASS



NOTES:
- * CONSTRUCTION TOLERANCE ± 0.5%
- ** SEE CONSTRUCTION STANDARD E 107.9.0

WCR #	℄ RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	LEVEL LANDING LENGTH	RAMP WIDTH	ROADWAY 1 WIDTH OF SIDEWALK	TRANSITION 1		ROADWAY 2 WIDTH OF SIDEWALK	TRANSITION 2	
					GUTTER GRADE	L1		GUTTER GRADE	L2
K1	124+08.67/29.98RT	7.45	5.00	8.05	N/A	6.5	7.50	4.74	15.0
K2	126+44.89/30.00RT	8.45	5.00	9.17	3.73	14.0	7.50	N/A	6.50

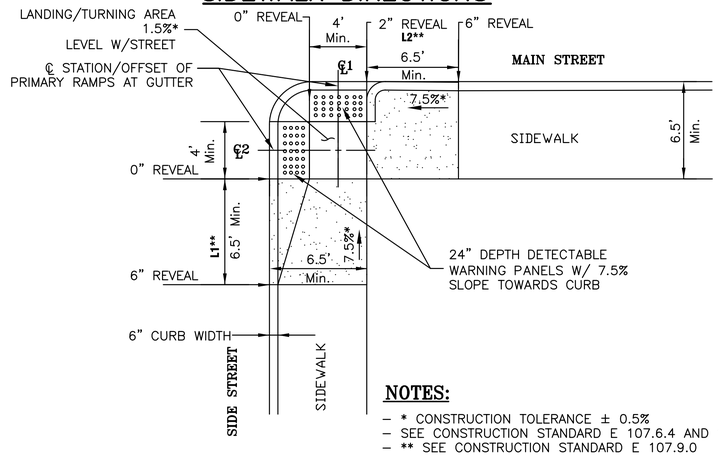
WHEELCHAIR RAMP
STYLE "H" – SINGLE DIRECTION WITH LEVEL ENTRANCE



NOTES:
- * CONSTRUCTION TOLERANCE ± 0.5%
- SEE CONSTRUCTION STANDARD E 107.6.0
- ** SEE CONSTRUCTION STANDARD E 107.9.0

WCR #	℄ RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	WIDTH OF SIDEWALK W	WIDTH OF OPENING	ROADWAY GUTTER SLOPE (%)	LENGTH OF RAMP (W1)
H1	25+50.51/40.00RT	8.5	8.5	2.58	6.42
H2	N. COMMON ST. 5+23.06/22.79RT	9.5	9.5	1.16	9.00
H3	100+50.27/96.19RT	4.20	4.20	2.24	7.57
H4	100+62.29/76.14RT	4.39	4.39	1.84	7.60
H5	102+58.40/49.50RT	7.5	7.5	0.59	7.66
H6	102+88.87/59.37RT	15.75	15.75	1.96	9.00
H7	120+37.93/28.98RT	5.5	5.0	4.90	7.5**
H8	Church St. 3+11.39/26.09RT	10.0	5.0	N/A	8.65
H9	Church St. 2+87.39/26.06RT	10.0	5.0	N/A	8.33
H10	Church St. 1+52.38/25.97RT	10.0	5.0	N/A	8.62
H11	Church St. 1+28.36/25.94RT	10.0	5.0	N/A	8.74

WHEELCHAIR RAMP
STYLE "E" – DOUBLE STREET CROSSING SERVING TWO SIDEWALK DIRECTIONS



NOTES:
- * CONSTRUCTION TOLERANCE ± 0.5%
- SEE CONSTRUCTION STANDARD E 107.6.4 AND 107.6.5
- ** SEE CONSTRUCTION STANDARD E 107.9.0

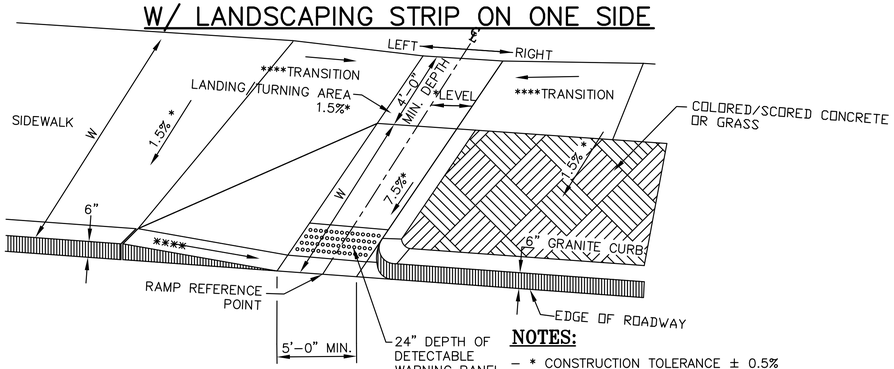
WCR #	℄1 RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	℄2 RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	RAMP 1 WIDTH	RAMP 2 WIDTH	ROADWAY 1 WIDTH OF SIDEWALK	TRANSITION 1		ROADWAY 2 WIDTH OF SIDEWALK	TRANSITION 2	
						GUTTER GRADE	L1		GUTTER GRADE	L2
E1	LEXINGTON ST. 4+02.56/15.72RT	LEXINGTON ST. 04+07.77/22.10RT	5.0	5.0	10.0	2.14	11.0	8.0	2.13	11.00
E3	125+81.99/39.25LT	125+87.36/33.50LT	6.5	5.0	9.0	2.34	6.50	6.75	2.41	11.00

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	196	240
PROJ. FILE NO. 604688			

CONSTRUCTION DETAILS
WHEELCHAIR RAMPS

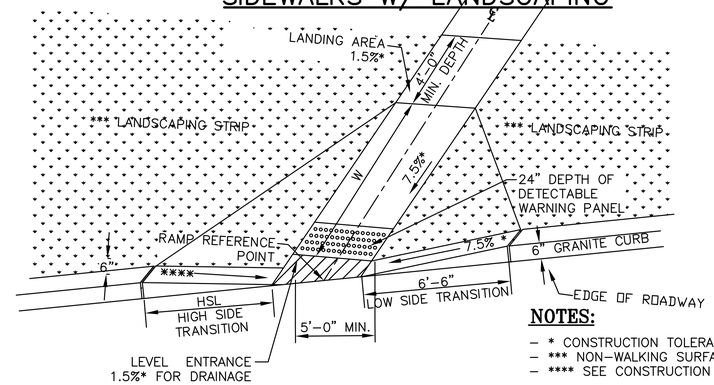
WHEELCHAIR RAMP
STYLE "M" – PERPENDICULAR RAMP FOR WIDE SIDEWALKS W/ LANDSCAPING STRIP ON ONE SIDE



NOTES:
- * CONSTRUCTION TOLERANCE ± 0.5%
- *** SIDEWALK ENDS
- **** SEE CONSTRUCTION STANDARD E 107.9.0

WCR #	℄ RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	WIDTH OF SIDEWALK (W)	LENGTH OF PRIMARY RAMP (W1)	WIDTH OF PRIMARY RAMP (W1)	DEPTH OF LEVEL LANDING Min. 4'-0"	TRANSITION LENGTH AND ROADWAY GUTTER SLOPE (%)			
						LEFT SIDE		RIGHT SIDE	
						L	%	L	%
M1	N. COMMON ST. 4+76.16/27.99RT	12.00	6.61	5.0	4.0	7.66	0.30	6.5	0.61
M2	117+78.97/41.39RT	9.5	5.82	5.0	4.0	11.0	2.78	6.5	N/A
M3	128+37.56/38.70RT	7.5	4.40	5.0	4.0	6.5	N/A	9.0	1.88
M4	130+63.25/39.25RT	7.0	2.82	5.0	4.0	14.0	3.36	6.5	N/A
M5	130+94.88/38.84RT	7.5	5.24	5.0	4.01	6.5	N/A	15.0	4.27
M6	140+93.83/35.50LT	VARIES	3.26	5.0	3.22	6.5	N/A	N/A	N/A
M7	142+07.16/38.06RT	8.0	5.49	5.0	4.0	6.5	N/A	11.0	2.27
M8	141+71.98/36.72RT	VARIES	10.98	5.0	4.0	N/A	N/A	9.0	1.27
M9	CHURCH ST. 3+88.07/22.00LT	11.7	7.66	5.0	4.0	7.67	0.49	6.5	N/A
M10	71+35.37/42.68LT	VARIES	3.45	5.0	4.0	6.5	N/A	15.0	6.18
M11	74+16.31/39.68LT	8.5	4.30	5.0	4.05	14.0	3.50	11.0	2.79
M12	84+15.92/43.51RT	VARIES	6.94	5.0	4.99	7.66	0.51	7.66	0.14
M13	115+48.58/45.00LT	7.5	3.29	5.0	4.03	14.0	3.24	6.5	N/A
M14	117+40.76/46.83LT	7.5	3.64	5.0	4.0	14.0	3.91	6.5	N/A
M15	135+42.95/48.10RT	7.5	4.74	5.0	4.0	6.5	N/A	9.0	1.31
M16	100+89.53/39.00RT	7.50	7.0	5.0	4.0	6.5	N/A	7.66	0.10
M17	63+38.28/29.00LT	8.5	3.50	5.0	5.0	6.5	N/S	7.51**	0.56

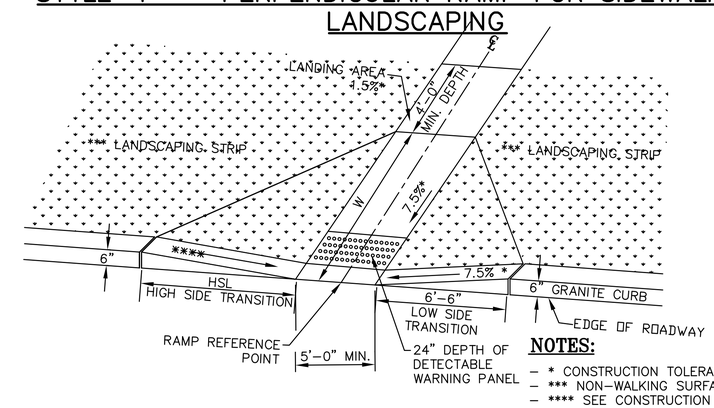
WHEELCHAIR RAMP
STYLE "N" – DIRECTIONAL PERPENDICULAR RAMP FOR SIDEWALKS W/ LANDSCAPING



NOTES:
- * CONSTRUCTION TOLERANCE ± 0.5%
- *** NON-WALKING SURFACE
- **** SEE CONSTRUCTION STANDARD E 107.9.0

WCR #	℄ RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	WIDTH OF SIDEWALK (W)	LENGTH OF PRIMARY RAMP (W1)	WIDTH OF PRIMARY RAMP (W1)	DEPTH OF LEVEL LANDING Min. 4'-0"	TRANSITION LENGTH AND ROADWAY GUTTER SLOPE (%)			
						LEFT SIDE		RIGHT SIDE	
						L	%	L	%
N1	18+58.72/41.02LT	6.0	8.00	6.0	4.0	6.5	N/A	6.5	N/A
N2	34+26.72/54.78RT	5.0	12.92	5.0	4.0	6.5	N/A	6.5	N/A
N3	119+11.92/32.09RT	N/A	7.0	5.0	4.0	6.5	N/A	9.0	1.36

WHEELCHAIR RAMP
STYLE "P" – PERPENDICULAR RAMP FOR SIDEWALKS W/ LANDSCAPING



NOTES:
- * CONSTRUCTION TOLERANCE ± 0.5%
- *** NON-WALKING SURFACE
- **** SEE CONSTRUCTION STANDARD E 107.9.0

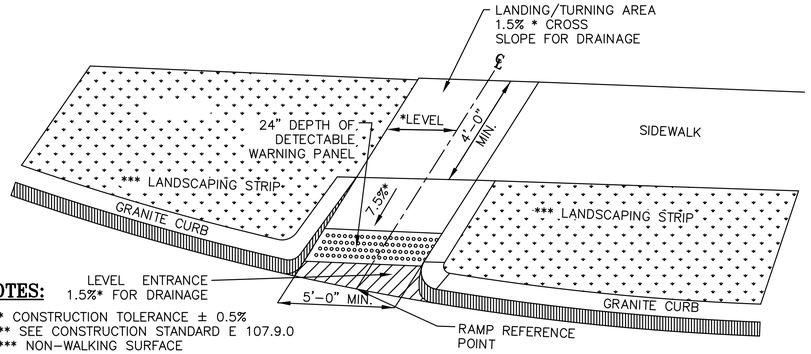
WCR #	℄ RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	WIDTH OF SIDEWALK (W)	LENGTH OF PRIMARY RAMP (W1)	WIDTH OF PRIMARY RAMP (W1)	DEPTH OF LEVEL LANDING Min. 4'-0"	TRANSITION LENGTH AND ROADWAY GUTTER SLOPE (%)			
						LEFT SIDE		RIGHT SIDE	
						L	%	L	%
P1	18+07.66/47.55LT	6.0	11.00	6.0	4.0	6.5	N/A*	6.5	N/A*
P2	34+77.79/49.52RT	5.0	8.00	5.0	4.0	6.5	N/A	6.5	N/A
P3	63+34.28/23.00RT	14.5	7.66	5.0	6.84	6.5	N/A	7.66	0.24

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	197	240
PROJ. FILE NO. 604688			

CONSTRUCTION DETAILS
WHEELCHAIR RAMPS

WHEELCHAIR RAMP
STYLE "S" – DIRECTIONAL PARALLEL PERPENDICULAR W/ LANDSCAPING STRIPS

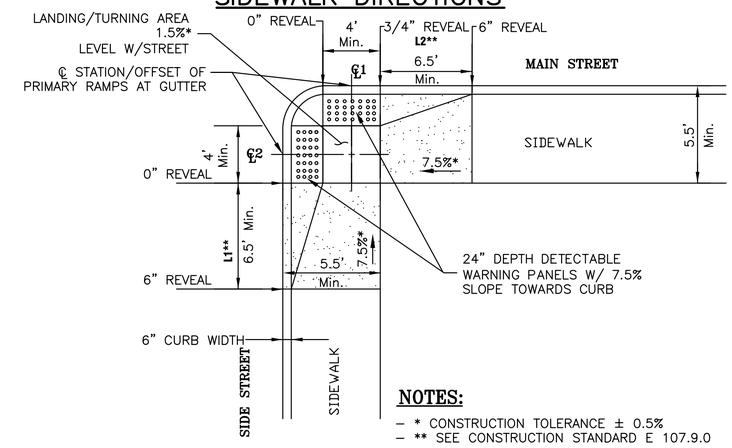


NOTES:

- * CONSTRUCTION TOLERANCE ± 0.5%
- ** SEE CONSTRUCTION STANDARD E 107.9.0
- *** NON-WALKING SURFACE

WCR #	℄ RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	WIDTH OF SIDEWALK W	WIDTH OF OPENING	ROADWAY GUTTER SLOPE (%)	LENGTH OF RAMP (W1)
S1	92+83.36/35.54LT	VARIES	5.00	0.30	7.66
S2	67+34.53/40.21LT	VARIES	8.0	2.43	11.0
S3	86+66.02/36.97LT	N/A	8.0	3.67	5.00
S4	86+92.34/36.62LT	N/A	8.0	0.67	2.00
S5	86+81.98/23.00LT	N/A	8.0	1.04	3.40

WHEELCHAIR RAMP
STYLE "T" – DOUBLE STREET CROSSING SERVING TWO SIDEWALK DIRECTIONS



NOTES:

- * CONSTRUCTION TOLERANCE ± 0.5%
- ** SEE CONSTRUCTION STANDARD E 107.9.0

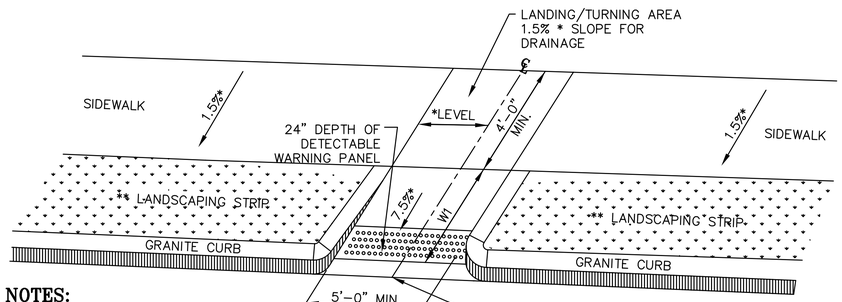
WCR #	℄1 RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	℄2 RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	RAMP 1 WIDTH	RAMP 2 WIDTH	ROADWAY 1 WIDTH OF SIDEWALK	TRANSITION 1		ROADWAY 2 WIDTH OF SIDEWALK	TRANSITION 2	
						GUTTER GRADE	L1		GUTTER GRADE	L2
T1	131+19.93/34.00LT	131+14.82/40.02LT	5.0	5.0	7.5	N/A	6.5	8.0	N/A	6.5

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	198	240
PROJ. FILE NO. 604688			

CONSTRUCTION DETAILS
WHEELCHAIR RAMPS

WHEELCHAIR RAMP
STYLE "U" – PERPENDICULAR W/ LANDSCAPING STRIP

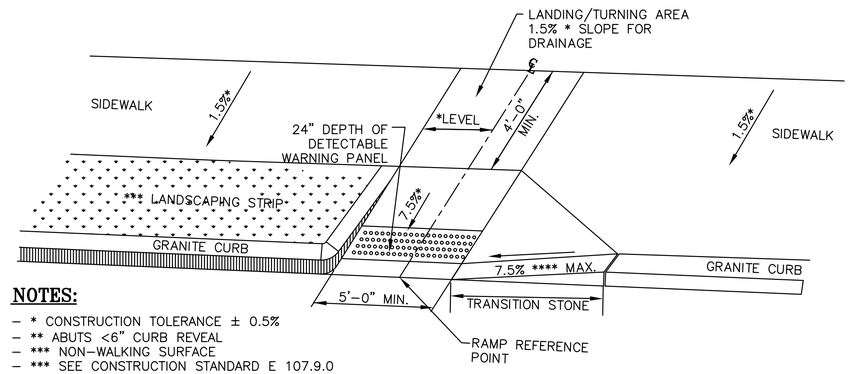


NOTES:

- * CONSTRUCTION TOLERANCE ± 0.5%
- ** NON-WALKING SURFACE

WCR #	℄ RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	WIDTH OF SIDEWALK W	WIDTH OF OPENING	ROADWAY GUTTER SLOPE (%)	LENGTH OF RAMP (W1)
U1	19+36.95/26.00RT	5.0	8.0	1.85	9.03
U2	43+99.73/19.60LT	VARIES	8.0	1.16	13.46
U3	48+5.26/18.57LT	VARIES	8.0	1.07	12.93
U4	48+26.80/33.56LT	VARIES	8.0	0.31	11.54
U5	71+76.77/23.00LT	8.5	8.0	6.68	9.51
U6	78+05.50/25.00LT	12.5	5.0	4.11	6.5
U7	92+62.30/23.01LT	VARIES	8.0	4.12	10.13
U8	92+62.22/23.00RT	VARIES	8.0	0.22	8.53
U9	113+93.89/22.58LT	VARIES	8.0	2.96	10.17
U10	48+5.26/18.00RT	VARIES	8.0	1.67	9.71
U11	19+37.45/25.00LT	6.0	6.0	1.65	7.91
U12	19+25.02/35.42LT	5.0	5.0	0.00	9.43
U13	19+38.40/40.71LT	6.0	6.0	1.23	4.05
U14	29+20.68/42.07LT	6.0	6.0	0.30	6.86
U15	29+24.11/27.51LT	6.0	6.0	1.43	4.28
U16	29+42.60/37.28LT	6.0	6.0	3.17	12.13

WHEELCHAIR RAMP
STYLE "V" – PERPENDICULAR W/ LANDSCAPING STRIP ON ONE SIDE

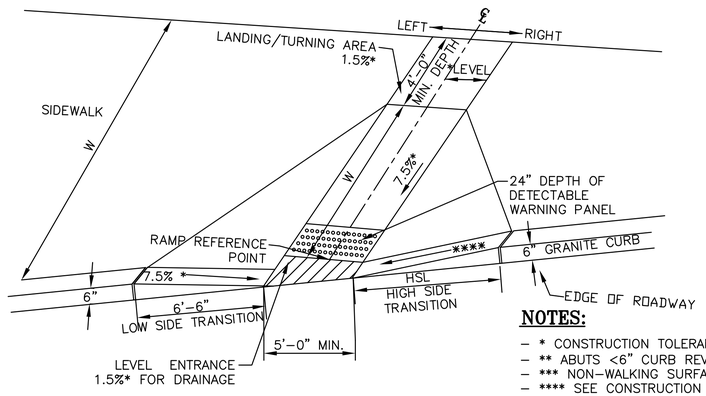


NOTES:

- * CONSTRUCTION TOLERANCE ± 0.5%
- ** ABUTS <6" CURB REVEAL
- *** NON-WALKING SURFACE
- *** SEE CONSTRUCTION STANDARD E 107.9.0

WCR #	C RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	WIDTH OF SIDEWALK (W)	LENGTH OF PRIMARY RAMP (W1)	WIDTH OF PRIMARY RAMP	DEPTH OF LEVEL LANDING Min. 4'-0"	TRANSITION LENGTH AND ROADWAY GUTTER SLOPE (%)			
						LEFT SIDE		RIGHT SIDE	
						L	%	L	%
V1	43+97.15/21.14RT	VARIES	11.30	8.0	5.86	N/A	N/A	8.61	N/A
V2	46+35.72/35.90RT	VARIES	8.10	5.0	4.0	6.5	N/A	N/A	N/A
V4	HARRIET AVE. 1+19.79/31.45RT	VARIES	4.0	5.0	4.0	6.5	N/A	N/A	N/A
V5	87+03.78/23.00RT	VARIES	8.5	8.0	4.0	N/A	N/A	6.5	N/A
V6	87+45.22/43.62LT	VARIES	8	5.0	4.0	7.95	0.59	N/A	N/A
V7	87+76.62/52.79LT	VARIES	8.91	5.0	4.0	N/A	N/A	6.5	N/A
V8	88+03.33/53.00LT	VARIES	8.01	5.0	4.0	6.5	N/A	N/A	N/A
V9	113+93.97/23.84RT	VARIES	9.14	8.0	4.0	N/A	N/A	11.0	2.93
V10	88+26.65/23.00LT	VARIES	8.0	5.0	4.0	N/A	N/A	7.95	N/A
V11	99+94.48/35.13RT	VARIES	8.0	5.0	4.0	3.25**	N/A	15.0	4.13
V12	129+08.51/29.00LT	VARIES	11.14	5.0	4.0	11.0	2.89	6.5	N/A
V13	136+61.01/30.43RT	VARIES	8.35	8.0	4.0	N/A	N/A	3.25**	N/A
V14	135+75.32/56.55RT	VARIES	8.0	5.0	N/A	7.66	N/A	N/A	N/A

WHEELCHAIR RAMP
STYLE "W" – DIRECTIONAL RAMP FOR WIDE SIDEWALKS

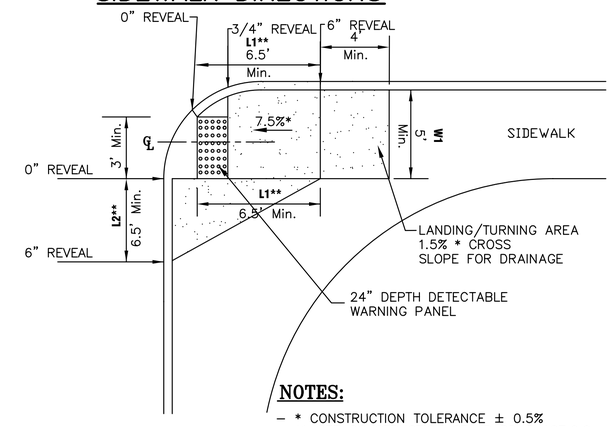


NOTES:

- * CONSTRUCTION TOLERANCE ± 0.5%
- ** ABUTS <6" CURB REVEAL
- *** NON-WALKING SURFACE
- **** SEE CONSTRUCTION STANDARD E 107.9.0

WCR #	℄ RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	WIDTH OF SIDEWALK (W)	LENGTH OF PRIMARY RAMP (W1)	WIDTH OF PRIMARY RAMP (W1)	DEPTH OF LEVEL LANDING Min. 4'-0"	TRANSITION LENGTH AND ROADWAY GUTTER SLOPE (%)			
						LEFT SIDE		RIGHT SIDE	
						L	%	L	%
W1	71+21.90/35.00RT	VARIES	8.00	5.0	4.0	7.66	0.28	4.50**	1.34
W2	66+53.02/23.64LT	14.5	8.40	5.0	4.0	6.5	N/A	7.66	0.14
W3	53+51.64/31.30LT	16.2	9.00	5.0	4.0	6.5	N/A	7.66	0.45

WHEELCHAIR RAMP
STYLE "Y" – SINGLE STREET CROSSING SERVING TWO SIDEWALK DIRECTIONS

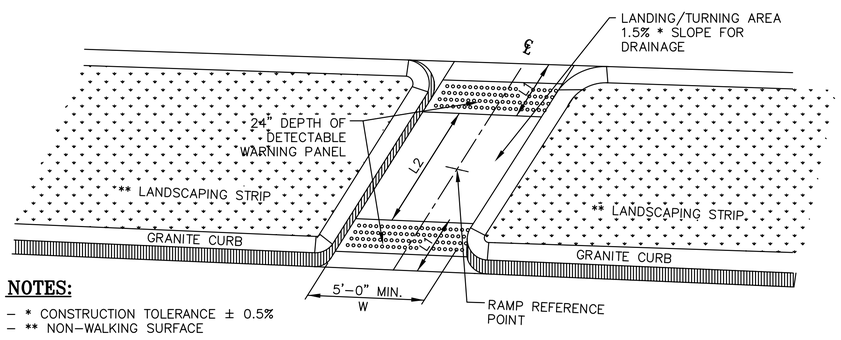


NOTES:

- * CONSTRUCTION TOLERANCE ± 0.5%
- ** SEE CONSTRUCTION STANDARD E 107.9.0

WCR #	℄ RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	LEVEL LANDING LENGTH	RAMP WIDTH	ROADWAY 1 WIDTH OF SIDEWALK	TRANSITION 1		ROADWAY 2 WIDTH OF SIDEWALK	TRANSITION 2	
					GUTTER GRADE	L1		GUTTER GRADE	L2
Y1	34+44.44/32.59LT	4.0	7.68	VARIES	2.13	9.0	VARIES	2.13	11.0
Y2	35+17.47/32.50LT	6.24	6.87	VARIES	0.31	7.66	VARIES	2.22	11.0
Y3	Mill St. 2+48.22/24.90RT	4.0	5.89	VARIES	N/A	6.5	VARIES	N/A	6.5

WHEELCHAIR RAMP
STYLE "X" – MEDIAN ISLAND CROSSINGS

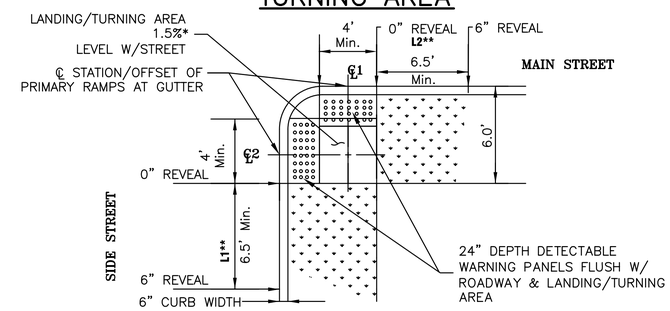


NOTES:

- * CONSTRUCTION TOLERANCE ± 0.5%
- ** NON-WALKING SURFACE

WCR #	℄ RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	WIDTH OF OPENING (W)	LENGTH OF RAMP (L1)	LENGTH OF LANDING (L2)
X1	63+36.27/00.00	10.0	2.5	3.0
X2	107+65.16/01.50RT	10.0	3.0	4.0

WHEELCHAIR RAMP
STYLE "Z" – DOUBLE STREET CROSSING W/ LEVEL TURNING AREA

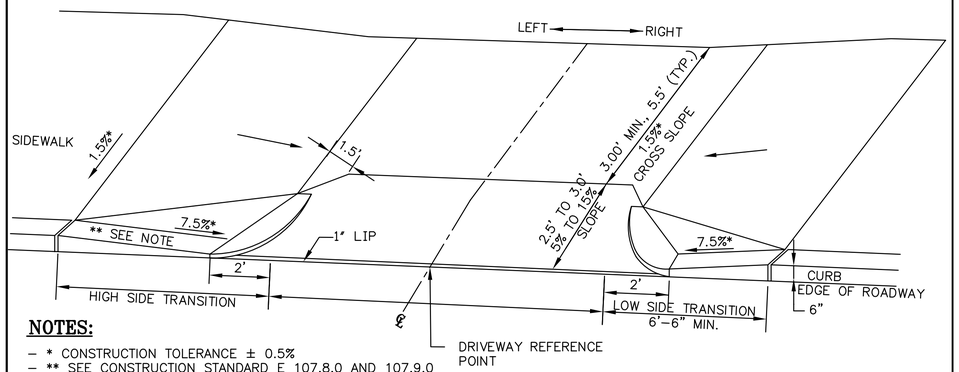


NOTES:

- * CONSTRUCTION TOLERANCE ± 0.5%
- ** SEE CONSTRUCTION STANDARD E 107.9.0

WCR #	℄1 RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	℄2 RAMP REFERENCE POINT (STATION/OFFSET) Ref Street for Centerline	RAMP 1 WIDTH	RAMP 2 WIDTH	ROADWAY 1 WIDTH OF SIDEWALK	TRANSITION 1		ROADWAY 2 WIDTH OF SIDEWALK	TRANSITION 2	
						GUTTER GRADE	L1		GUTTER GRADE	L2
Z1	Mill St 2+95.59/19.59RT	Mill St 2+91.09/23.67RT	4.0	4.0	6.0	N/A	6.5	N/A	N/A	6.5

SIDEWALK THROUGH DRIVEWAYS – TYPE F

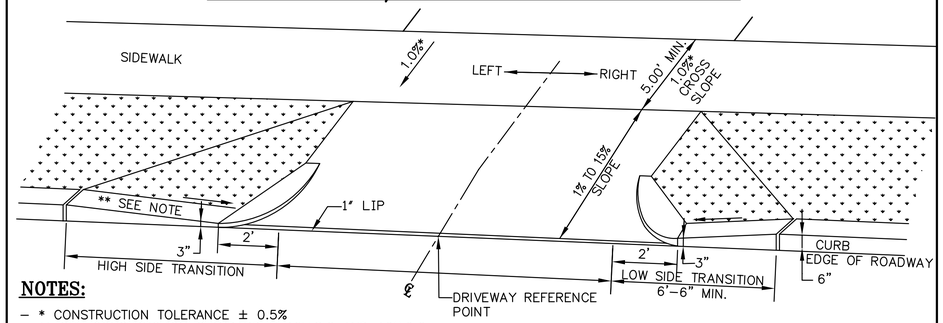


NOTES:

– * CONSTRUCTION TOLERANCE ± 0.5%
– ** SEE CONSTRUCTION STANDARD E 107.8.0 AND 107.9.0
– *** ABUTS <6" CURB REVEAL
– **** ABUTS >6" CURB REVEAL

DRIVEWAY #	DRIVEWAY REFERENCE POINT		WIDTH OF SIDEWALK	WIDTH OF TRAVEL PATH ACROSS OPENING	LEFT SIDE TRANSITION LENGTH	RIGHT SIDE TRANSITION LENGTH	ROADWAY GUTTER SLOPE
	STATION	OFFSET					
F1	29+54.13	22.67RT	5.5	3.0	6.50	6.50	1.20%
F2	30+05.68	19.32RT	5.5	3.0	6.50	9.00	1.20%
F3	30+38.37	25.5LT	4.0	3.0	9.0	6.50	1.95%
F4	31+20.80	25.5LT	4.0	3.0	11.0****	6.50	1.95%
F5	31+62.14	15.31RT	5.5	3.0	6.50	9.00	1.27%
F6	32+03.64	18.92RT	5.5	3.0	6.50	8.00	1.87%
F7	30+62.48	16.70RT	5.5	3.0	6.50	9.00	1.96%
F8	36+04.86	26.00LT	VARIES	3.5' TO 2.5'	6.50	15.00	0.57%
F10	60+03.51	28.42RT	9.50	6.5	6.50	6.50	0.72%
F11	61+48.26	29.00RT	8.50	5.5	6.50	7.66	0.20%
F14	22+95.61	34.00RT	8.50	5.5	9.00	6.50	1.52%
F15	23+35.07	34.00RT	8.50	5.5	7.66	6.50	0.72%
F16	32+53.09	28.80RT	5.5	3.0	6.50	11.00	2.36%
F17	LEXINGTON ST. 01+62.94	15.00RT	10.00	7.00	7.66	6.50	0.35%
F18	LEXINGTON ST. 03+04.00	15.00RT	10.00	7.00	3.25***	7.0***	3.93%
F19	60+24.66	28.93LT	VARIES	5.5	6.50	N/A	0.59%
F20	60+99.76	29.00LT	VARIES	5.5	N/A	6.50	1.05%
F22	62+86.10	29.02RT	8.50	5.5	6.50	7.66	0.17%
F23	63+70.20	29.00RT	8.50	5.5	N/A	7.66	0.38%
F24	63+96.06	29.00RT	8.50	5.5	6.50	N/A	0.83%
F25	64+73.69	29.00RT	8.50	5.5	7.66	6.50	0.60%
F26	68+35.57	29.00LT	8.50	5.5	6.50	N/A	3.00%
F27	68+80.88	29.00LT	8.50	5.5	N/A	15.0	4.41%
F28	COMMON ST. 01+67.27	22.00LT	8.00	5.5	6.50	15.0	2.11%
F29	91+42.68	29.00RT	8.50	5.5	9.00	6.50	1.47%
F30	91+79.50	28.66RT	8.50	5.5	7.66	6.50	0.96%
F31	91+36.77	29.00LT	8.50	5.5	6.50	7.66	0.08%
F32	94+65.35	29.02RT	8.50	5.5	7.66	6.50	0.20%
F33	99+07.53	29.00LT	8.50	5.5	9.00	6.50	1.37%
F34	102+78.62	29.00LT	8.50	5.5	11.00	6.50	2.61%
F35	109+40.20	29.00LT	8.50	5.5	14.00	6.50	3.98%
F36	114+45.03	29.43LT	8.50	5.5	14.00	6.50	3.37%
F37	124+61.87	33.50LT	9.00	6.00	11.00	5.41***	2.90%
F38	125+17.37	33.50LT	9.00	6.00	9.17***	3.25***	2.25%
F39	127+11.83	24.50RT	8.00	5.00	6.50	11.00	2.41%
F40	137+19.44	34.00RT	8.00	5.00	7.66	6.50	0.88%
F41	137+36.04	25.08LT	8.50	5.50	7.66	6.50	0.27%
F42	142+63.94	28.50RT	9.00	6.00	6.50	7.66	0.95%
F43	140+09.12	28.51RT	9.25	6.25	7.66	6.50	0.04%
F44	66+27.25	29.00RT	8.50	5.00	N/A	6.50	1.39%
F45	COMMON ST. 0+88.93	22.00LT	8.00	5.00	6.50***	7.5***	2.21%
F46	129+59.20	34.44LT	VARIES	VARIES	9.0	6.50	1.44%
F47	133+20.82	34.00LT	8.50	VARIES	9.0	6.50	1.44%

SIDEWALK THROUGH DRIVEWAYS W/ WIDE BUFFER – TYPE R



NOTES:

– * CONSTRUCTION TOLERANCE ± 0.5%
– ** SEE CONSTRUCTION STANDARD E 107.8.0 AND 107.9.0
WHERE ABUTTING AREA NOT GRASS

DRIVEWAY #	DRIVEWAY REFERENCE POINT		WIDTH OF SIDEWALK	WIDTH OF TRAVEL PATH ACROSS OPENING	LEFT SIDE TRANSITION LENGTH	RIGHT SIDE TRANSITION LENGTH	ROADWAY GUTTER SLOPE
	STATION	OFFSET					
R1	43+60.56	28.37RT	VARIES	5.00	N/A	6.50	0.15%
R2	45+23.95	25.00RT	12.50	5.00	6.50	6.50	1.37%
R3	45+17.10	25.00LT	12.50	5.00	6.50	6.50	1.41%
R4	45+89.11	25.00LT	12.50	5.00	6.50	6.50	1.87%
R5	46+92.50	25.00LT	12.50	5.00	6.50	6.50	1.59%
R6	46+73.57	25.00RT	VARIES	VARIES	6.50	6.50	0.38%
R7	47+54.67	25.00RT	VARIES	5.00	6.50	6.50	2.59%
R8	48+62.27	25.00RT	12.50	5.00	6.50	6.50	1.25%
R9	50+29.71	25.00LT	12.50	5.00	6.50	6.50	3.12%
R10	50+90.70	25.00LT	12.50	5.00	6.50	6.50	2.38%
R11	51+16.03	25.00LT	12.50	5.00	6.50	6.50	0.48%
R12	51+50.67	25.00RT	12.50	5.00	11.0	6.50	2.36%
R13	52+25.02	25.00LT	12.50	5.00	6.50	6.50	1.16%
R14	57+70.84	25.00LT	12.50	5.00	7.66	6.50	0.74%
R15	57+53.01	25.40RT	12.50	7.50	N/A	7.66	0.57%
R16	57+97.25	25.73RT	12.50	7.50	N/A	N/A	2.73%
R17	58+31.03	25.00LT	12.50	5.00	6.50	6.50	1.09%
R18	58+96.47	25.10LT	VARIES	5.00	6.50	6.50	0.60%
R19	59+31.48	27.27RT	10.50	7.50	6.50	6.50	0.76%
R20	59+41.80	25.59LT	VARIES	5.00	6.50	6.50	0.23%
R21	59+84.98	26.45LT	VARIES	5.00	6.50	6.50	0.41%
R22	60+28.84	27.69LT	VARIES	5.00	6.50	6.50	0.79%
R23	75+84.02	25.96LT	VARIES	5.00	6.50	6.50	4.29%
R24	76+52.83	25.00LT	12.50	5.00	6.50	6.50	3.46%
R25	77+56.96	25.00LT	12.50	5.00	6.50	N/A	3.73%
R26	77+73.87	25.00LT	12.50	5.00	N/A	6.50	3.73%
R27	78+20.72	25.00LT	12.50	5.00	6.50	6.50	4.15%
R28	76+53.76	25.00RT	12.50	5.00	6.50	6.50	2.78%
R29	78+78.81	25.00LT	12.50	5.00	6.50	6.50	4.17%
R30	79+26.35	25.00RT	12.50	5.00	11.0	6.50	2.73%
R31	79+39.19	25.00LT	12.50	5.00	6.50	6.50	3.50%
R32	79+91.46	25.00RT	12.50	5.00	6.50	6.50	4.08%
R33	79+97.60	25.00LT	12.50	5.00	6.50	6.50	3.33%
R34	80+87.23	25.00LT	12.50	5.00	6.50	6.50	3.30%
R35	81+20.20	25.00RT	12.50	5.00	6.50	6.50	4.11%
R36	81+51.42	25.10LT	12.50	5.00	6.50	6.50	3.33%
R37	81+84.20	25.69RT	12.50	5.00	6.50	6.50	2.93%
R38	80+56.82	25.00RT	12.50	5.00	6.50	6.50	3.29%
R39	82+12.81	26.43LT	11.00	5.00	6.50	6.50	3.07%
R40	CHURCH ST. 2+74.10	22.00RT	11.50	5.00	7.66	6.50	0.94%
R41	114+58.05	26.51RT	VARIES	5.00	6.50	6.50	3.84%
R42	46+23.24	57.15RT	VARIES	5.00	N/A	6.50	N/A
R43	N. COMMON ST. 4+60.26	18.25RT	13.00	5.00	N/A	N/A	0.61%

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	200	240
PROJ. FILE NO. 604688			

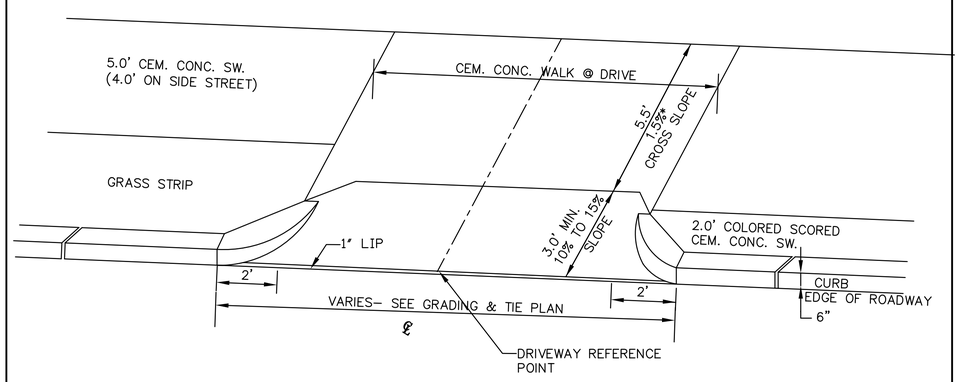
CONSTRUCTION DETAILS
DRIVEWAY DETAILS

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	201	240
PROJ. FILE NO. 604688			

CONSTRUCTION DETAILS
DRIVEWAY DETAILS

SIDEWALK THROUGH DRIVEWAYS – TYPE L

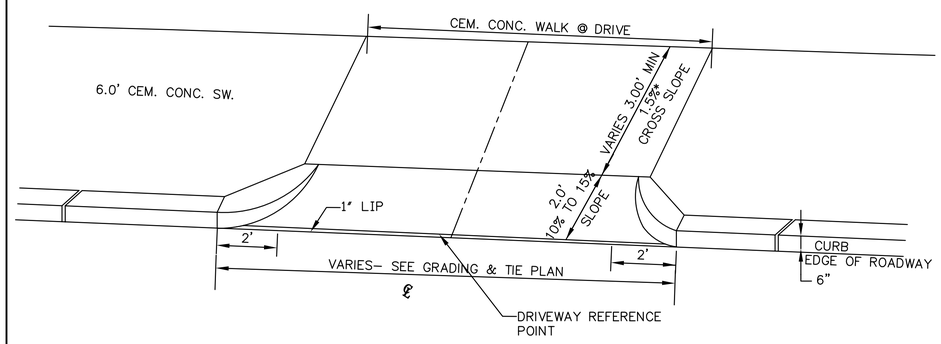


NOTES:

– * CONSTRUCTION TOLERANCE ± 0.5%

DRIVEWAY #	DRIVEWAY REFERENCE POINT		WIDTH OF SIDEWALK	WIDTH OF TRAVEL PATH ACROSS OPENING	LEFT SIDE TRANSITION LENGTH	RIGHT SIDE TRANSITION LENGTH	ROADWAY GUTTER SLOPE
	STATION	OFFSET					
L2– L89			VARIES 7' TO 10'	VARIES 4' TO 7'	N/A	N/A	N/A

SIDEWALK THROUGH DRIVEWAYS – TYPE O



NOTES:

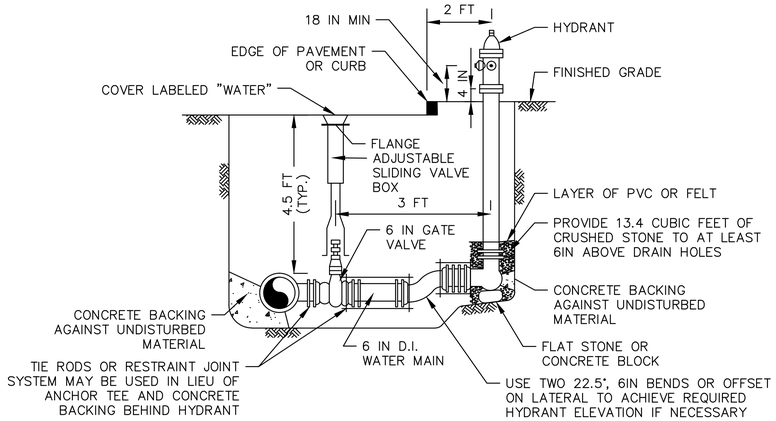
– * CONSTRUCTION TOLERANCE ± 0.5%

DRIVEWAY #	DRIVEWAY REFERENCE POINT		WIDTH OF SIDEWALK	WIDTH OF TRAVEL PATH ACROSS OPENING	LEFT SIDE TRANSITION LENGTH	RIGHT SIDE TRANSITION LENGTH	ROADWAY GUTTER SLOPE
	STATION	OFFSET					
01	20+95	36.0 LT	6.0	4.0	N/A	N/A	N/A
02	29+40	80.0 LT	6.0	3.0	N/A	N/A	N/A

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

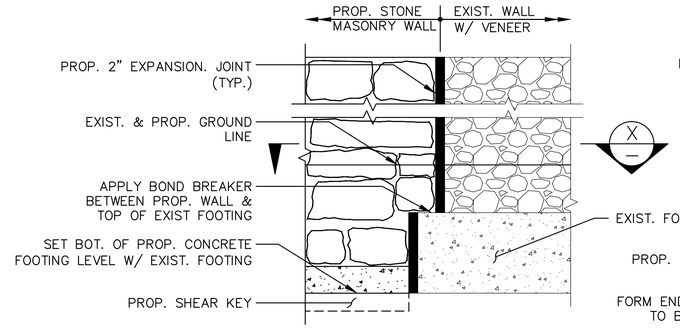
STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	202	240
PROJ. FILE NO. 604688			

CONSTRUCTION DETAILS
MISCELLANEOUS



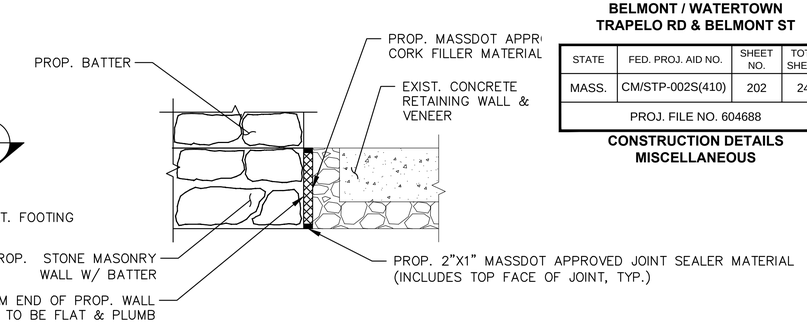
HYDRANT AND VALVE DETAIL

N.T.S.



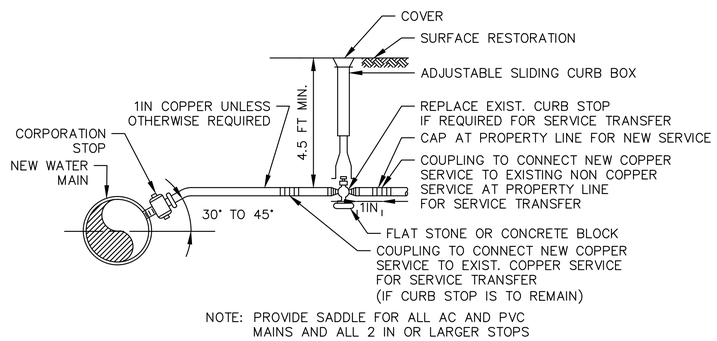
DETAIL–MASONRY WALL AT EXIST. WALL

N.T.S.



SECTION X

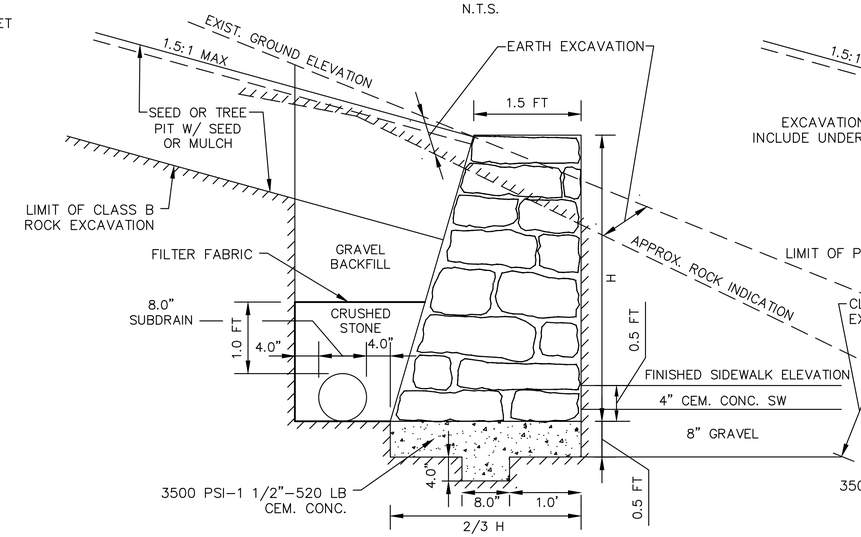
N.T.S.



NOTE: PROVIDE SADDLE FOR ALL AC AND PVC MAINS AND ALL 2 IN OR LARGER STOPS

WATER SERVICE DETAIL

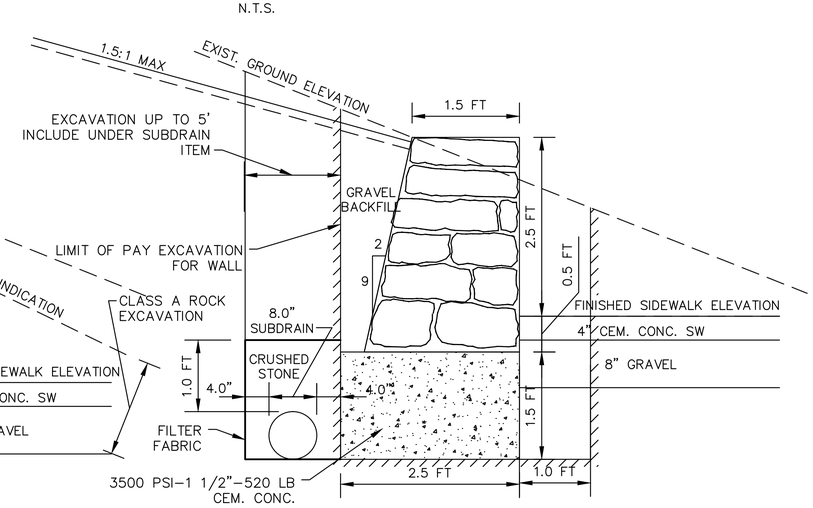
N.T.S.



NOTE: ALL CONCRETE DIMENSIONS SHOWN ARE MINIMUM.

CEMENTED STONE MASONRY WALL IN LEDGE

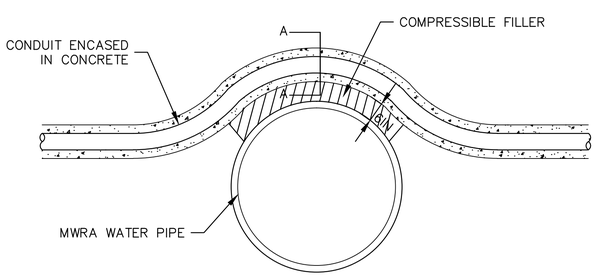
N.T.S.



NOTE: ALL CONCRETE DIMENSIONS SHOWN ARE MINIMUM.

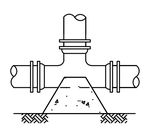
CEMENTED STONE MASONRY WALL

N.T.S.



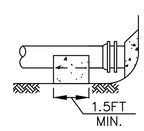
TYPICAL ELECTRICAL CONDUIT CROSSING OVER MWRA WATER PIPE

N.T.S.



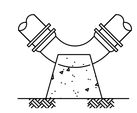
TEE DETAIL

PLAN VIEW
N.T.S.



CAP DETAIL (PLUG SIMILAR)

SECTION VIEW
N.T.S



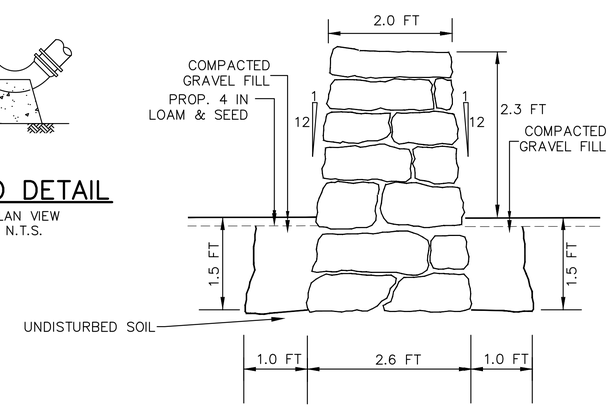
BEND DETAIL

PLAN VIEW
N.T.S.

2 CONDUIT SECTION

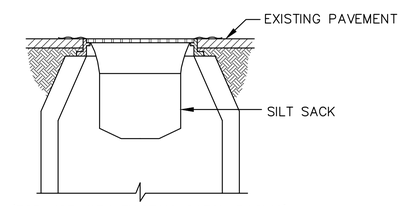
6 CONDUIT SECTION

SECTION A–A



CEMENTED STONE MASONRY WALL BALANCED

N.T.S.



(FOR USE WITH EXISTING CATCH BASINS)

NOTE: SILT SACKS TO BE PLACED IN ALL CATCH BASINS IN THE VICINITY OF NEW CONSTRUCTION. CATCH BASINS ARE TO BE PROTECTED AS SHOWN, WITH MINIMUM WEEKLY MAINTENANCE, OR AS REQUIRED AND REPLACED IF NECESSARY.

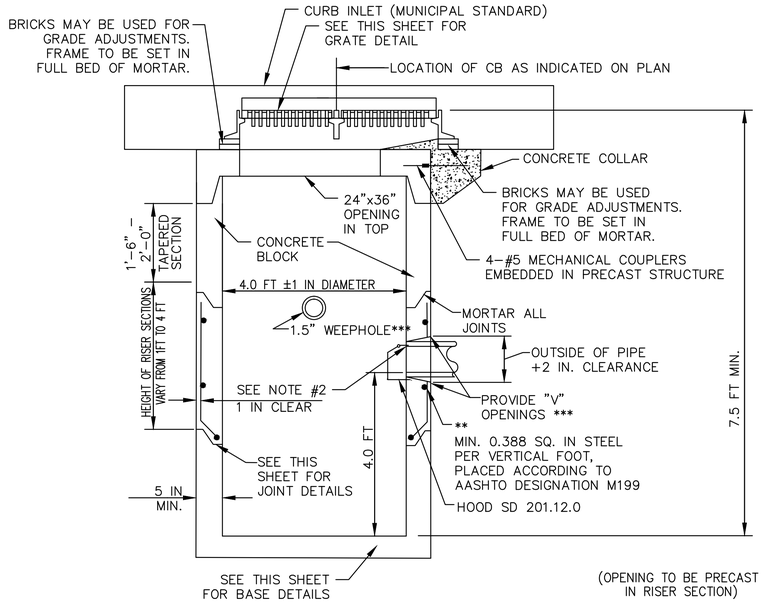
SILT SACK INLET PROTECTION

N.T.S.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	203	240
PROJ. FILE NO. 604688			

CONSTRUCTION DETAILS
DRAINAGE DETAILS



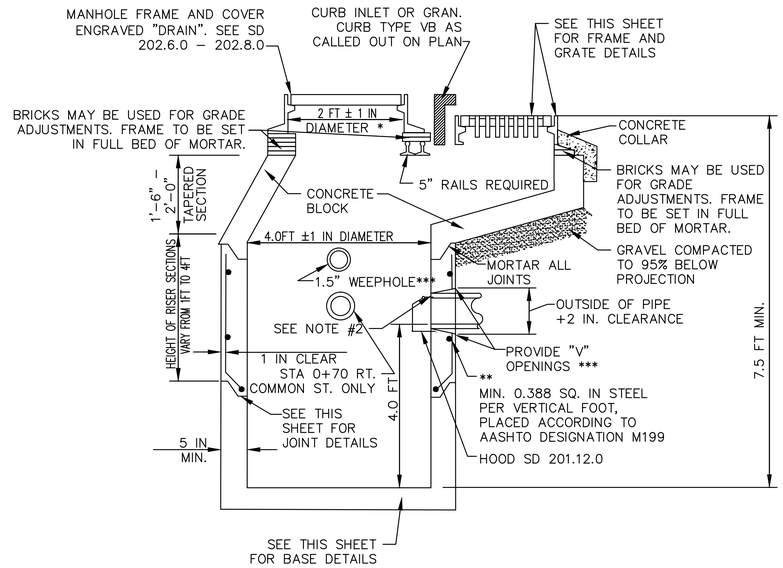
** REINFORCED STEEL BASED ON A WALL THICKNESS OF 5 IN.
*** OPENING TO BE PRECAST IN RISER SECTION.

NOTES:

1. DETAILS NOT INDICATED ABOVE ARE TO BE SIMILAR TO THOSE SHOWN ON 201.3.0
2. FACE OF PIPE FLUSH OR NOT TO PROJECT MORE THAN 4 IN FROM FACE OF WALL ALONG CENTERLINE OF PIPE.
3. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHOD, SEE STANDARD SPECIFICATIONS.
4. ALL CONCRETE TO BE AIR ENTRAINED.
5. DESIGN TO CONFORM TO H.20 LOADING.

CATCH BASIN MUNICIPAL STANDARD TYPE 2

N.T.S.



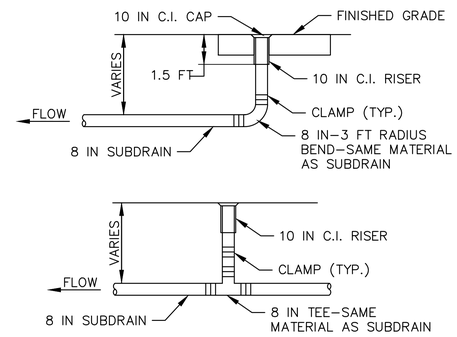
** REINFORCED STEEL BASED ON A WALL THICKNESS OF 5 IN.
*** OPENING TO BE PRECAST IN RISER SECTION.

NOTES:

1. DETAILS NOT INDICATED ABOVE ARE TO BE SIMILAR TO THOSE SHOWN ON 201.3.0
2. FACE OF PIPE FLUSH OR NOT TO PROJECT MORE THAN 4 IN FROM FACE OF WALL ALONG CENTERLINE OF PIPE.
3. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHOD, SEE STANDARD SPECIFICATIONS.
4. ALL CONCRETE TO BE AIR ENTRAINED.
5. DESIGN TO CONFORM TO H.20 LOADING.

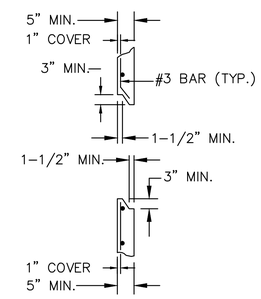
CATCH BASIN MUNICIPAL STANDARD TYPE 3

N.T.S.



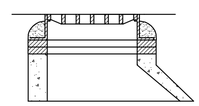
CLEANOUTS FOR 8–INCH SUBDRAIN

N.T.S.

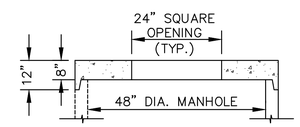


JOINT DETAILS

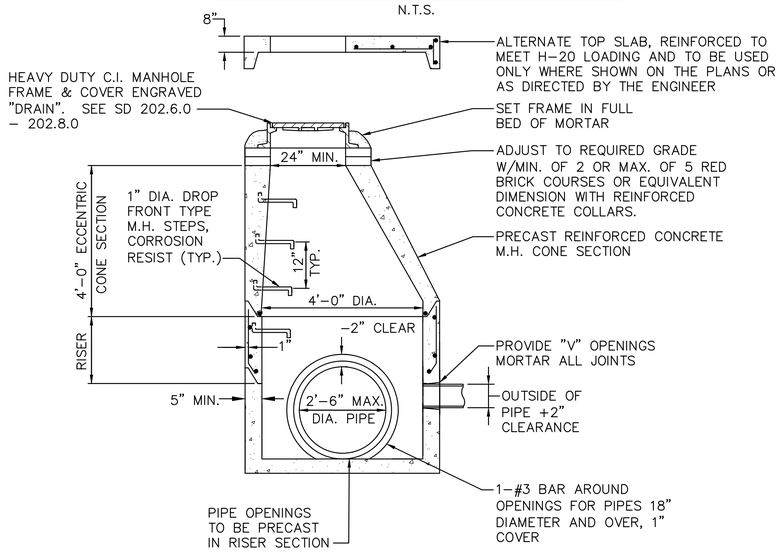
N.T.S.



ALTERNATE ECCENTRIC CONE SECTION



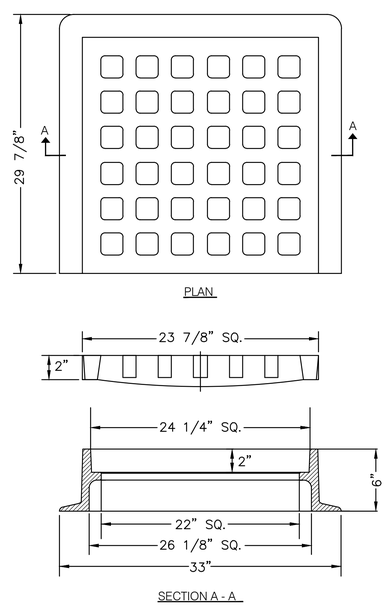
ALTERNATE TOP SLAB



NOTE:
PREFORMED BITUMASTIC SEALANT AS SPECIFIED. SHALL FILL AT LEAST 75% OF JOINT CAVITY. RUBBER OR "O" RING SET IN RECESS.

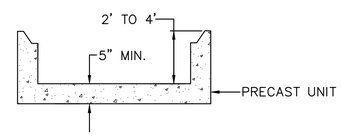
MANHOLE MUNICIPAL STANDARD

N.T.S.

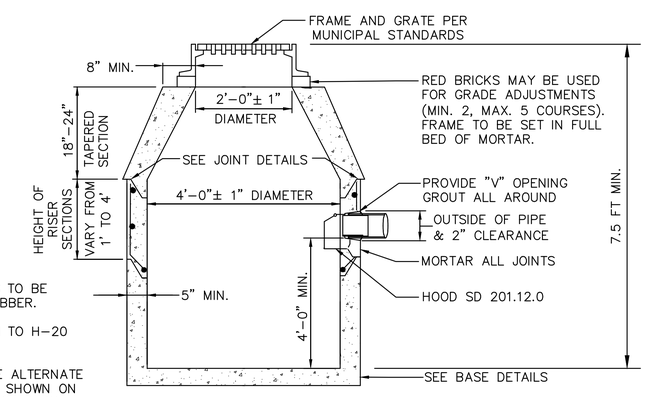


CATCH BASIN FRAME AND GRATE DETAIL

N.T.S.



BASE DETAILS



NOTES:

1. ALL PRECAST JOINTS TO BE SEALED WITH BUTYL RUBBER.
2. DESIGN TO CONFORM TO H–20 LOADING.
3. CONTRACTOR TO USE ALTERNATE TOP SLAB ONLY WHERE SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

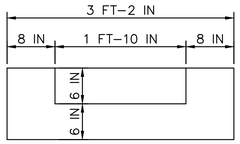
CATCH BASIN MUNICIPAL STANDARD

N.T.S.

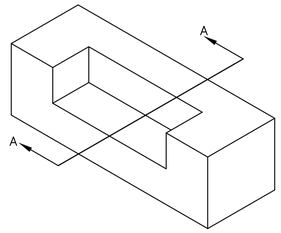
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	204	240
PROJ. FILE NO. 604688			

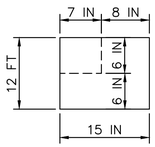
CONSTRUCTION DETAILS
DRAINAGE DETAILS



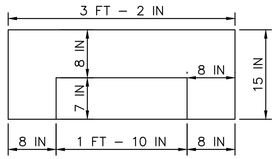
FRONT VIEW



ISOMETRIC VIEW

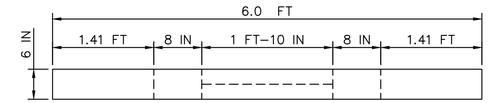


SECTION A–A

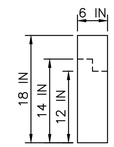


TOP VIEW

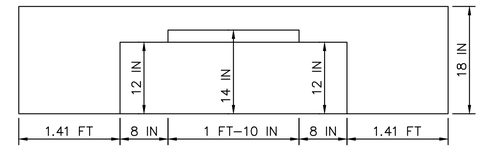
PRECAST CONCRETE THROAT OPENING



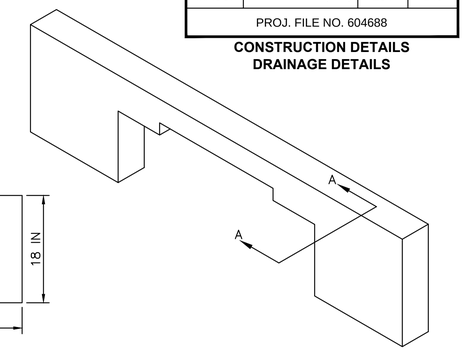
TOP VIEW



SECTION A–A

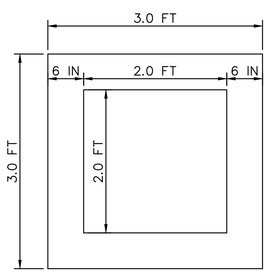


FRONT VIEW

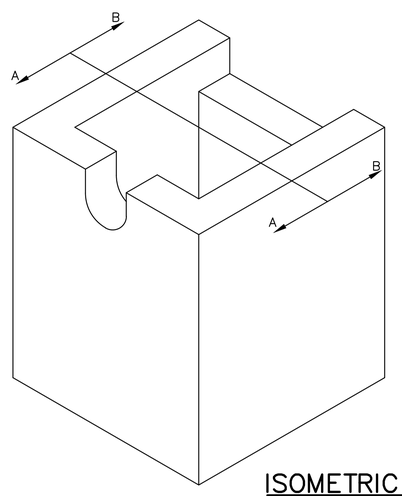


ISOMETRIC VIEW

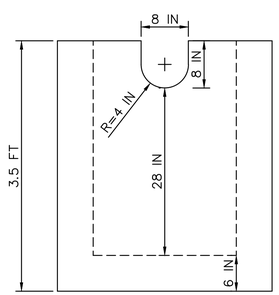
CURB INLET MUNICIPAL STANDARD



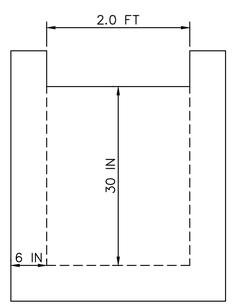
TOP VIEW



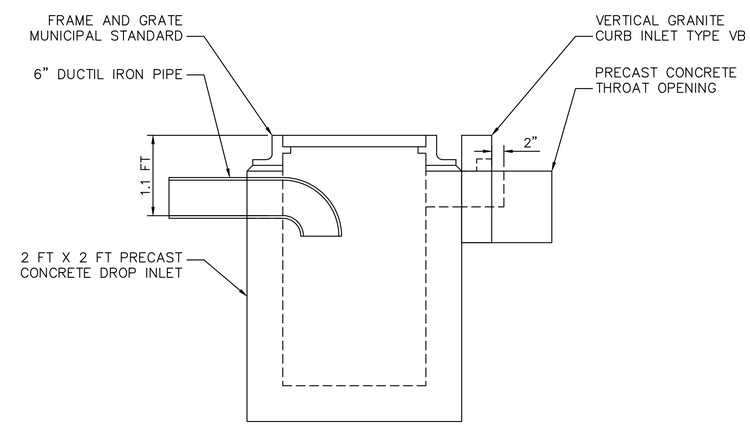
ISOMETRIC VIEW



SECTION A–A



SECTION B–B



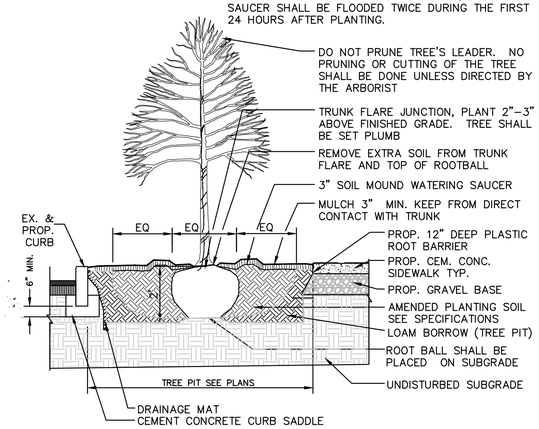
CATCH BASIN MUNICIPAL
STANDARD TYPE 4

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	205	240
PROJ. FILE NO. 604688			

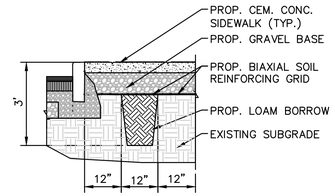
CONSTRUCTION DETAILS
LANDSCAPE DETAILS

NOTES:
SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
SAUCER SHALL BE FLOODED TWICE DURING THE FIRST 24 HOURS AFTER PLANTING.



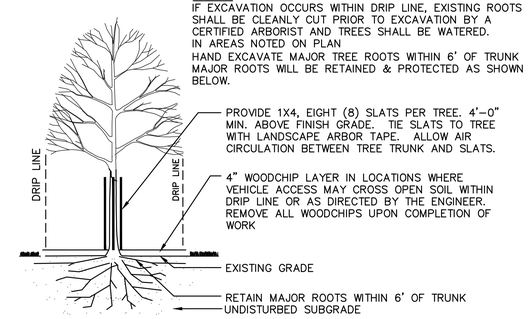
TREE PLANTING/ TREE PIT
N.T.S.

NOTES:
DRAINAGE MAT, AND ROOT PATHS SHALL BE CONSTRUCTED PRIOR TO CONSTRUCTION OF THE SIDEWALK.
MODIFY DEPTH AND LOCATION OF ROOT PATHS TO ACCOMMODATE EXISTING UTILITIES.
TREE PITS SHALL RECEIVE EITHER LOAM & SEED OR MULCH SEE PLANS.

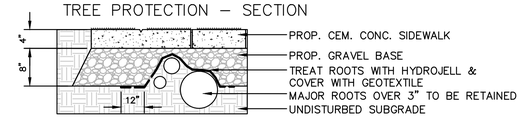


SECTION B–B

NOTES:
IF EXCAVATION OCCURS WITHIN DRIP LINE, EXISTING ROOTS SHALL BE CLEANLY CUT PRIOR TO EXCAVATION BY A CERTIFIED ARBORIST AND TREES SHALL BE WATERED.
IN AREAS NOTED ON PLAN
HAND EXCAVATE MAJOR TREE ROOTS WITHIN 6' OF TRUNK
MAJOR ROOTS WILL BE RETAINED & PROTECTED AS SHOWN BELOW.

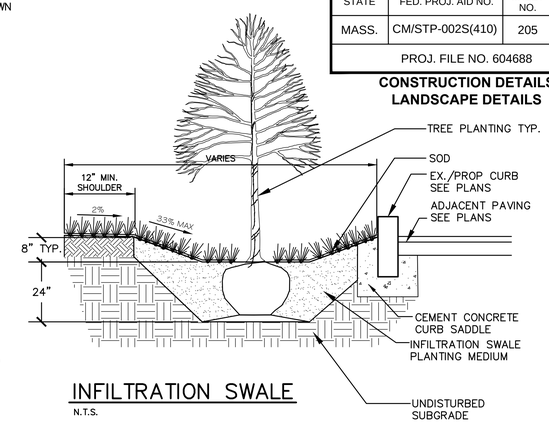


TREE PROTECTION – SECTION



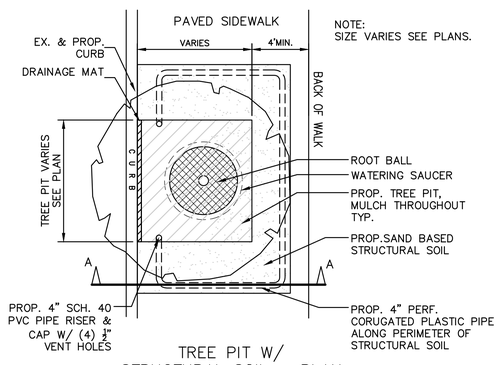
HAND EXCAVATE AROUND MAJOR TREE ROOTS – SECTION

EXISTING TREE PROTECTION
N.T.S.

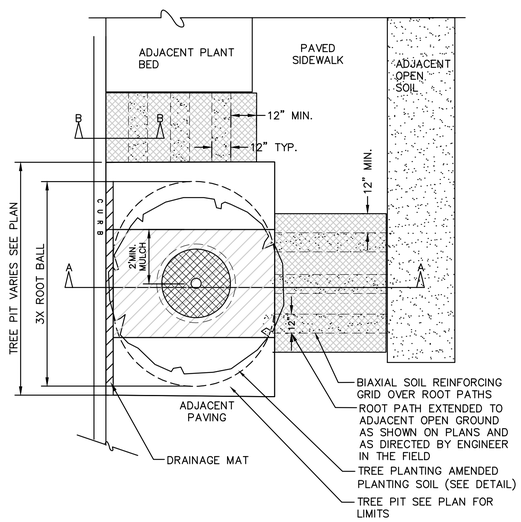


INFILTRATION SWALE
N.T.S.

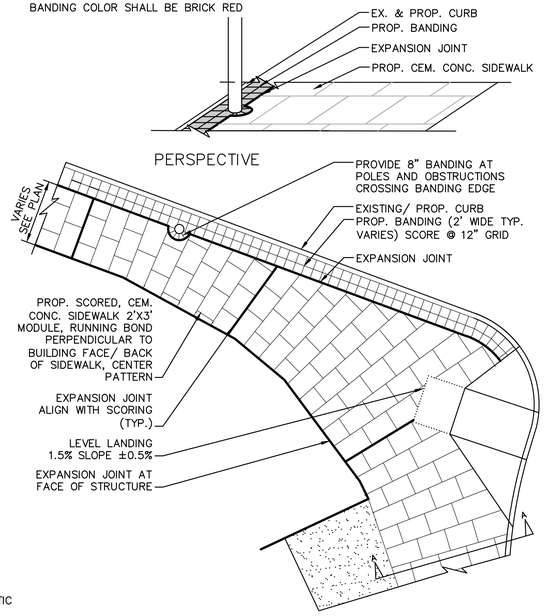
SHRUB PLANTING NOTES:
1. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
2. NO PRUNING OR CUTTING UNLESS DIRECTED BY THE LANDSCAPE ARCHITECT.
3. SAUCER SHALL BE FLOODED TWICE DURING THE FIRST 24 HOURS AFTER PLANTING.
4. SHRUBS SHALL BE SET PLUMB AND PLANTED SO THAT THE TOP OF THE ROOTBALL IS 1"–2" ABOVE FINISHED GRADE.
5. FOR HEDGE PLANTING SHRUBS SHALL BE SPACED AS CALLED OUT ON PLANS AT QUANTITIES SUFICIENT TO PROVIDE COMPLETE COVERAGE OF AREA INDICATED



TREE PIT W/
STRUCTURAL SOIL – PLAN

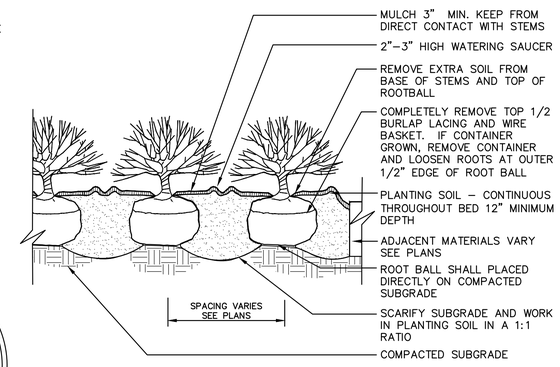


TREE PIT WITH ROOT PATHS – PLAN

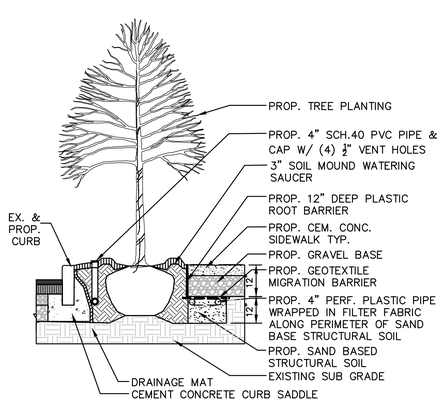


SCORING AND BANDING AT CORNERS – PLAN

NOTES:
PROVIDE EXPANSION JOINT @ 20' O.C. MAX. BETWEEN WALK & BANDING AND AT FACE OF STRUCTURES EXPANSION JOINTS SHALL BE SEALED COLOR OF SEALANT TO MATCH CONCRETE.
BANDING COLOR SHALL BE BRICK RED

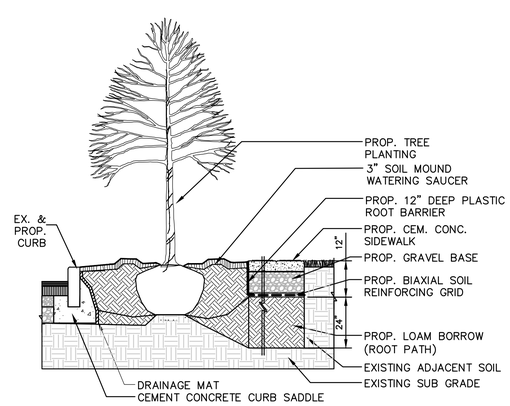


SHRUB PLANTING BED (HEDGE)
N.T.S.



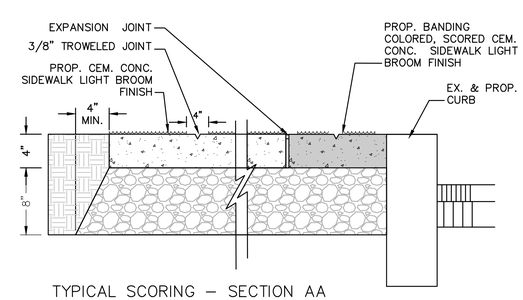
SECTION A–A

STRUCTURAL SOIL (AT TREE PITS)
N.T.S.



SECTION A–A

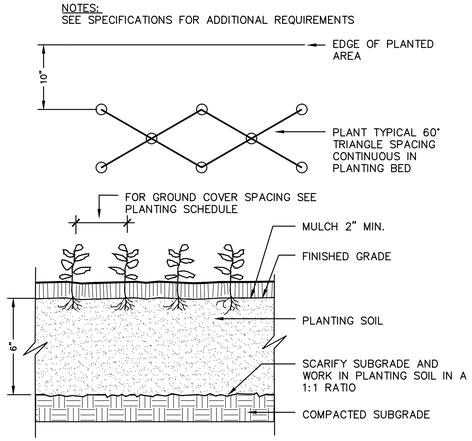
ROOT PATHS (AT TREE PIT)
N.T.S.



TYPICAL SCORING – SECTION AA

CEM. CONC. SIDEWALK SCORING AND BANDING
N.T.S.

NOTES:
SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS



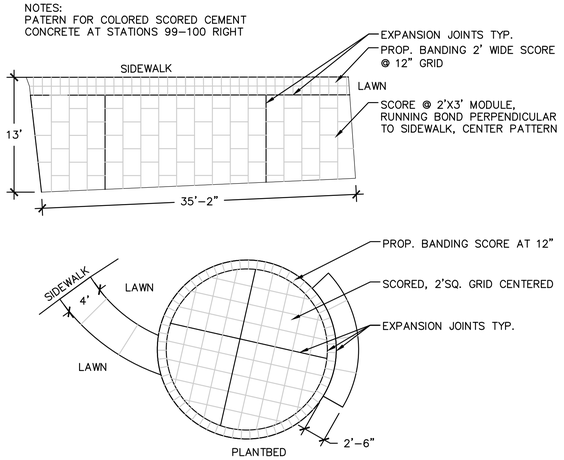
GROUNDCOVER PLANTING
N.T.S.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	206	240
PROJ. FILE NO. 604688			

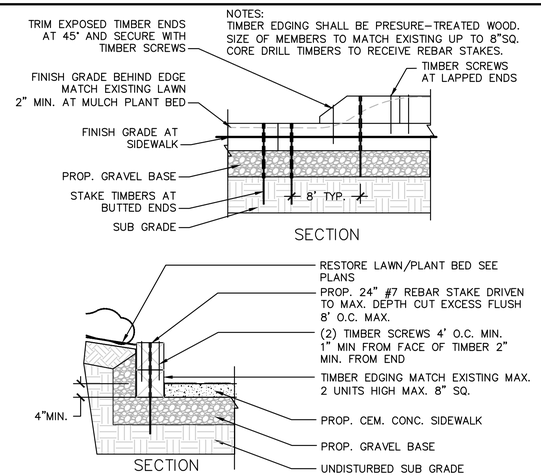
CONSTRUCTION DETAILS
STREETSCAPE DETAILS

NOTES:
PATERN FOR COLORED SCORED CEMENT CONCRETE AT STATIONS 99–100 RIGHT



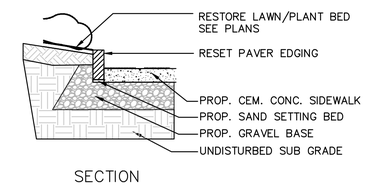
CUSTOM BANDING SCORING PATTERN AREAS
N.T.S.

NOTES:
TIMBER EDGING SHALL BE PRESURE–TREATED WOOD.
SIZE OF MEMBERS TO MATCH EXISTING UP TO 8"SQ.
CORE DRILL TIMBERS TO RECEIVE REBAR STAKES.



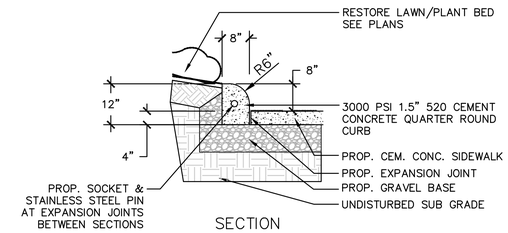
TIMBER EDGING
N.T.S.

NOTES:
(PAVERS) INCLUDES LOOSE MODULAR BRICK, STONE, AND CONCRETE USED AS EDGING. STOCKPILE EXISTING PAVERS AND RESET TO REASONABLY MATCH ORIGINAL CONDITION.
FINISH GRADE BEHIND EDGE – MATCH EXISTING AT LAWN OR 2" MIN. AT MULCH PLANT BED.
WHERE EXISTING PAVERS ARE MISSING INSUFICIENT OR DETERIORATED THEY SHALL BE REPLACED IN KIND.
WHERE COMPARABLE PAVERS ARE UNAVAILABLE THE ENGINEER SHALL DETERMINE THE APPROPRIATE MATERIAL FOR REPLACEMENT.

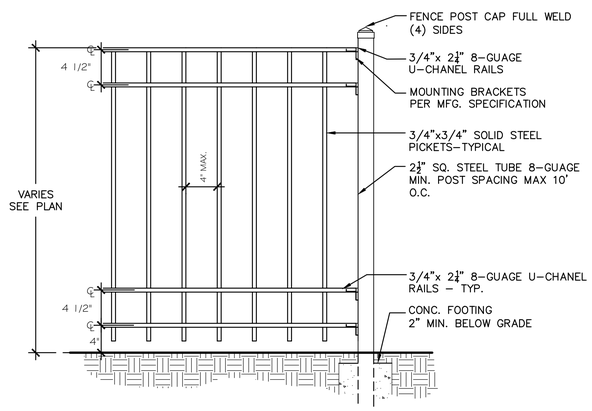


PAVER EDGING
N.T.S.

NOTES:
RADIAL CURB TO MATCH EXISTING VERIFY DIMENSIONS IN FIELD.
RADIAL CURB SHALL BE EXTRUDED OR PRECAST.
ALIGN JOINTS WITH SIDEWALK SCORING.
SAW CUT EXISTING CURB AT NEAREST JOINT.

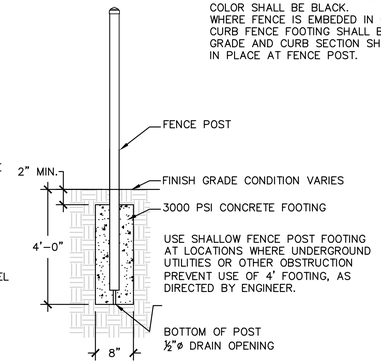


CEMENT CONCRETE QUARTER ROUND CURB
N.T.S.



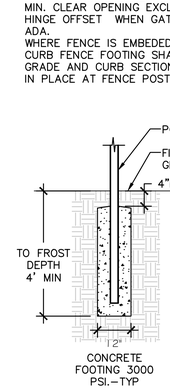
ORNAMENTAL STEEL FENCE
N.T.S.

NOTE:
SEE SPECIFICATION FOR FINISH.
COLOR SHALL BE BLACK.
WHERE FENCE IS EMBEDDED IN CONCRETE CURB FENCE FOOTING SHALL BE SET BELOW GRADE AND CURB SECTION SHALL BE CAST IN PLACE AT FENCE POST.

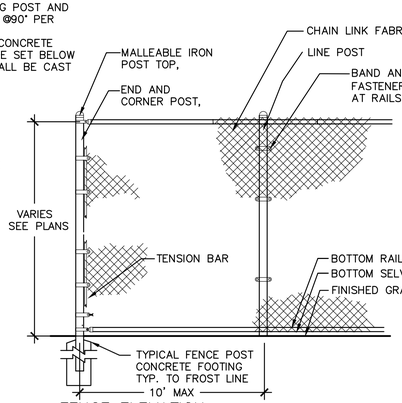


CONC. FOOTING SECTION

NOTE:
SEE SPECIFICATION FOR FRAME MEMBER SIZING, MESH GAUGE & OPENING, FINISH, AND HARDWARE GATES SHALL HAVE 36" MIN. CLEAR OPENING EXCLUDING POST AND HINGE OFFSET WHEN GATE IS @90° PER ADA.
WHERE FENCE IS EMBEDDED IN CONCRETE CURB FENCE FOOTING SHALL BE SET BELOW GRADE AND CURB SECTION SHALL BE CAST IN PLACE AT FENCE POST.

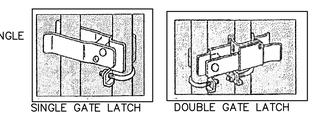


FOOTING SECTION

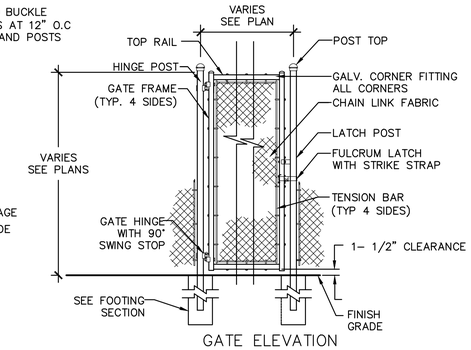


FENCE ELEVATION

GATE LATCH
GATE LATCHES FOR SINGLE AND DOUBLE GATES

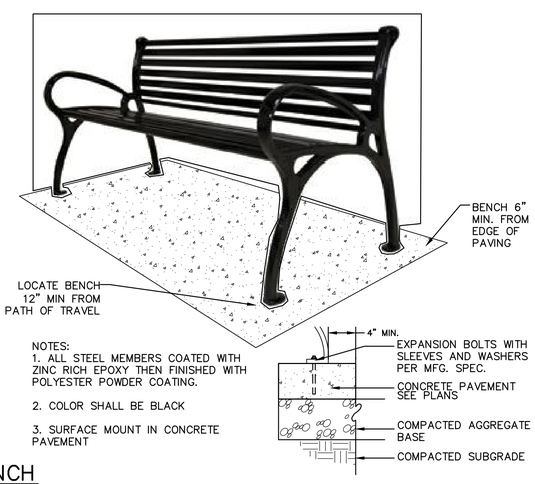


SINGLE GATE LATCH DOUBLE GATE LATCH



GATE ELEVATION

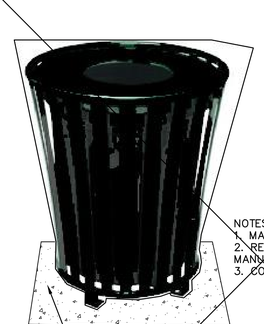
CHAIN LINK FENCE AND GATE DETAIL
N.T.S.



NOTES:
1. ALL STEEL MEMBERS COATED WITH ZINC RICH EPOXY THEN FINISHED WITH POLYESTER POWDER COATING.
2. COLOR SHALL BE BLACK
3. SURFACE MOUNT IN CONCRETE PAVEMENT

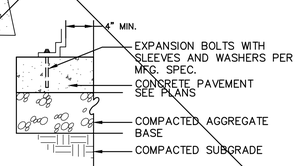
BENCH
N.T.S.

N.I.C.

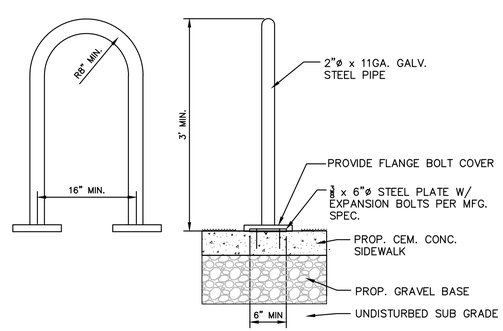


NOTES:
1. MATERIALS SHALL MATCH BENCH
2. RECEPTACLE TO BE BY SAME MANUFACTURER AS BENCH
3. COLOR SHALL BE BLACK

LOCATE RECEPTACLE 18" MIN FROM EDGE OF PAVEMENT



TRASH RECEPTACLE
N.T.S.

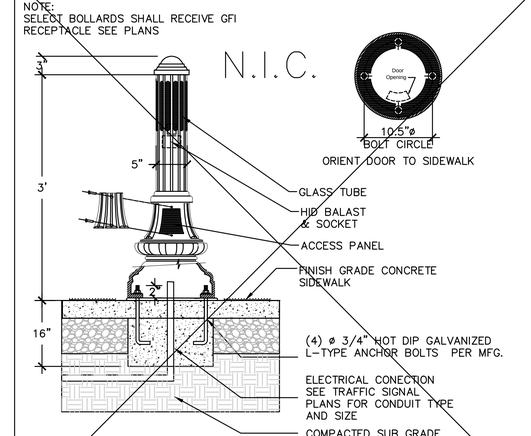


NOTES:
1. MATERIALS SHALL MATCH BENCH
2. BIKE RACK SHALL BE SURFACE MOUNTED ON CONCRETE PAVEMENT.
3. COLOR SHALL BE BLACK

BIKE RACK
N.T.S.

NOTE:
SELECT BOLLARDS SHALL RECEIVE GFI RECEPTACLE SEE PLANS

N.I.C.

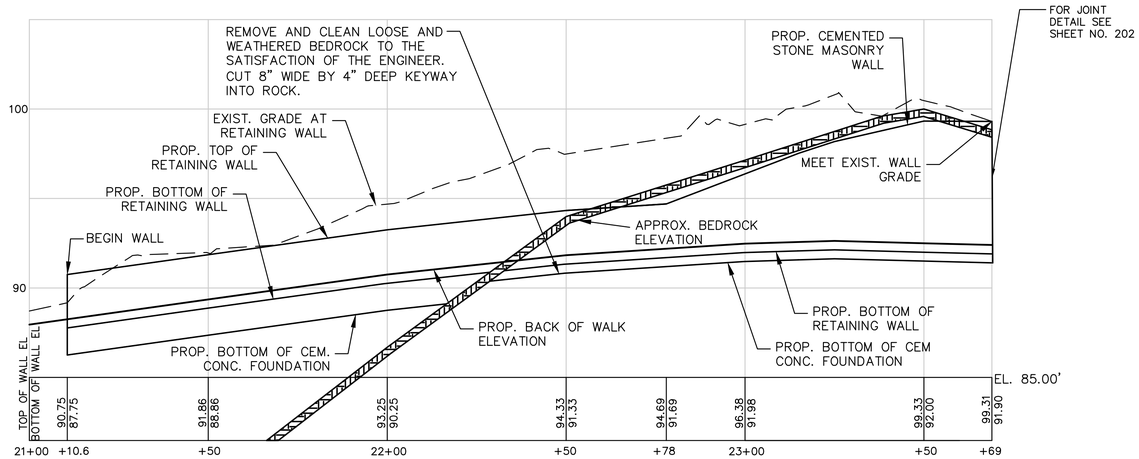


BOLLARD
N.T.S.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	207	240
PROJ. FILE NO. 604688			

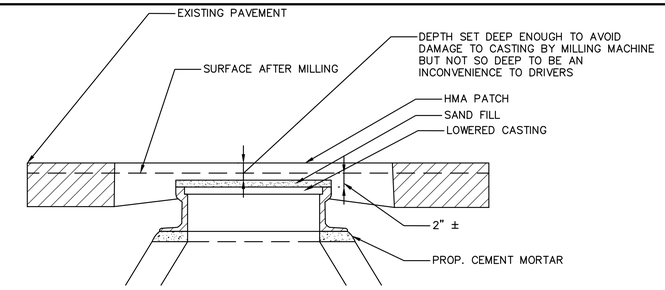
CONSTRUCTION DETAILS
MISCELLANEOUS DETAILS



RETAINING WALL ELEVATION

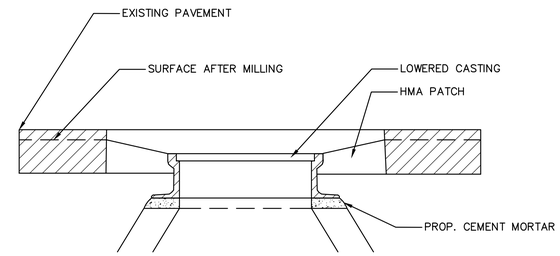
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 4'

(SEE GRADING AND CURB TIE PLAN FOR HORIZONTAL ALIGNMENT OF WALLS.)



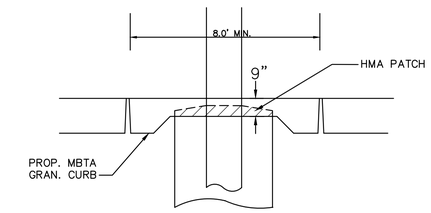
LOWERED CASTING PRIOR TO MILLING

N.T.S.

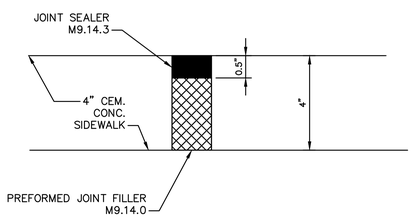


LOWERED CATCH BASIN CASTING PRIOR TO MILLING

N.T.S.

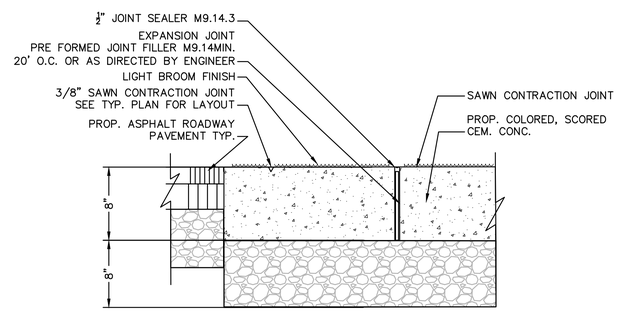


SECTION A+A



PERFORMED JOINT FILLER AND SEALER

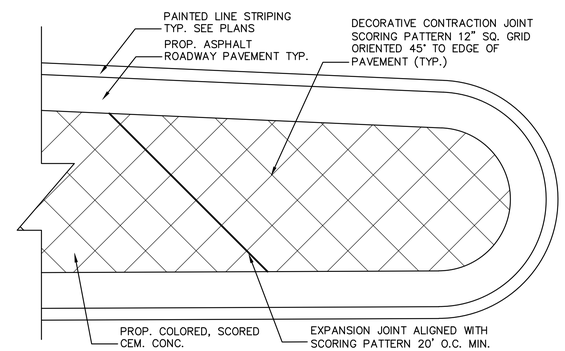
N.T.S.



TYPICAL SCORING/JOINTING – SECTION

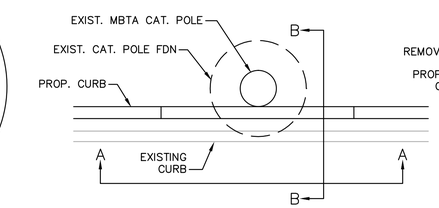
COLORED SCORED CEMENT CONCRETE PAVEMENT

N.T.S.

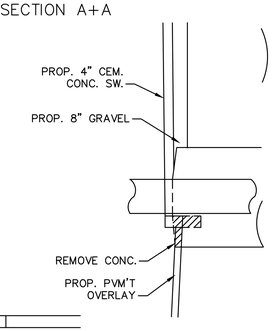


TYPICAL SCORING/JOINTING – PLAN

N.T.S.



PLAN VIEW



SECTION B+B

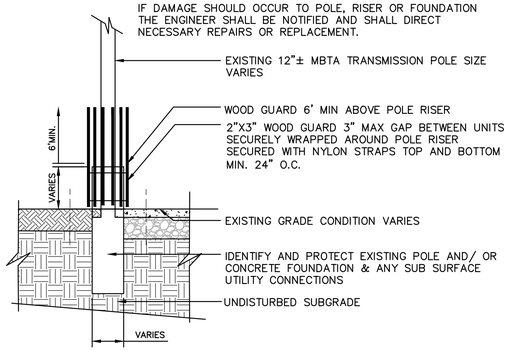
WIDENING ROADWAY AT MBTA CAT POLE

N.T.S.

NOTES:
IF EXCAVATION OF MORE THAN 3' OF DEPTH MUST OCCUR AT THE EXISTING POLE BRACING MAY BE REQUIRED AS DIRECTED BY THE ENGINEER.

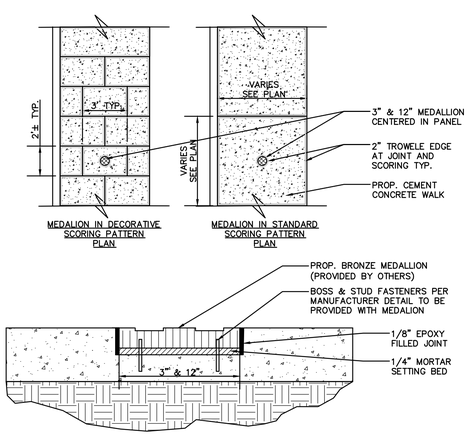
SIGNIFICANT EXCAVATION AT POLE SHALL NOT BE ALLOWED TO REMAIN OPEN OUTSIDE THE HOURS OF CONSTRUCTION OPERATIONS.

IF DAMAGE SHOULD OCCUR TO POLE, RISER OR FOUNDATION THE ENGINEER SHALL BE NOTIFIED AND SHALL DIRECT NECESSARY REPAIRS OR REPLACEMENT.



EXISTING MBTA POLE PROTECTION

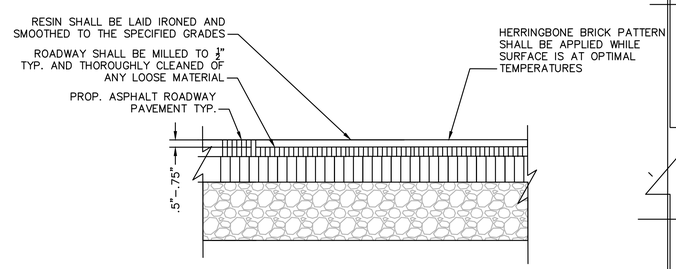
N.T.S.



WAVERLY TRAIL MEDALLION INSTALATION

N.T.S.

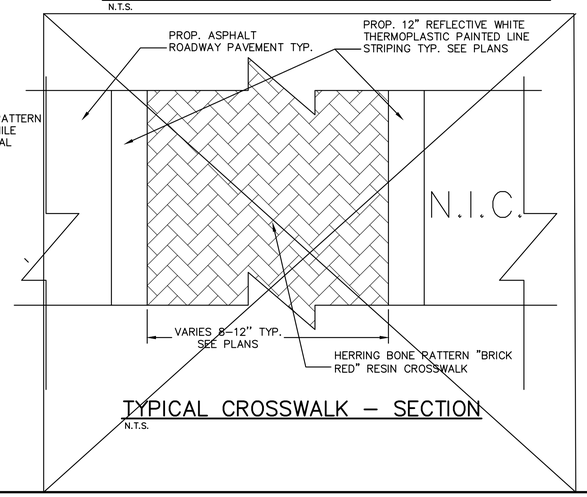
NOTE:
RESIN CROSSWALK SHALL NOT BE OPENED TO VEHICULAR OR PEDESTRIAN TRAFFIC UNTIL IT HAS COOLED AND HARDENED THROUGHOUT TO TEMPERATURE SPECIFIED. SURFACE SHALL BE INSPECTED AND APPROVED BY THE ENGINEER PRIOR TO BEING OPENED TO TRAFFIC.



TYPICAL SCORING/JOINTING – SECTION

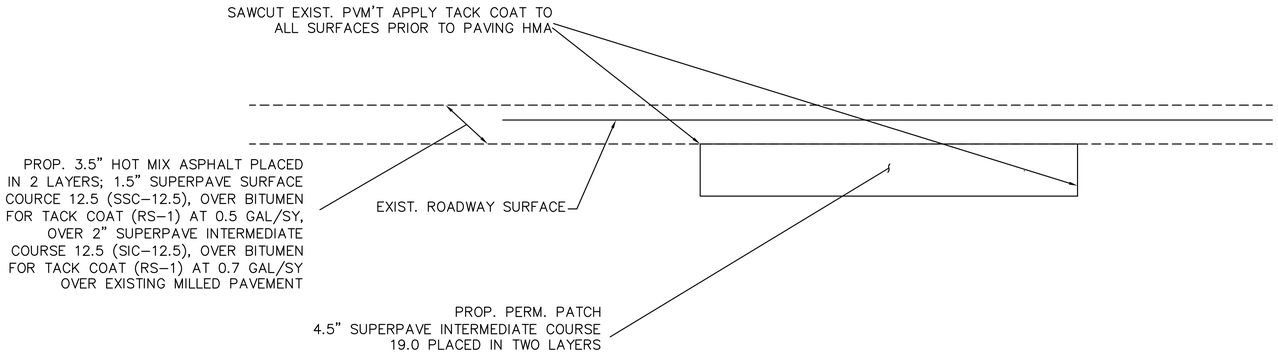
COLORED SCORED CEMENT CONCRETE PAVEMENT

N.T.S.



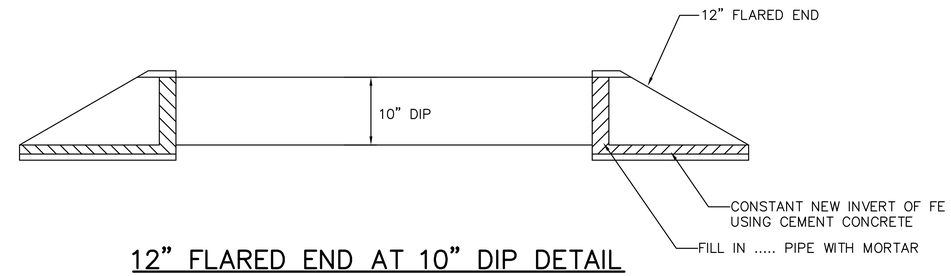
TYPICAL CROSSWALK – SECTION

N.T.S.



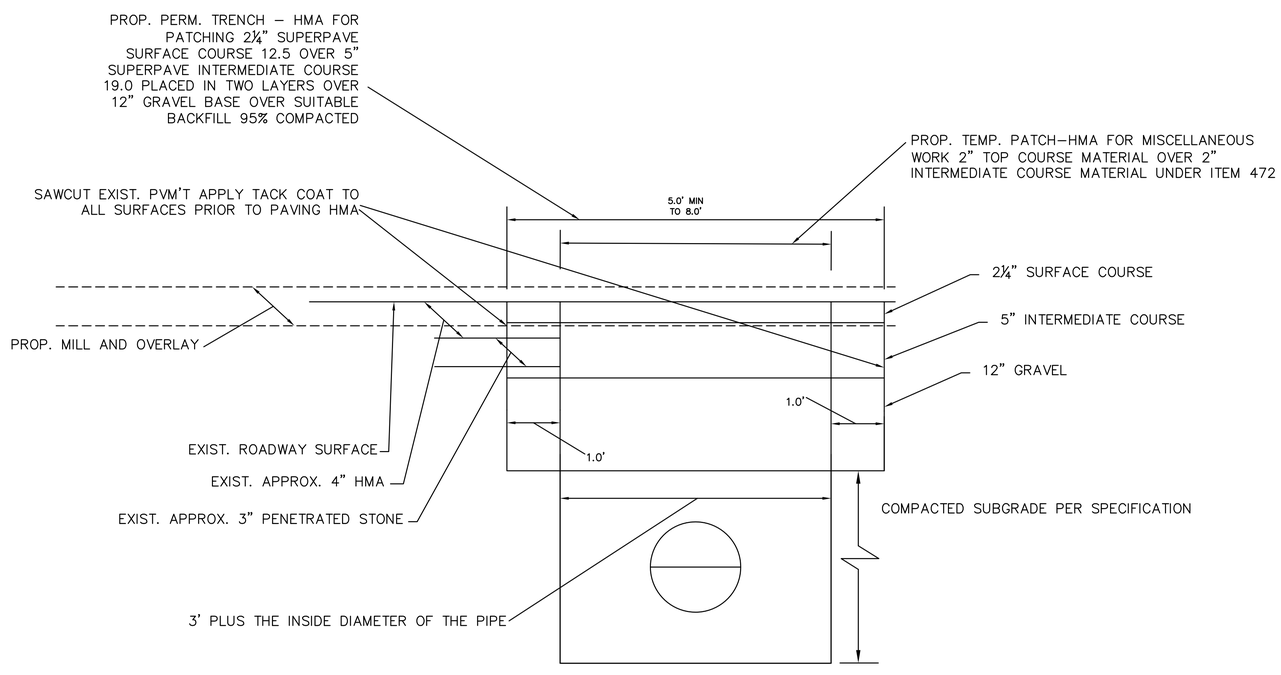
PERMANENT PATCH DETAIL
(AFTER MILLING AND PRIOR TO OVERLAY)

N.T.S.



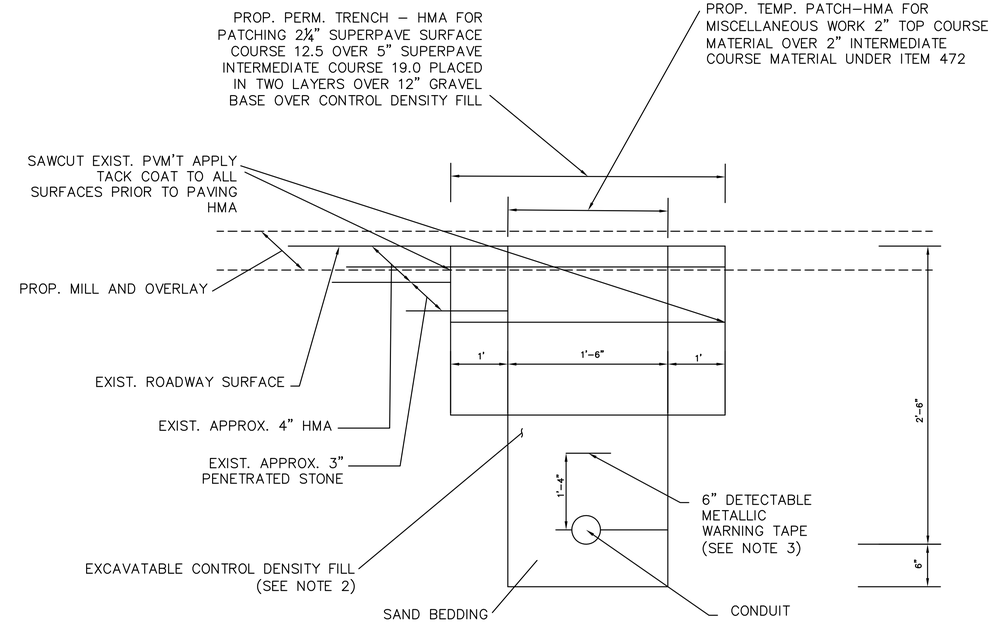
12" FLARED END AT 10" DIP DETAIL

N.T.S.



TEMPORARY AND PERMANENT TRENCH PATCH DETAIL
(PRIOR TO MILLING AND OVERLAY)

N.T.S.



TRAFFIC SIGNAL CONDUIT CROSSING ROADWAY

N.T.S.

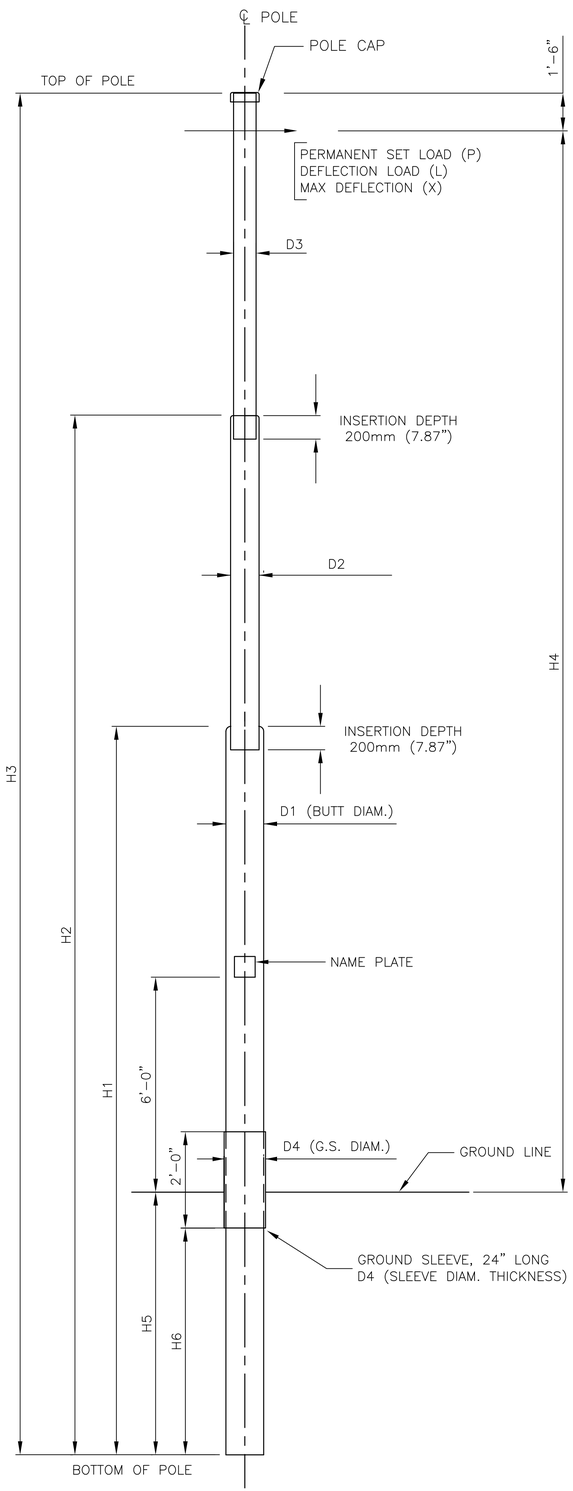
NOTES:

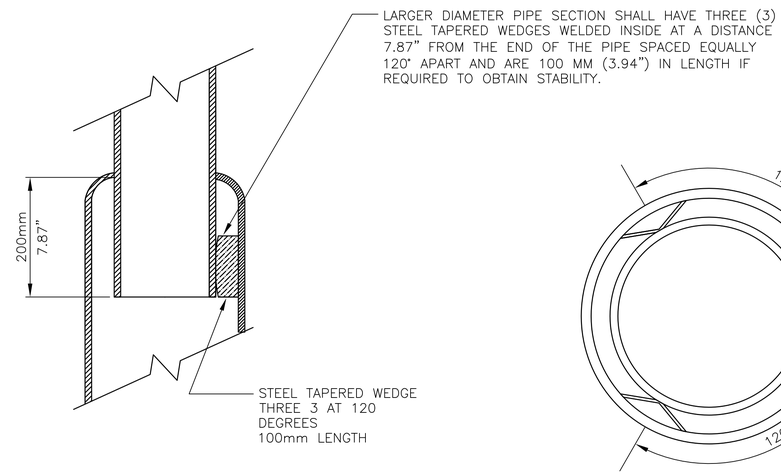
1. SCHEDULE 80 ELECTRICAL CONDUIT TYPE NM-PLASTIC (UL), WITH PULL ROPE, UNLESS OTHERWISE NOTED BY MASSDOT.
2. CONTROL DENSITY FILL SHALL MEET THE REQUIREMENTS OF SUBSECTION M4.08.0.
3. WARNING TAPE SHALL BE PER CURRENT APWA STANDARDS.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	209	240
PROJ. FILE NO. 604688			

CONSTRUCTION DETAILS
MBTA POLE SPECIFICATIONS





NOTES:

1. EACH POLE SHALL BE SUPPLIED WITH A GALVANIZED STEEL POLE CAP.
2. TUBULAR STEEL POLES SHALL CONFORM TO ASTM A618 WITH MINIMUM TENSILE STRENGTH OF 50,000 PSI AT YIELD OR EQUIVALENT.
3. TUBULAR STEEL SECTIONED POLES TO HAVE MINIMUM OF THREE TAPERED STEEL WEDGES. WEDGES SHALL BE POSITIONED SO THAT THE SMALLER DIAMETER PIPE WHEN PRESSED INSIDE THE WEDGES OF THE LARGER PIPE FORMS A PERMANENT CONNECTION.
4. POLE SPECIFICATION TABLE IS TAKEN FROM MBTA POWER DIVISION SPECIFICATION P-22-H WITH MODIFICATIONS FOR PIPE SIZE. POLES SHALL BE CONSTRUCTED AS SPECIFIED IN MBTA SPECIFICATION P-22-H EXCEPT AS MODIFIED HEREIN AND ON POLE INSTALLATION TABLE ON DRAWING 210.
5. LENGTH OF POLE BUTT SECTION BELOW GROUND LINE SHALL CONFORM TO THE DEPTH OF THE FOUNDATION SHOWN ON THE POLE INSTALLATION TABLE ON DRAWING 210.
6. ALLOWABLE BENDING MOMENTS BASED ON ALLOWABLE STRENGTH DESIGN AND STEEL STRENGTH OF 50,000 PSI MINUS 10% FOR MANUFACTURING VARIATIONS.

POLE SPECIFICATION TABLE

		MBTA POLE DESIGNATION								
		NO. 2	NO. 3	NO. 4	NO. 5	NO. 6	NO. 7	NO. 8	NO. 9	NO. 10
H3	LENGTH OVERALL (FEET)	28	30	32	36	38	40	42	46	50
SM	SECTION MODULUS (MIN.)	12.22	18.72	24.51	31.09	39.43	47.68	56.71	69.10	79.90
H2	BOTTOM OF POLE TO TOP OF MIDDLE SECTION (FEET)	24'-6"	25'-0"	25'-3"	27'-3"	29'-0"	30'-0"	33'-0"	37'-0"	41'-0"
H1	BOTTOM OF POLE TO TOP OF BUTT SECTION (FEET)	18'-0"	19'-0"	18'-6"	18'-6"	20'-0"	21'-0"	24'-0"	28'-0"	32'-0
P	PERMANENT SET LOAD (POUNDS)	2131	3051	3751	4162	5011	5959	6972	7972	8683
L	DEFLECTION LOAD (POUNDS)	1420	2034	2501	2775	3341	3973	4648	5315	5789
X	MAX. DEFLECTION (INCHES)	7.74"	8.28"	8.82"	10.08"	10.62"	10.80"	10.98"	11.70"	12.42"
H4	DISTANCE OF APPLIED LOAD FROM GROUND LINE (FEET)	21'-6"	23'-0"	24'-6"	28'-0"	29'-6"	30'-0"	30'-6"	32'-6"	34'-6"
H5	GROUND LINE DISTANCE FROM POLE BOTTOM (FEET) [SEE NOTE 5]	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	8'-6"	10'-0"	12'-0"	14'-0"
H6	DISTANCE FROM BOTTOM OF POLE TO BOTTOM OF GROUND SLEEVE (FT)	4'-4"	4'-10"	5'-4"	5'-10"	6'-4"	7'-10"	9'-4"	11'-4"	13'-4"
D1	BUTT DIAMETER AND THICKNESS	6.625" 0.50"	7.625" 0.50"	8.625" 0.50"	9.625" 0.50	10.75" 0.50"	11.75" 0.50"	12.75" 0.50"	14.00" 0.50"	15.00" 0.50"
D2	MIDDLE DIAMETER AND THICKNESS	5.563" 0.258"	6.625" 0.280"	7.625" .301"	8.625" .322"	9.625" .342"	10.75" .365"	11.75" 0.75"	10.75" 0.365"	14.00" 0.50"
D3	TOP DIAMETER AND THICKNESS	4.500" 0.237"	5.563" 0.258"	6.625" .280"	7.625" .301"	8.625" .322"	9.625" .342"	10.75" 0.365"	9.625" .342"	12.75" 0.50"
D4	GROUND SLEEVE DIAMETER AND THICKNESS	7.625" 0.50"	8.625" 0.50"	9.625" 0.50"	10.75" 0.50"	11.75" 0.50"	12.75" 0.50"	14.00" 0.50"	15.00" 0.50"	16.00" 0.50"
BM	ALLOWABLE BENDING MOMENT (FOOT-POUNDS)	30,550	46,800	61,275	77,725	98,575	119,200	141,775	172,750	199,750

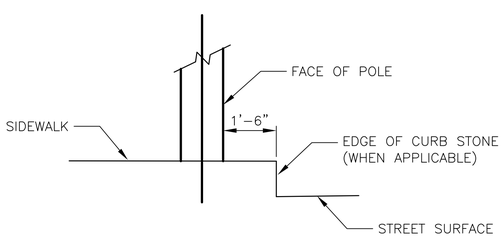
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	210	240
PROJ. FILE NO. 604688			

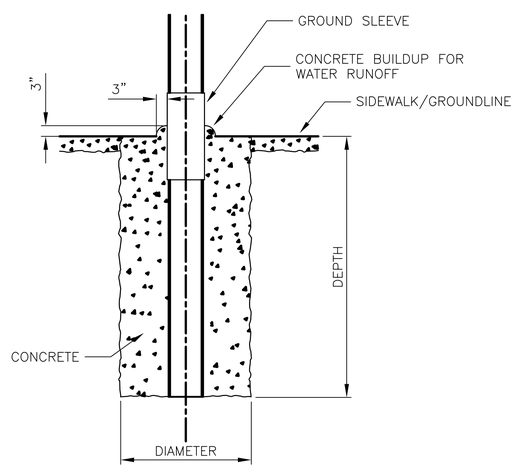
CONSTRUCTION DETAILS
MBTA POLE INSTALLATION DETAILS

POLE INSTALLATION TABLE

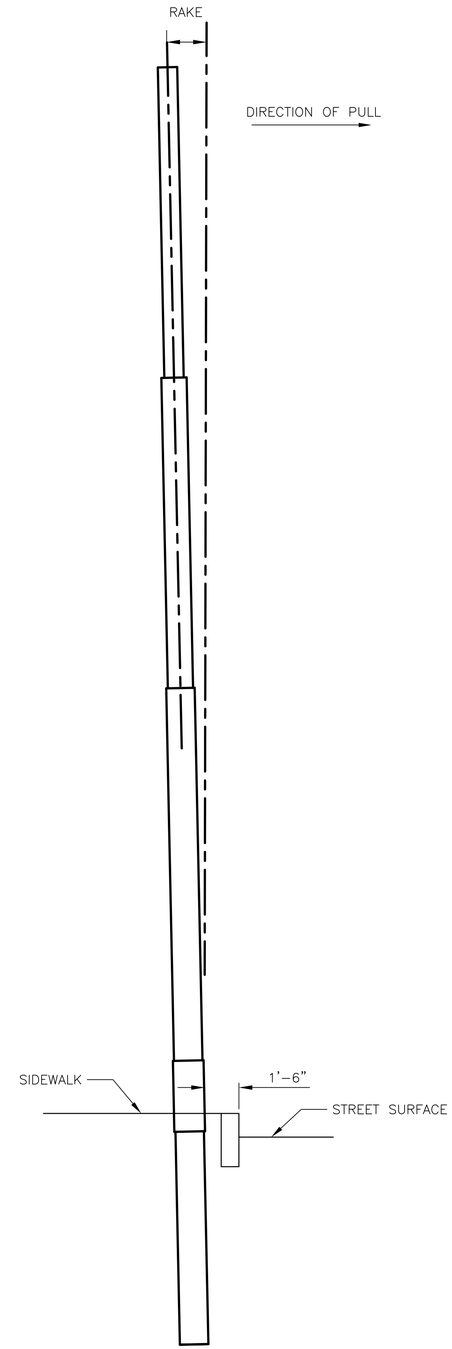
ITEM	POLE NUMBER	STREET	STATION MARK	OFFSET	SIDE	MBTA TYPE	ATTACHMENT	FOUNDATION		
								DEPTH	DIAMETER	CONCRETE QTY.
1	220/42	BELMONT STREET	135+14.62	29.1 FT	RT	NO. 5	CROSSARM	9'–0"	3'–0"	2.19 CY
2	220/48	BELMONT STREET	131+35.89	25.0 FT	RT	NO. 4	CROSSARM	8'–0"	3'–0"	1.93 CY
3	220/66	BELMONT STREET	121+51.97	25.5 FT	RT	NO. 7	CROSSARM	11'–6"	3'–0"	2.69 CY
4	220/68	BELMONT STREET	120+12.72	25.6 FT	RT	NO. 8	CROSSARM	12'–9"	3'–0"	2.92 CY
5	220/100A	BELMONT STREET	103+17.34	59.62 FT	RT	NO. 4	–	8'–0"	3'–0"	1.93 CY
6	221/8	TRAPELO ROAD	99+37.00	41.50 FT	RT	NO. 5	–	9'–0"	3'–0"	2.19 CY
7	221/32	TRAPELO ROAD	84+52.60	40.0 FT	RT	NO. 4	–	8'–0"	3'–0"	1.93 CY
8	221/54	TRAPELO ROAD	72+10.62	30.0 FT	RT	NO. 5	CROSSARM	9'–0"	3'–0"	2.19 CY
9	221/56	TRAPELO ROAD	71+12.78	30 FT	RT	NO. 5	CROSSARM	9'–0"	3'–0"	2.19 CY
10	221/108	TRAPELO ROAD	41+15.12	30.3 FT	RT	NO. 5	CROSSARM	9'–0"	3'–0"	2.19 CY
11	221/114	TRAPELO ROAD	37+00.09	31.3 FT	RT	NO. 4	–	8'–0"	3'–0"	1.93 CY
12	222/1	TRAPELO ROAD	37+87.40	42.0 FT	RT	NO. 5	–	9'–0"	3'–0"	2.19 CY
13	222/7	CHURCH STREET	2+85.66	28.6 FT	RT	NO. 4	–	8'–0"	3'–0"	1.93 CY
14	222/9	CHURCH STREET	3+18.38	14.2 FT	RT	NO. 4	–	8'–0"	3'–0"	1.93 CY



POLE OFFSET FROM CURB
SCALE: NTS



POLE FOUNDATION DETAIL
SCALE: NTS



POLE RAKE
SCALE: NTS

NOTES:

1. POLES TO CONFORM TO MBTA SPECIFICATION P–22–H. THEY SHALL HAVE A FINISH COAT OF EPOXY PAINT COMPATIBLE WITH THE PRIMER COAT AND APPLIED AT THE FACTORY. COLOR TO CONFORM TO FEDERAL COLOR STANDARD 595A, COLOR 24036, GREEN.
2. POLE HOLES TO BE HAND EXCAVATED. UNSTABLE SOIL TO HAVE STEEL CAISSON INSERTED INTO SOIL AS EXCAVATION PROCEEDS TO KEEP HOLE FROM COLLAPSING.
3. POLE TO BE DIRECTLY EMBEDDED INTO POLE HOLE AND REST AGAINST BARE SOIL. POLE TO BE PROPERLY RAKED AND SUPPORTED THEN CONCRETE TO BE POURED INTO HOLE. CONCRETE TO BE 4,000 PSI–3/8" AGGREGATE.
4. POLE TO BE RAKED OPPOSITE DIRECTION OF PULL. FORCE DIRECTION OF POLE IS INDICATED BY RESULTANT ARROW SHOWN ON LAYOUT DRAWINGS.
5. RAKE TO BE 6 INCHES IN 24 FT UNLESS INDICATED OTHERWISE.
6. POLE WITH RAKE TO BE SUPPORTED DURING CONCRETE POUR AND CURING PROCESS UNTIL CONCRETE IS STABLE.
7. WHERE FOUNDATION CANNOT COMPLETELY FIT DUE TO CURBSTONE, IT MAY BE CLIPPED AS NEEDED. OBTAIN DIRECTION FROM THE ENGINEER.
8. WHERE POLE AND FOUNDATION CANNOT BE MADE TO COINCIDE DUE TO FOUNDATION CLEARANCES, POLE MAY BE OFFSET IN HOLE AS DIRECTED BY THE ENGINEER. MAINTAIN A FOUNDATION EDGE DISTANCE OF 6 INCHES.
9. HEIGHTS FOR ATTACHMENT OF CLAMPS FOR SPAN WIRES ARE SHOWN ON THE LAYOUT DRAWINGS.
10. CROSSARM HEIGHTS VARY AND ARE SHOWN ON DRAWING 231.
11. THE BOTTOM SURFACE OF THE BUTT PIPE SECTION THAT BARES AGAINST SOIL SHALL BE CLEANED TO BARE METAL TO INSURE A GOOD ELECTRICAL EARTH GROUND.
12. LENGTH OF BUTT SECTION BELOW GROUND LINE SHALL CORRESPOND TO THE DEPTH OF THE FOUNDATION SHOWN IN THE POLE INSTALLATION TABLE ON THIS PLAN.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	211	240
PROJ. FILE NO. 604688			

MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)

RELOCATION OF MBTA CATENARY WIRES

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SHEET NO.	DESCRIPTION
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213	OPERATIONAL PARAMETERS
214	TROLLEY BUS DIMENSIONS
215	FEEDER CABLE TENSION INSTALLATION CHART
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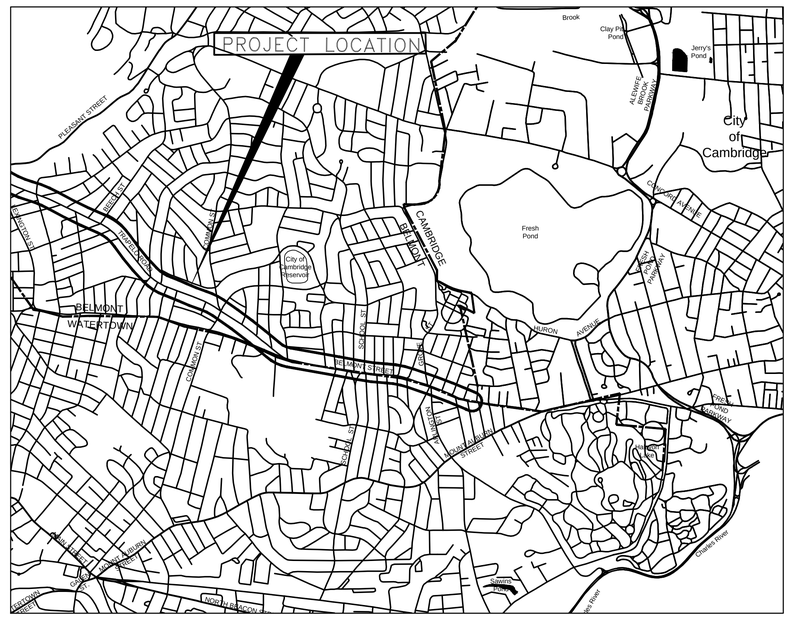
232	CROSSARM MOUNTING HARDWARE



LOCATION MAP

1500 0 1500 3000

SCALE 1" = 1500'

LENGTH OF PROJECT = 12,990.18 FEET = 2.460 MILES

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	212	240
PROJ. FILE NO. 604688			

MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)
SYMBOLS AND GENERAL NOTES

SYMBOLS

- TROLLEY WIRE POSITIVE
- TROLLEY WIRE NEGATIVE
- STEEL POLE
- WOOD POLE
- 2030 / 20.6FT — TENSION (LBS) AND HEIGHT (FT) OF SPAN WIRE FIRST OR TOP IS TENSION, BOTTOM OR SECOND IS HEIGHT
- 2030/20.6FT
- BACK GUY AND ANCHOR
- BULL RING LOCATION
- OVER / UNCONNECTED SPAN WIRES / UNDER
- 13.7° — PULLOVER ANGLE AT EAR
- HANGER AND EAR–RIGID SUSPENSION
- P — PENDULUM HANGER TYPE WITH DIRECTION OF INCLINE
- OLD SPAN WIRE TO BE REMOVED
- CONSTRUCTION SPAN (REMOVE IF NOT REQUIRED)
- BRACKET ARM, SINGLE
- 3/8" GUY WIRE
- SPAN WIRE ABOVE OTHERS NOT CONNECTED
- TRAPEZE SUSPENSION FOR SWITCHES & CROSSINGS
- X10° / U99 — SWITCH ASSEMBLY WITH CROSSING ANGLE AND TYPE
- X30° — CROSSOVER ASSEMBLY
- CONTACT WIRE SPLICE

ABBREVIATIONS

A/R	AS REQUIRED
AWPA	AMERICAN WOOD PRESERVES ASSOCIATION
CWH	CONTACT WIRE HEIGHT
F	FORCE, FAHRENHEIT
IEEE	INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS
MAX	MAXIMUM
N/A	NOT APPLICABLE
P.O.	PULLOVER
RS	RULING SPAN
S	SPAN
SW	SWITCH
T	TENSION
TAN	TANGENT

GENERAL NOTES

1. CONTACT WIRE HEIGHT BETWEEN SPANS TO BE 18'–0" AT MINIMUM TENSION OR WITH 1/2" RADIAL ICE, UNLESS NOTED OTHERWISE.
2. TROLLEY WIRE HEIGHT AT THE SUSPENSION POINT TO BE 18'–6".
3. SPAN WIRE HEIGHTS ON POLES MAY HAVE TO BE ADJUSTED AFTER INSTALLATION TO OBTAIN PROPER CONTACT WIRE HEIGHT.
4. SWITCH ASSEMBLIES, CROSSING ASSEMBLIES, PENDULUM HANGERS AND ALL SUSPENSION CLAMPS TO BE PERPENDICULAR TO ROAD CROWN. MAKE ADJUSTMENTS TO LEVELING AFTER ALL ATTACHMENTS AND TENSIONS ARE COMPLETED.
5. AT VEE SPANS USING A BULL RING, RING TO BE LOCATED 6 FEET OFF THE NEGATIVE CONTACT WIRE UNLESS OTHERWISE INDICATED AS SHOWN ON DRAWING 228.
6. FOR MATERIAL LIST, SEE DRAWING 217. FOR OVERHEAD SUSPENSION ASSEMBLIES, SEE DRAWINGS 228–230.
8. CONTACT WIRE TO BE HALF TENSION ON BENTON SQUARE LOOP AND TO BE FULL TENSION ON TRAPELO ROAD. MAIN LINE TROLLEY WIRE TENSION TO BE PULLED UP TO 4037 lbs. FOR PRE–STRESSING AND THEN TENSIONED ACCORDING TO THE TENSION INSTALLATION CHART SHOWN ON DRAWING 215. CONTACT WIRE FOR BENTON SQUARE LOOP TENSION TO BE PULLED UP TO 3044 lbs AND THEN TENSIONED TO TENSION INSTALLATION CHART SHOWN ON DRAWING 216.
9. FEEDER CABLE TAPS HAVE NOT BEEN SHOWN FOR CLARITY. EXISTING FEEDER TAPS TO REMAIN AT EXISTING LOCATIONS UNLESS FIELD CONDITIONS REQUIRE RELOCATION.
10. WHERE FEEDER CABLES ARE IN CLOSE PROXIMITY TO GROUNDED SURFACES OF LESS THAN 2 FEET, SUCH AS TRAFFIC LIGHT MASTS, INSULATE THE FEEDER CABLES WITH SPLIT CABLE INSULATION.
11. WHERE TROLLEY WIRES ARE IN CLOSE PROXIMITY TO TRAFFIC LIGHTS AND THEIR STRUCTURES, ATTACH CONTACT WIRE TROUGH TO TROLLEY WIRES.
12. TROLLEY WIRE LAYOUT AND SPAN WIRE ARRANGEMENTS ARE PICTORIALLY REPRESENTED ON THE LAYOUT PLANS AND MAY NOT SHOW EXACT FIELD CONDITIONS. THE NEW SPAN WIRE AND CONTACT WIRE ARRANGEMENTS FOR THE BENTON SQUARE LOOP ARE TO BE CONSIDERED ACCURATE.
13. LAYOUT AND DETAIL PLANS ARE FOR MBTA FORCE ACCOUNT INSTALLATION AND INFORMATIONAL FOR THE CONTRACTOR.

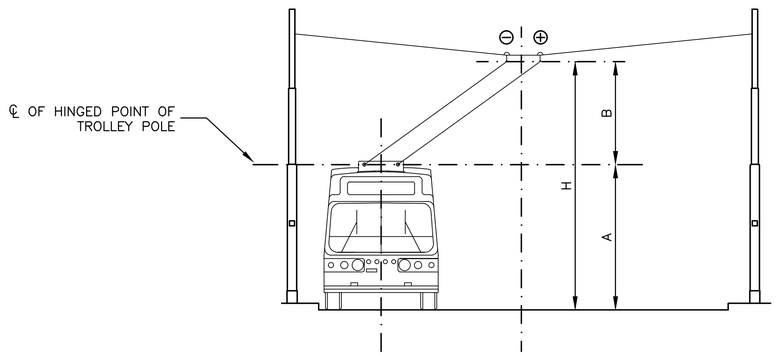
INSTALLATION PROCEDURE

1. MBTA INSTALLATION CREWS MAY HAVE ALTERNATE INSTALLATION PROCEDURES AND THEY HAVE FINAL DETERMINATION ON CONSTRUCTION METHODS.
2. NEW CROSSARMS TO BE COMPLETELY INSTALLED ON NEW POLES BEFORE TRANSFER OF FEEDER CABLES FROM EXISTING POLE. TRANSFER FEEDER CABLES BEFORE TRANSFERRING SPAN WIRES.
3. PLACE POLE CLAMPS ON POLES AT SPECIFIED HEIGHTS AND ATTACH NEW SPAN WIRES. RUN SPAN WIRES OUT TO EXISTING SPANS AND PULL FROM POINT OF FIXATION TO POLE IN A STRAIGHT LINE. ADJUST LOCATIONS OF LINE INSULATORS ON TROLLEY WIRES TO PREVENT SKEWING SO THAT SPAN WIRE IS STRAIGHT IF STRUNG BETWEEN POLES.
4. INSTALLATION PROCEDURE FOR BENTON SQUARE LOOP IS ON LAYOUT SHEET 223 AND 224.
5. WHEN ALL WIRES HAVE BEEN INSTALLED, TERMINATED PROPERLY, AND CLIPPED IN, CHECK CONTACT WIRE ALIGNMENT AND HEIGHT AND MAKE ADJUSTMENTS AS NEEDED.

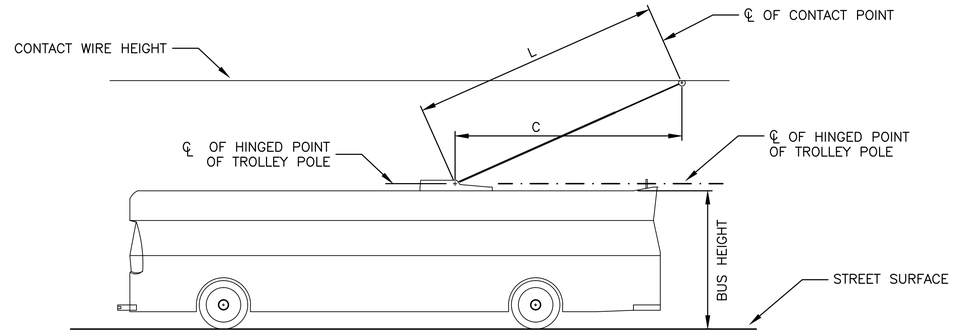
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	213	240
PROJ. FILE NO. 604688			

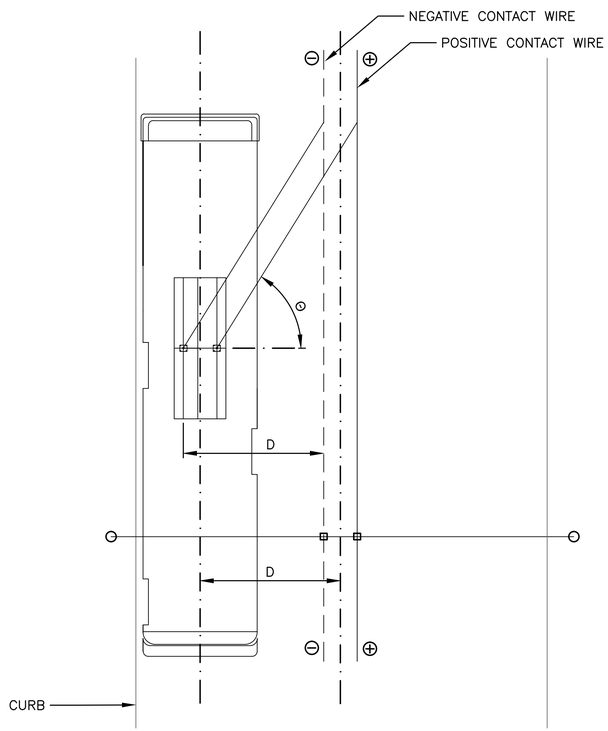
MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)
OPERATIONAL PARAMETERS



FRONT VIEW
SCALE: 1" = 1'–0"



SIDE VIEW
SCALE: 1" = 1'–0"



PLAN VIEW
SCALE: 1" = 1'–0"

A = HEIGHT OF BASE AND MOUNTING TO HINGED POINT OF COLLECTOR POLE

B = VERTICAL DISTANCE FROM HINGED POINT OF COLLECTOR POLE TO CONTACT WIRE LEVEL

C = HORIZONTAL PROJECTION OF COLLECTOR POLE

D = TOURING RANGE

L = DISTANCE FROM HINGE POINT OF COLLECTOR POLE TO CENTER OF COLLECTOR SHOE ALONG THE POLE AXIS

H = A + B = CONTACT WIRE HEIGHT

$$D = (\cos \Theta)\ (C)$$

$$C^2 = L^2 - B^2$$

$$D = \cos \Theta \sqrt{L^2 - B^2}$$

$$B = H - A$$

$$D = \cos \Theta \sqrt{L^2 - (H - A)^2}$$

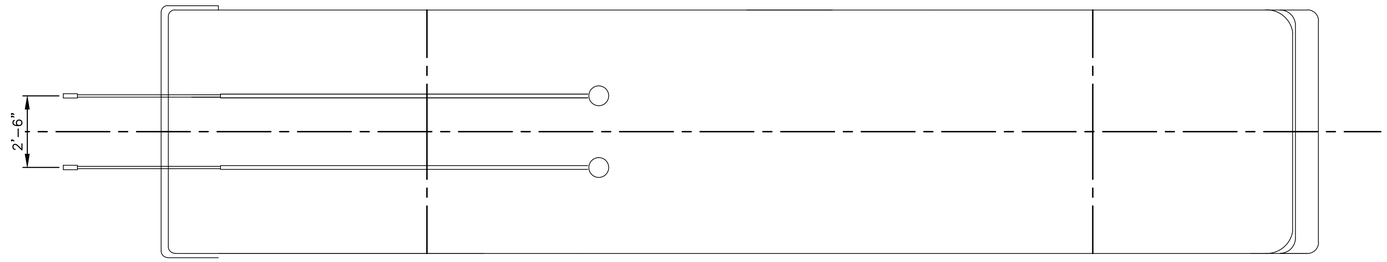
NOTES

1. SEE DRAWING 214 FOR TROLLEY BUS DIMENSIONS.
2. AT A CONTACT WIRE HEIGHT OF 18'–6", NEGATIVE WIRE DISTANCE FROM CURB SHALL BE NO GREATER THAN 14'–0".

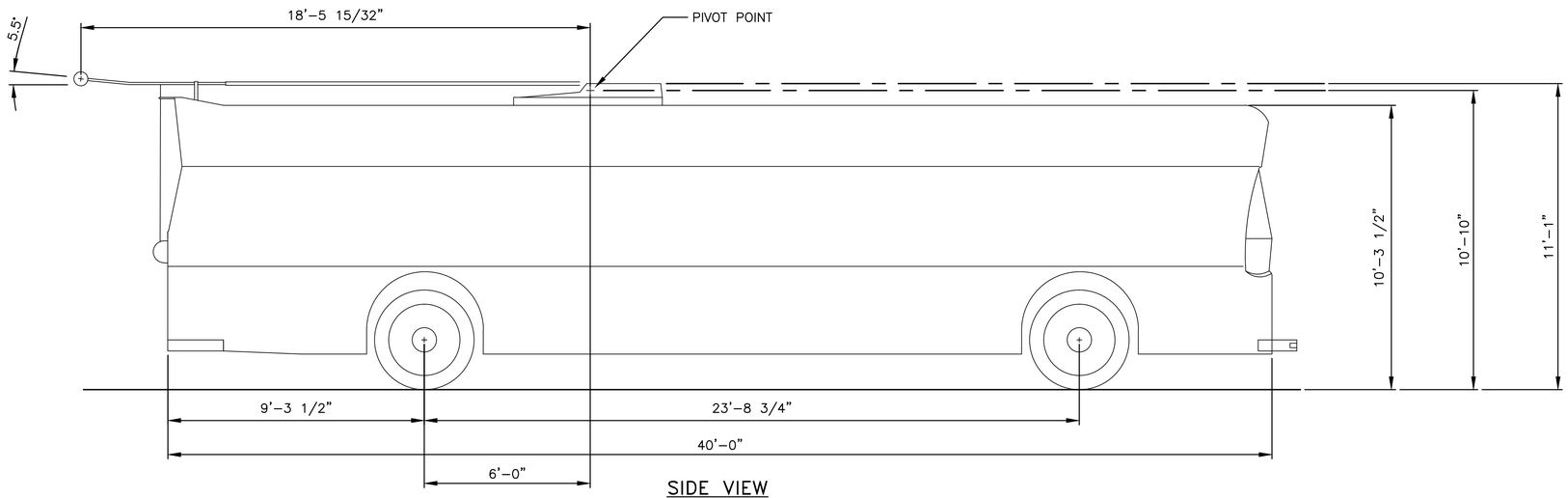
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	214	240
PROJ. FILE NO. 604688			

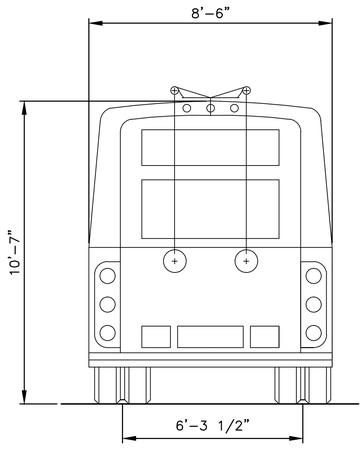
MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)
TROLLEY BUS DIMENSIONS



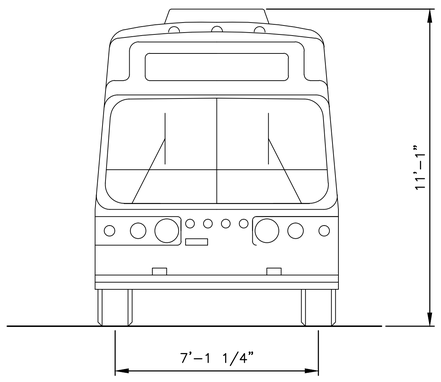
LAYOUT VIEW
SCALE: 1" = 1'-0"



SIDE VIEW
SCALE: 1" = 1'-0"



VIEW FROM BACK
SCALE: 1" = 1'-0"



VIEW FROM FRONT
SCALE: 1" = 1'-0"

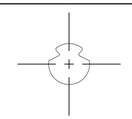
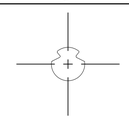
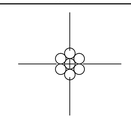
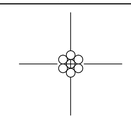
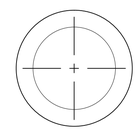
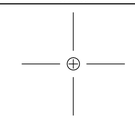
NOTES

1. SEE DRAWING 230 FOR OPERATIONAL PARAMETERS
2. DIMENSIONS SHOWN ARE FOR REFERENCE ONLY.

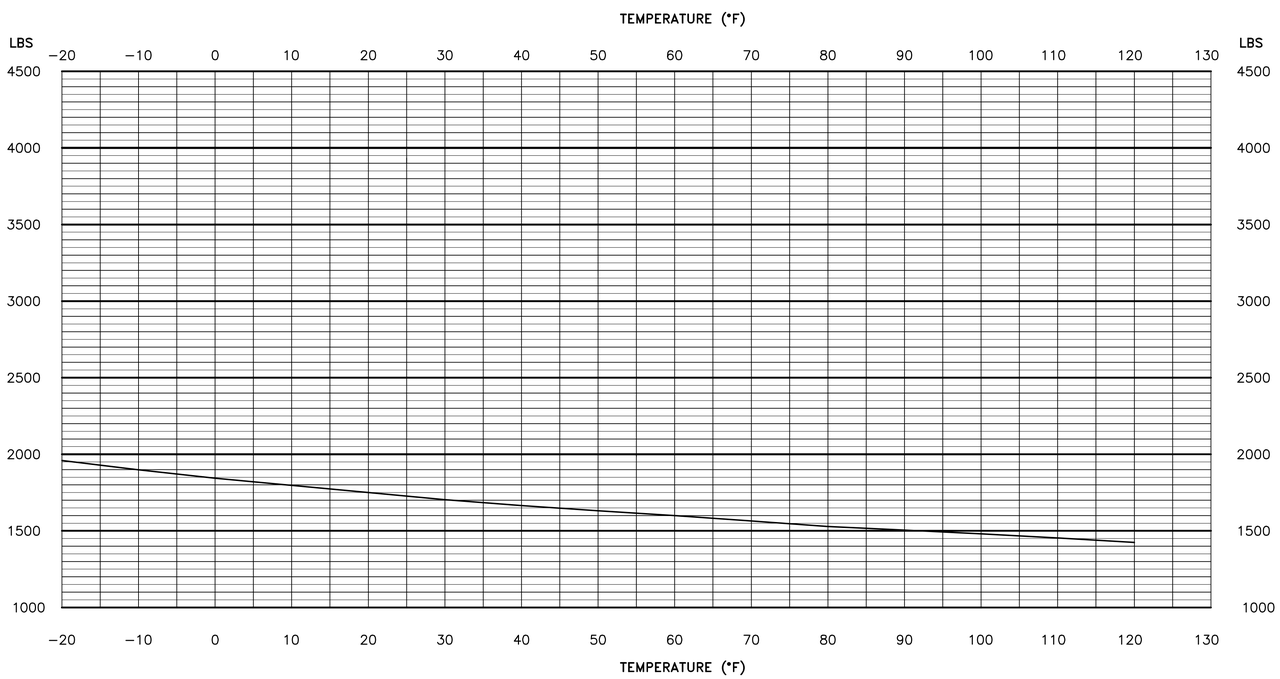
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	215	240
PROJ. FILE NO. 604688			

MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)
FEEDER CABLE INSTALLATION TENSION CHART

CONDUCTOR PARTICULAR	CONTACT WIRE	CONTACT WIRE	SPAN WIRE	SPAN WIRE	FEEDER CABLE	HANGER WIRE
SIZE	4/0	2/0	3/8	5/16	1000 KCMIL POS	4 mm (0.157 in)
MATERIAL	COPPER–CADMIUM (80)	COPPER–CADMIUM (80)	GALV STEEL	GALV STEEL	COPPER. INSUL	STAINLESS STEEL
MAKE–UP	SOLID GROOVED TROLLEY WIRE	SOLID GROOVED TROLLEY WIRE	7 WIRE STRAND	7 WIRE STRAND	61 STRAND ANNEALED	SOLID
TYPE	––	––	GRADE UTILITIES	GRADE UTILITIES	MBTA SPEC. PXX	HANGER WIRE
STRAND DIAMETER – IN	N/A	N/A	0.120	0.104	0.1281	0.157
OVERALL DIAMETER – IN	0.482	0.392	0.375	0.3125	1.625	0.157
CROSS SECTION AREA–IN^2	0.1665	0.1083	0.0792	0.0653	0.7854	0.019
ASTM	B9–90	B9–90	A475	A475	B8 & B33	MIL–W–83420
INSULATION	NONE	NONE	NONE	NONE	EPR	NONE
WEIGHT–lb/FT(NO ICE)	0.641	0.417	0.273	0.205	3.674	0.022
BREAKING LOAD – lb	10,820	7,473	11,500	6,000	21,910	2,247
MODULUS OF ELASTICITY PSI	17 (10)^6	17 (10)^6	28.5 X 10^6	28.5 X 10^6	17 X 10^6	28.0 X 10^{-6}
THERMAL COEFFICIENT–°F	9.4 x 10^{-6}	9.4 x 10^{-6}	6.22 X 10^{-6}	6.22 X 10^{-6}	9.4 x 10^{-6}	9.6 X 10^{-6}
NORMAL TENSION–lb 60°F NO WIND	2000 (MAIN LINE) 1200 (LOOP)	2134 (MAIN LINE)	N/A	N/A	1599	N/A
RADIAL ICE–IN WEIGHT–lb/FT (1/2" RAD ICE)	0.5 1.241	0.5 1.241	0.5 0.787	0.5 0.781	0.5 6.424	0.5/ 0.431
TYPICAL SECTION						

CONDUCTOR PARTICULARS



FEEDER CABLE INSTALLATION CHART

100' RULING SPAN

(1000 KCMIL INSULATED COPPER CABLE)

FEEDER CABLE TENSION INSTALLATION CHART	
	RS = 100 FT
TEMP. °F	FEEDER CABLE TENSION (LB)
–20	1953.2
–15	1924.1
–10	1896.3
–5	1869.6
0	1843.9
5	1819.3
10	1795.5
15	1772.7
20	1750.6
25	1729.41
30	1708.8
35	1689.0
40	1669.8
45	1651.2
50	1633.3
55	1615.8
60	1599.0
65	1582.6
70	1566.7
75	1551.2
80	1536.2
85	1521.6
90	1507.5
95	1493.6
100	1480.2
110	1454.3
115	1441.9
120	1429.8

INSTALLATION TENSION ASSUMED TO BE 1599 LBS @ 60° F

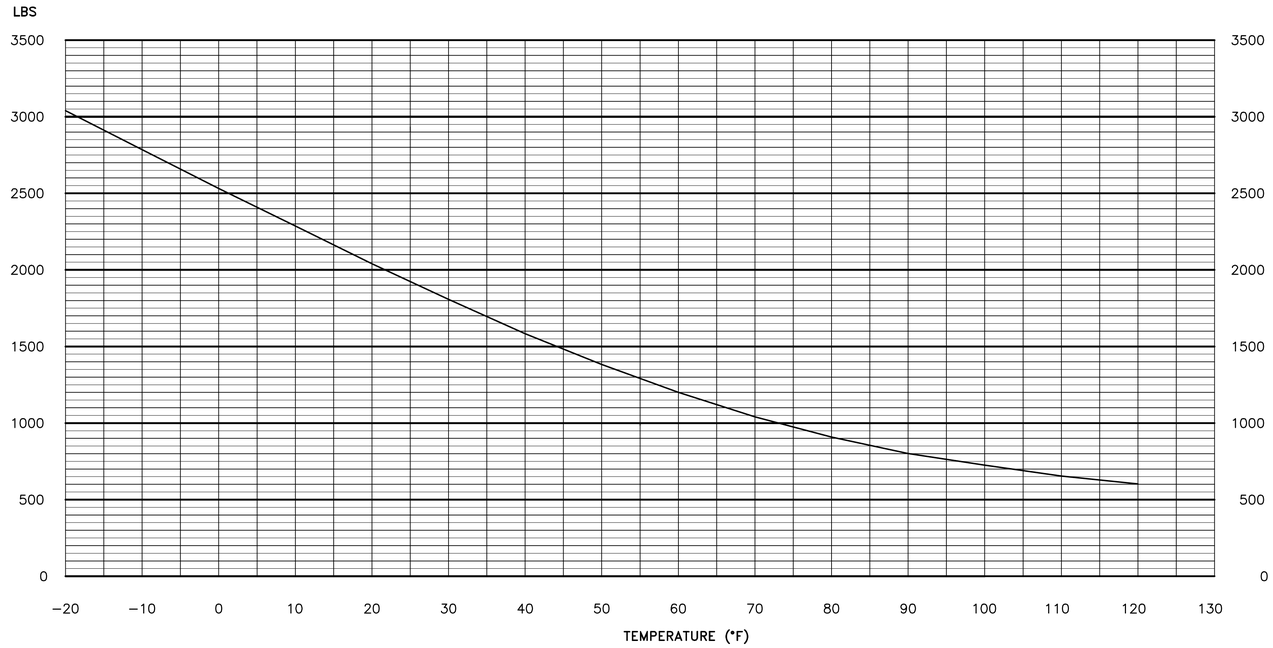
NOTES:

1. TENSION CHARTS INDICATE FEEDER CABLE TENSION WITH NO WIND OR ICE AND ARE FOR WIRE STRINGING REFERENCE.

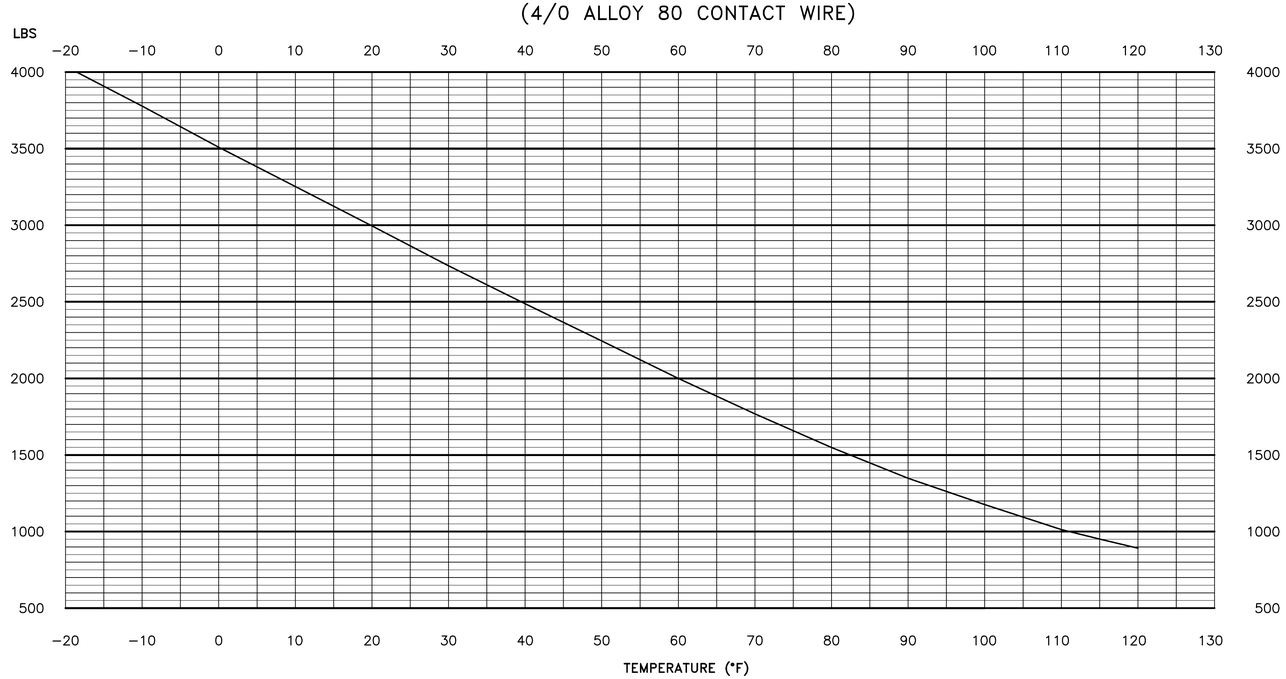
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	216	240
PROJ. FILE NO. 604688			

MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)
CONTACT WIRE INSTALLATION CHART



LOOP TROLLEY WIRE INSTALLATION CHART
100' RULING SPAN
(4/0 ALLOY 80 CONTACT WIRE)



MAIN LINE TROLLEY WIRE INSTALLATION CHART
100' RULING SPAN
(4/0 ALLOY 80 BRONZE CONTACT WIRE)

TENSION INSTALLATION CHART

	RS = 100 FT	
TEMP. °F	LOOP TROLLEY TENSION (LB)	MAIN TROLLEY TENSION (LB)
−20	3044.3	4037.1
−15	2915.9	3906.1
−10	2788.2	3775.3
−5	2661.3	3644.7
0	2535.2	3514.4
5	2410.2	3384.5
10	2286.5	3254.9
15	2164.2	3125.7
20	2043.77	2997.0
25	1925.4	2868.9
30	1809.6	2741.38
35	1696.9	2614.8
40	1587.8	2489.2
45	1482.9	2364.6
50	1382.9	2241.3
55	1288.4	2119.7
60	1200.0	2000.0
65	1118.0	1882.5
70	1042.9	1767.8
75	974.5	1656.3
80	912.8	1548.7
85	857.4	1445.5
90	807.8	1347.5
95	763.5	1255.1
100	723.9	1169.1
110	656.7	1017.02
115	628.17	951.1
120	602.4	891.7

INSTALLATION TENSION ASSUMED TO BE 1200 LBS FOR BENTON LOOP AND 2000 LBS FOR THE MAIN LINE @ 60° F

NOTES:

1. ALL NEW CONTACT WIRE IN BENTON SQUARE LOOP IS TO BE HALF TENSION AS SHOWN.
2. TENSION CHARTS INDICATE CONTACT WIRE TENSION WITH NO WIND OR ICE AND ARE FOR WIRE STRINGING REFERENCE.
3. MAIN LINE 4/0 CONTACT WIRE TO BE SPLICED TO EXISTING 2/0 CONTACT WIRE.

TRAPELO ROAD RECONSTRUCTION – MATERIAL LIST

ITEM	QTY	UNIT	DESCRIPTION	SUPPLIER	REFERENCE
1	2405	FT	WIRE, CONTACT, 4/0 GROOVED ALLOY 80	---	MBTA SPEC P–102B
2	4910	FT	WIRE, SPAN, 5/16" GUY	---	MBTA SPEC P–108B
3	350	FT	WIRE, SPAN, 3/8" GUY	---	MBTA SPEC P–108B
4	168	EA	STRANDVISE, 5/16", UNIVERSAL GRADE (SHORT BAIL)	MACLEAN	5201
5	135	EA	STRANDVISE, 5/16", UNIVERSAL GRADE (LONG BAIL)	MACLEAN	5251
6	2	EA	STRANDVISE, 3/8", UNIVERSAL GRADE (SHORT BAIL)	MACLEAN	5202
7	4	EA	STRANDVISE, 3/8", UNIVERSAL GRADE (LONG BAIL)	MACLEAN	5252
8	25	EA	PREFORMED END FITTING, 5/16"	PREFORMED LINE PRODUCTS	GDE–2106
9	6	EA	PREFORMED END FITTING, 3/8"	PREFORMED LINE PRODUCTS	GDE–2107
10	25	EA	THIMBLE, 5/16", OPEN PATTERN	CROSBY GROUP	1037559
11	12	EA	THIMBLE, 3/8", OPEN PATTERN	CROSBY GROUP	1037577
12	A/R	EA	CLAMP, POLE, SPLIT, NO. 2	---	MBTA DWG C–17068–A
13	A/R	EA	CLAMP, POLE, SPLIT, NO. 3	---	MBTA DWG C–17068–A
14	4	EA	CLAMP, POLE, SPLIT, NO. 4	---	MBTA DWG C–17068–A
15	12	EA	CLAMP, POLE, SPLIT, NO. 5	---	MBTA DWG C–17068–A
16	5	EA	CLAMP, POLE, SPLIT, NO. 7	---	MBTA DWG C–17068–A
17	A/R	EA	CLAMP, POLE, MULTIPLE, NO. 2	---	MBTA DWG C–17068–A
18	5	EA	CLAMP, POLE, MULTIPLE, NO. 4	---	MBTA DWG C–17068–A
18	3	EA	CLAMP, POLE, MULTIPLE, NO. 5	---	MBTA DWG C–17068–A
19	1	EA	CLAMP, POLE, MULTIPLE, NO. 7	---	MBTA DWG C–17068–A
20	1	EA	CROSSARM, WOOD TYPE N, 4 FT LONG	---	---
21	8	EA	CROSSARM, WOOD TYPE Q, 6 FT LONG	---	---
22	6	EA	CROSSARM, WOOD TYPE QA, 8 FT LONG	---	---
23	12	EA	BRACE, CROSSARM, SPECIAL TWISTED	---	MBTA DWG L–12807A
24	2	EA	BRACE, CROSSARM, FLAT	---	---
25	38	EA	PIN FOR INSULATOR	A.B. CHANCE	4326
26	38	EA	INSULATOR, PIN	HENDRICKS	HPI–25–02
27*	6	EA	POLE, NO. 4	---	MBTA SPEC P–22H
28*	8	EA	POLE, NO. 5	---	MBTA SPEC P–22H
29*	1	EA	POLE, NO. 7	---	MBTA SPEC P–22H
29A*	1	EA	POLE, NO. 8	---	MBTA SPEC P–22H
30	30	EA	RING, ELONGATED, 3/8", G–341	CROSBY GROUP	1013897
31	8	EA	STRANDLINK, 5/16", UNIVERSAL GRADE	MACLEAN	5041
32	2	EA	STRANDLINK, 3/8", UNIVERSAL GRADE	MACLEAN	5042
33	22	EA	BOLT, DOUBLE ARM, 3/4" X 18"	MACLEAN	J8888
34	12	EA	SCREW, LAG, SG HD, 5/8" X 3"	---	---
35	88	EA	WASHER, SQUARE, FOR 3/4" BOLT, 3" X 3"X 3/16"	MACLEAN	J1078
36	2	EA	WASHER, SQUARE, FOR 5/8" BOLT, 2–1/4" X 2–1/4" X 3/16"	MACLEAN	J1075
37	88	EA	NUT. SQUARE, 3/4–10	MACLEAN	J8564
38	2	EA	NUT, HEX, 5/8–11	MACLEAN	J8563
39	1450'	EA	WIRE, TIE, NO. 6 COPPER INSULATED FOR PIN INSULATORS	---	---
40	4	EA	PIPE, SPREADING, 762MM	K+M	E0114–06
41	8	EA	INSULATOR, LINE, TYPE G1	K+M	C1670–01
42	24	EA	HANGER WIRE, 4MM ø, 950MM LONG	K+M	D1340–06
43	24	EA	THIMBLE FOR HANGER WIRE, SYNTHETIC	K+M	D0719–01
44	1	EA	STRAP, POLE ARM	---	MBTA DWG A–2954
45	68	EA	INSULATOR, PORCELAIN, TYPE JB	MACLEAN	L502
46	12	EA	PENDULUM HANGER, TANGENT	K+M	101750
47	14	EA	PENDULUM HANGER, CURVE–3–5° WITH CURVE RAIL TYPE 0	K+M	101751
48	4	EA	PENDULUM HANGER, CURVE–5.5–7.5° WITH CURVE RAIL TYPE 1	K+M	101752
49	4	EA	PENDULUM HANGER, CURVE–8–10° WITH CURVE RAIL TYPE 2	K+M	101753
50	0	EA	PENDULUM HANGER, CURVE–10.5–14° WITH CURVE RAIL TYPE 3	K+M	101754
51	8	EA	PENDULUM HANGER, CURVE–14.5–30° WITH CURVE RAIL TYPE 4	K+M	101755
52	1	EA	SWITCH, CUT–IN, U99 MECHANICAL, 10°–RH, 762MM WIRE SPACING	K+M	102433
53	1	EA	CROSSING ETB–ETB CUT–IN RIGID–30° 762MM WIRE SPACING	K+M	100780
54	8	EA	SPLICE, CONTACT WIRE, 2/0 TO 4/0	K+M	C0944–01
55	2	EA	ARC BLOWER, FOR CUT–IN SWITCHES AND CROSSINGS	K+M	C1635–01
56	1	EA	FLYING PULLOFF, 14.5 30° WITH CURVE RAIL TYPE 4	K+M	100093
57	4	EA	SPLICE, CONTACT WIRE, 4/0 TO 4/0	K+M	D2700–02
58	4	EA	SPLICE, CONTACT WIRE, 2/0 TO 4/0	K+M	C0994–01
59*	32.15	CY	CONCRETE, 4,000 PSI–3/8" AGGREGATE, TYPE 2	---	---

*SUPPLIED BY CONTRACTOR

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	217	240
PROJ. FILE NO. 604688			

MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)
BILL OF MATERIAL

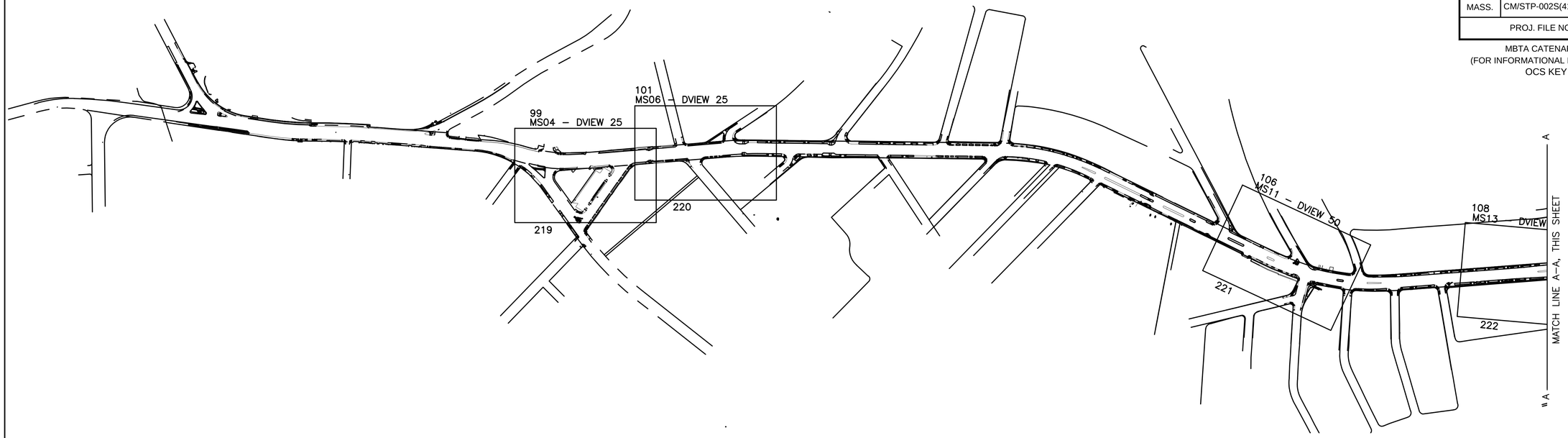
NOTES:

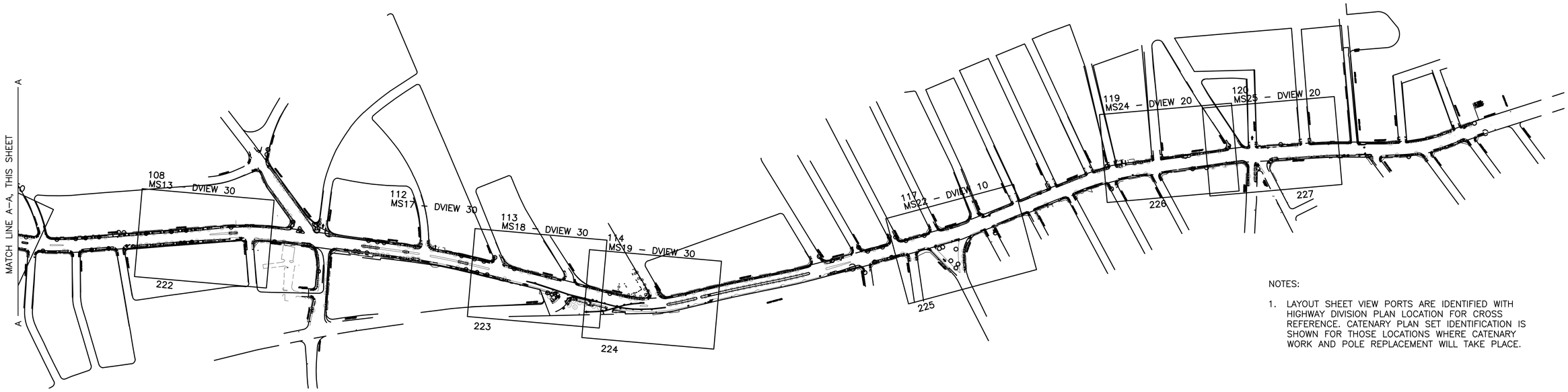
1. ITEMS SHOWN WITH NO QUANTITIES ARE REFERENCE ITEMS.
2. ITEMS 27, 28, 29, 29A AND 59 ARE PURCHASED BY THE CONTRACTOR AND ARE SHOWN FOR REFERENCE.
3. MATERIAL SHALL BE AS SHOWN OR APPROVED EQUAL.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	218	240
PROJ. FILE NO. 604688			

MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)
OCS KEY PLAN





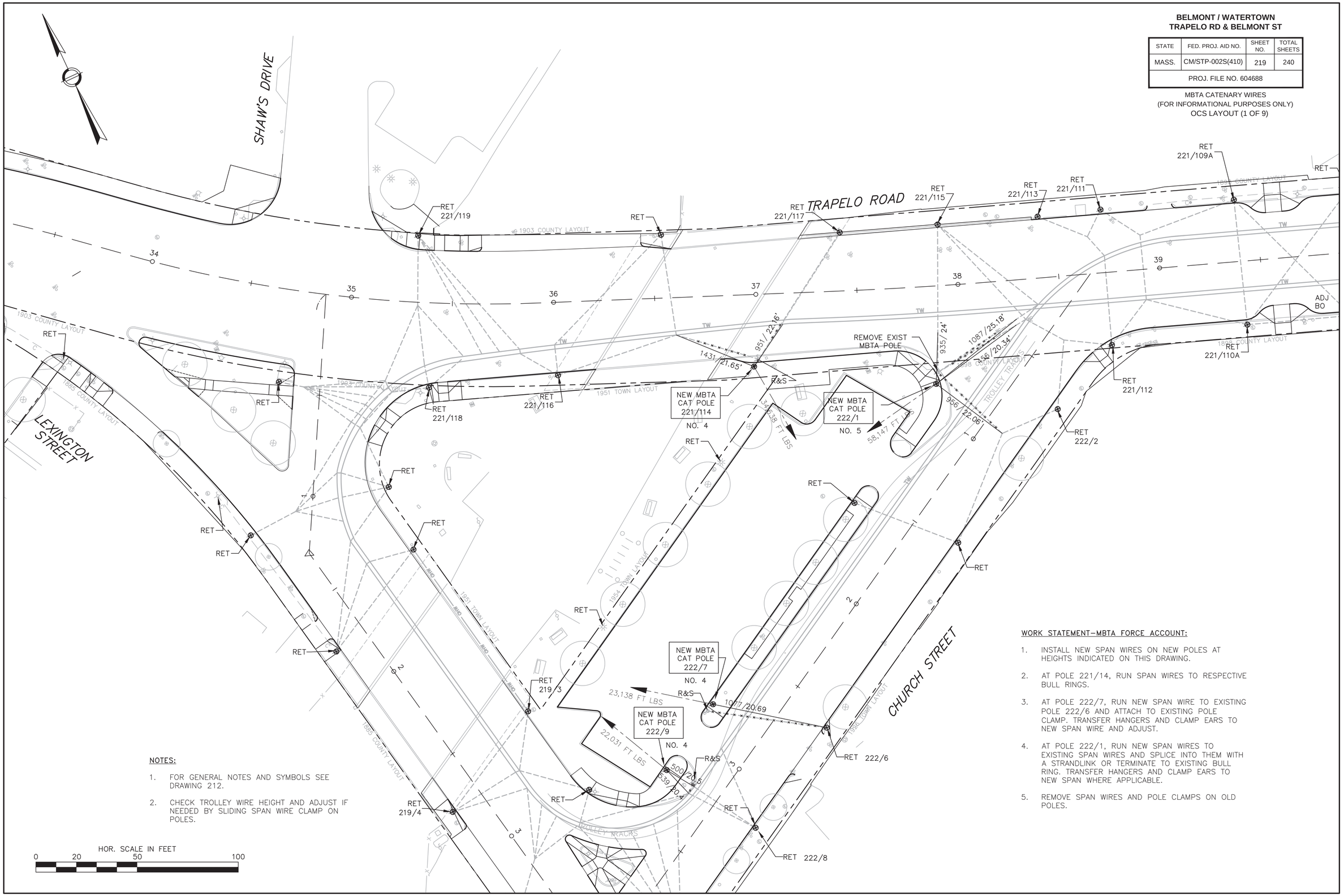
NOTES:

1. LAYOUT SHEET VIEW PORTS ARE IDENTIFIED WITH HIGHWAY DIVISION PLAN LOCATION FOR CROSS REFERENCE. CATENARY PLAN SET IDENTIFICATION IS SHOWN FOR THOSE LOCATIONS WHERE CATENARY WORK AND POLE REPLACEMENT WILL TAKE PLACE.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	219	240
PROJ. FILE NO. 604688			

MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)
OCS LAYOUT (1 OF 9)



NOTES:

1. FOR GENERAL NOTES AND SYMBOLS SEE DRAWING 212.
2. CHECK TROLLEY WIRE HEIGHT AND ADJUST IF NEEDED BY SLIDING SPAN WIRE CLAMP ON POLES.

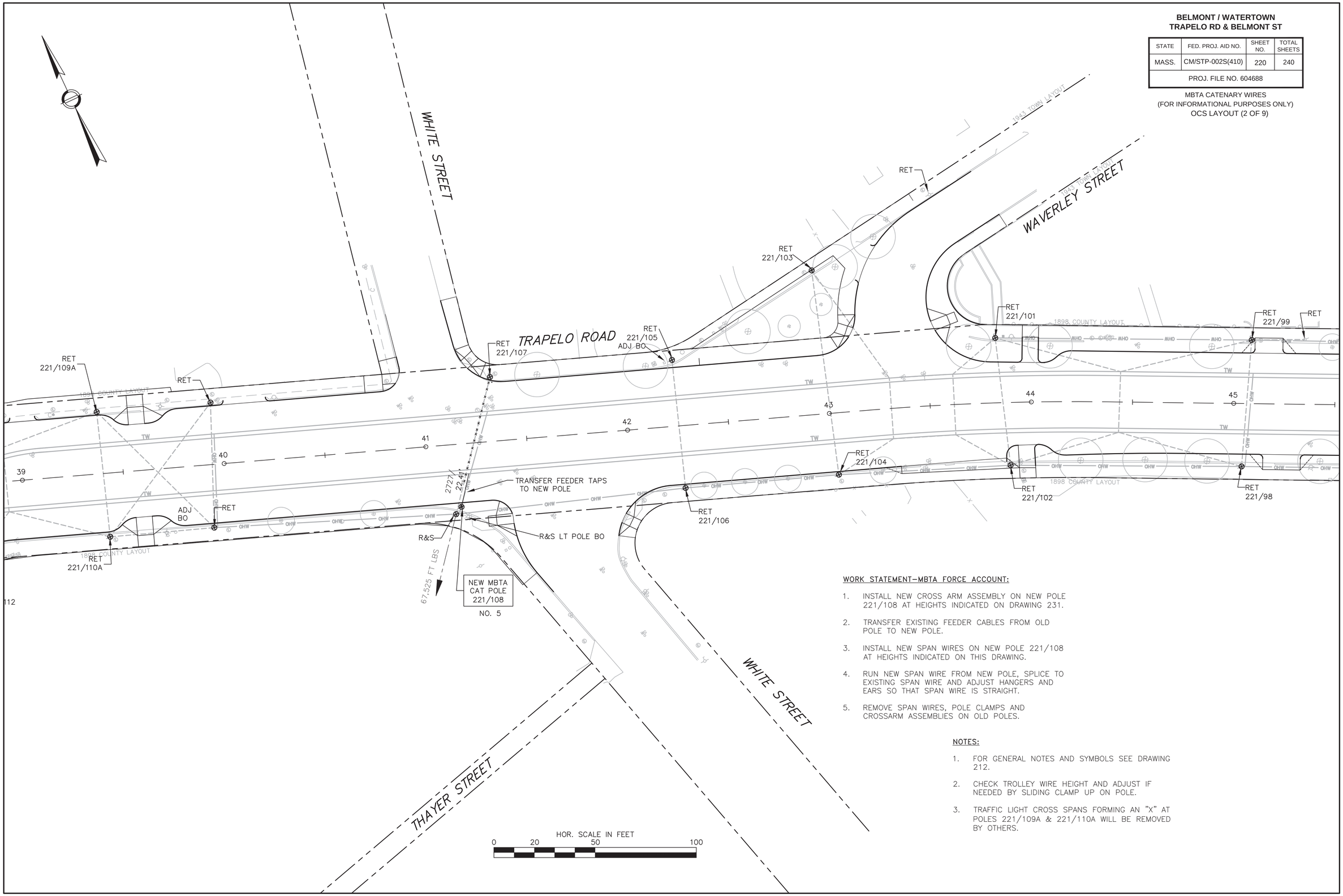
WORK STATEMENT–MBTA FORCE ACCOUNT:

1. INSTALL NEW SPAN WIRES ON NEW POLES AT HEIGHTS INDICATED ON THIS DRAWING.
2. AT POLE 221/14, RUN SPAN WIRES TO RESPECTIVE BULL RINGS.
3. AT POLE 222/7, RUN NEW SPAN WIRE TO EXISTING POLE 222/6 AND ATTACH TO EXISTING POLE CLAMP. TRANSFER HANGERS AND CLAMP EARS TO NEW SPAN WIRE AND ADJUST.
4. AT POLE 222/1, RUN NEW SPAN WIRES TO EXISTING SPAN WIRES AND SPLICE INTO THEM WITH A STRANDLINK OR TERMINATE TO EXISTING BULL RING. TRANSFER HANGERS AND CLAMP EARS TO NEW SPAN WHERE APPLICABLE.
5. REMOVE SPAN WIRES AND POLE CLAMPS ON OLD POLES.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	220	240
PROJ. FILE NO. 604688			

MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)
OCS LAYOUT (2 OF 9)



WORK STATEMENT–MBTA FORCE ACCOUNT:

1. INSTALL NEW CROSS ARM ASSEMBLY ON NEW POLE 221/108 AT HEIGHTS INDICATED ON DRAWING 231.
2. TRANSFER EXISTING FEEDER CABLES FROM OLD POLE TO NEW POLE.
3. INSTALL NEW SPAN WIRES ON NEW POLE 221/108 AT HEIGHTS INDICATED ON THIS DRAWING.
4. RUN NEW SPAN WIRE FROM NEW POLE, SPLICE TO EXISTING SPAN WIRE AND ADJUST HANGERS AND EARS SO THAT SPAN WIRE IS STRAIGHT.
5. REMOVE SPAN WIRES, POLE CLAMPS AND CROSSARM ASSEMBLIES ON OLD POLES.

NOTES:

1. FOR GENERAL NOTES AND SYMBOLS SEE DRAWING 212.
2. CHECK TROLLEY WIRE HEIGHT AND ADJUST IF NEEDED BY SLIDING CLAMP UP ON POLE.
3. TRAFFIC LIGHT CROSS SPANS FORMING AN "X" AT POLES 221/109A & 221/110A WILL BE REMOVED BY OTHERS.

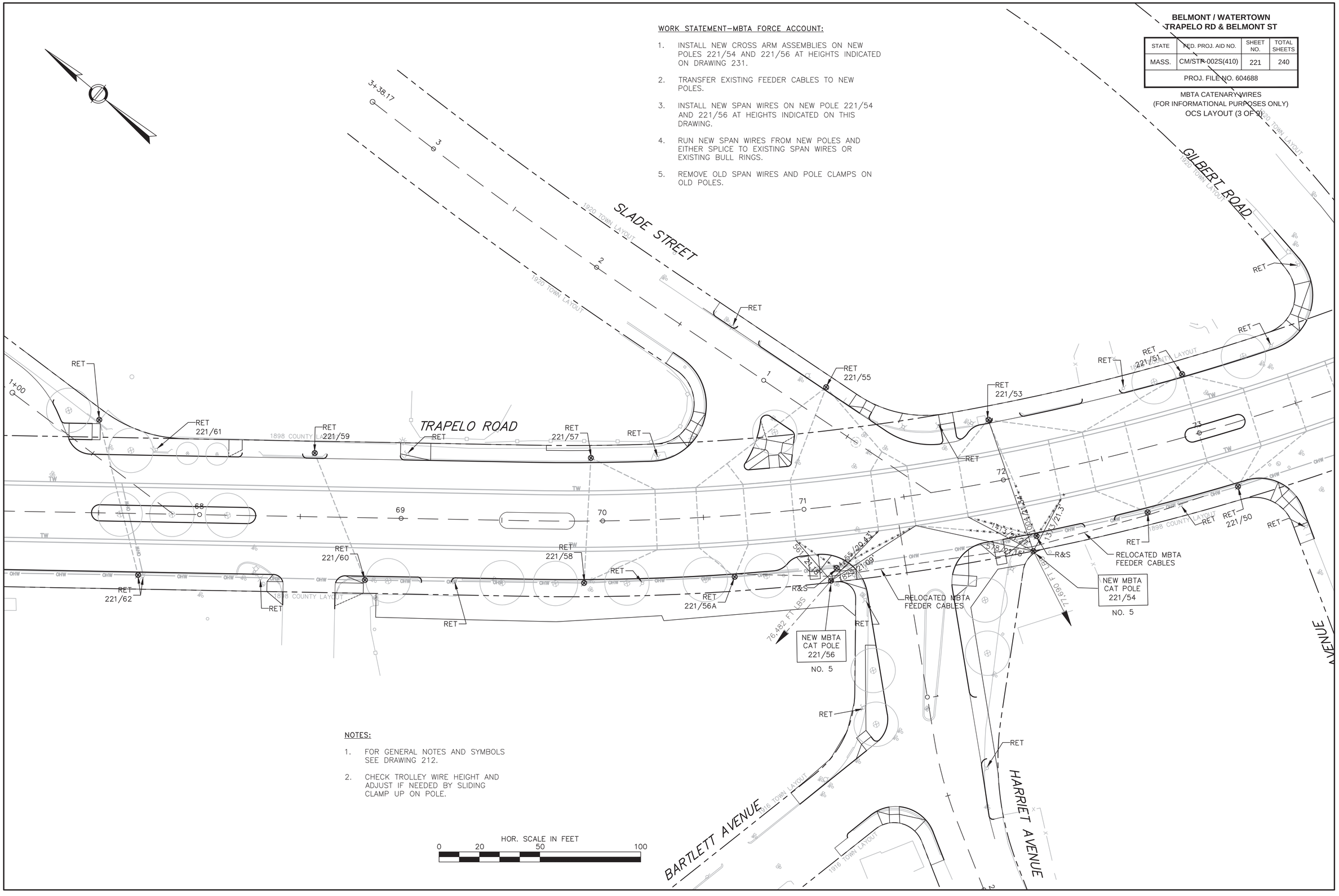
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STR-002S(410)	221	240
PROJ. FILE NO. 604688			

MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)
OCS LAYOUT (3 OF 9)

WORK STATEMENT–MBTA FORCE ACCOUNT:

1. INSTALL NEW CROSS ARM ASSEMBLIES ON NEW POLES 221/54 AND 221/56 AT HEIGHTS INDICATED ON DRAWING 231.
2. TRANSFER EXISTING FEEDER CABLES TO NEW POLES.
3. INSTALL NEW SPAN WIRES ON NEW POLE 221/54 AND 221/56 AT HEIGHTS INDICATED ON THIS DRAWING.
4. RUN NEW SPAN WIRES FROM NEW POLES AND EITHER SPLICE TO EXISTING SPAN WIRES OR EXISTING BULL RINGS.
5. REMOVE OLD SPAN WIRES AND POLE CLAMPS ON OLD POLES.



NOTES:

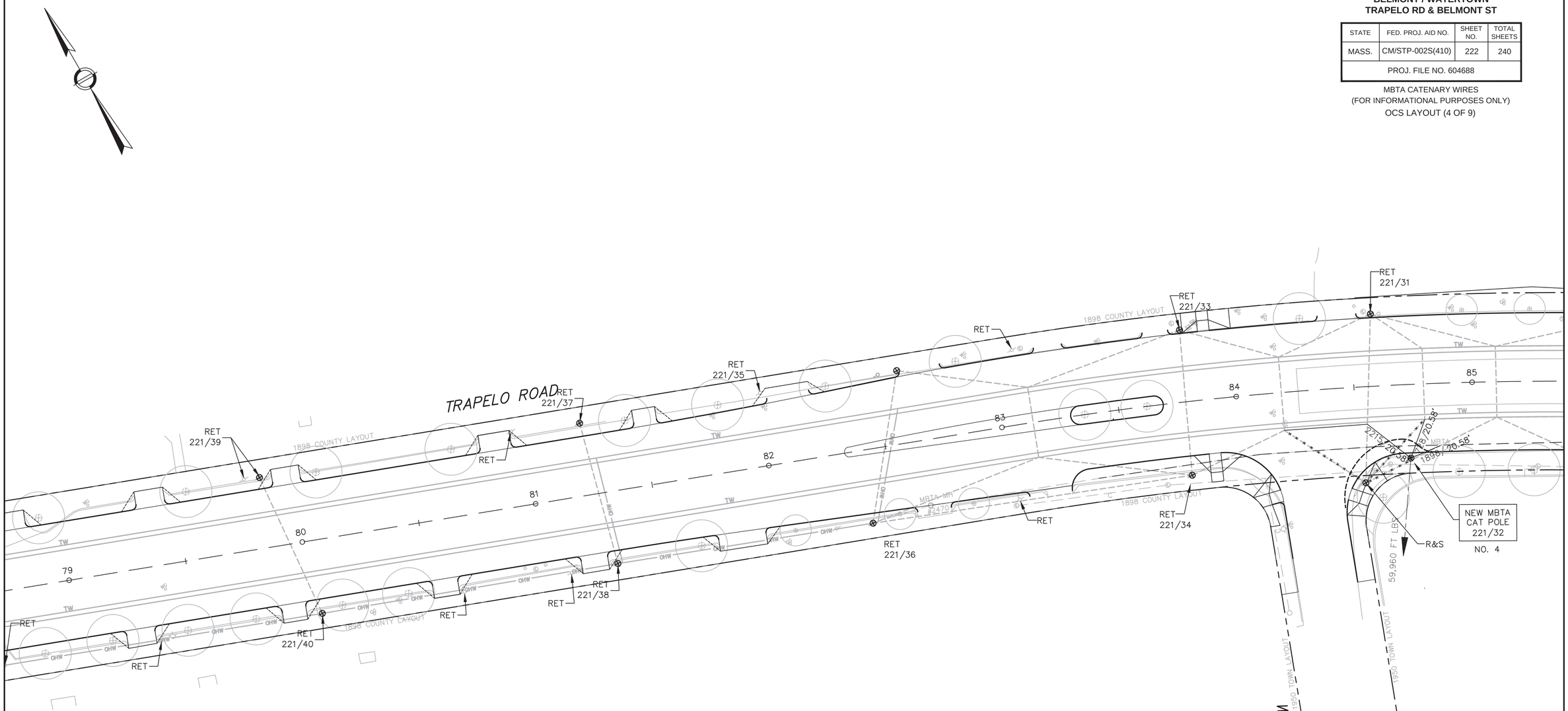
1. FOR GENERAL NOTES AND SYMBOLS SEE DRAWING 212.
2. CHECK TROLLEY WIRE HEIGHT AND ADJUST IF NEEDED BY SLIDING CLAMP UP ON POLE.

HOR. SCALE IN FEET
0 20 50 100

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	222	240
PROJ. FILE NO. 604688			

MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)
OCS LAYOUT (4 OF 9)



WORK STATEMENT–MBTA FORCE ACCOUNT:

1. INSTALL NEW SPAN WIRES ON NEW POLE 221/32 AT HEIGHTS INDICATED ON THE DRAWING.
2. RUN NEW SPAN WIRES FROM NEW POLE AND EITHER SPLICE TO EXISTING SPAN WIRES OR TERMINATE IN EXISTING BULL RINGS.
3. REMOVE OLD SPAN WIRES AND POLE CLAMPS ON OLD POLE.

NOTES:

1. FOR GENERAL NOTES AND SYMBOLS SEE DRAWING 212.
2. CHECK TROLLEY WIRE HEIGHT AND ADJUST IF NEEDED BY SLIDING CLAMP UP ON POLE.

HOR. SCALE IN FEET
0 20 50 100

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	223	240
PROJ. FILE NO. 604688			

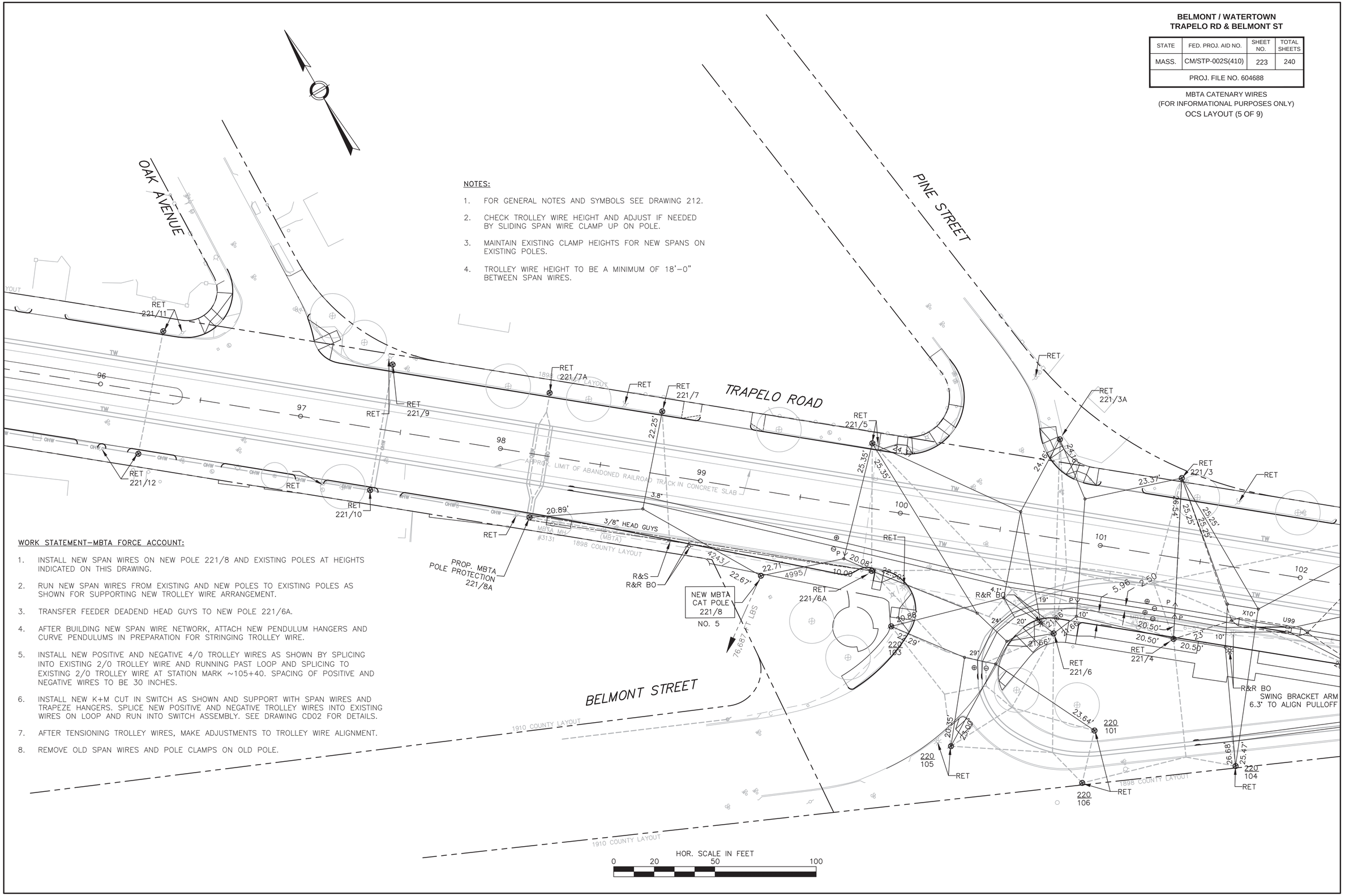
MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)
OCS LAYOUT (5 OF 9)

NOTES:

1. FOR GENERAL NOTES AND SYMBOLS SEE DRAWING 212.
2. CHECK TROLLEY WIRE HEIGHT AND ADJUST IF NEEDED BY SLIDING SPAN WIRE CLAMP UP ON POLE.
3. MAINTAIN EXISTING CLAMP HEIGHTS FOR NEW SPANS ON EXISTING POLES.
4. TROLLEY WIRE HEIGHT TO BE A MINIMUM OF 18'–0" BETWEEN SPAN WIRES.

WORK STATEMENT–MBTA FORCE ACCOUNT:

1. INSTALL NEW SPAN WIRES ON NEW POLE 221/8 AND EXISTING POLES AT HEIGHTS INDICATED ON THIS DRAWING.
2. RUN NEW SPAN WIRES FROM EXISTING AND NEW POLES TO EXISTING POLES AS SHOWN FOR SUPPORTING NEW TROLLEY WIRE ARRANGEMENT.
3. TRANSFER FEEDER DEADEND HEAD GUYS TO NEW POLE 221/6A.
4. AFTER BUILDING NEW SPAN WIRE NETWORK, ATTACH NEW PENDULUM HANGERS AND CURVE PENDULUMS IN PREPARATION FOR STRINGING TROLLEY WIRE.
5. INSTALL NEW POSITIVE AND NEGATIVE 4/0 TROLLEY WIRES AS SHOWN BY SPLICING INTO EXISTING 2/0 TROLLEY WIRE AND RUNNING PAST LOOP AND SPLICING TO EXISTING 2/0 TROLLEY WIRE AT STATION MARK ~105+40. SPACING OF POSITIVE AND NEGATIVE WIRES TO BE 30 INCHES.
6. INSTALL NEW K+M CUT IN SWITCH AS SHOWN AND SUPPORT WITH SPAN WIRES AND TRAPEZE HANGERS. SPLICE NEW POSITIVE AND NEGATIVE TROLLEY WIRES INTO EXISTING WIRES ON LOOP AND RUN INTO SWITCH ASSEMBLY. SEE DRAWING CD02 FOR DETAILS.
7. AFTER TENSIONING TROLLEY WIRES, MAKE ADJUSTMENTS TO TROLLEY WIRE ALIGNMENT.
8. REMOVE OLD SPAN WIRES AND POLE CLAMPS ON OLD POLE.

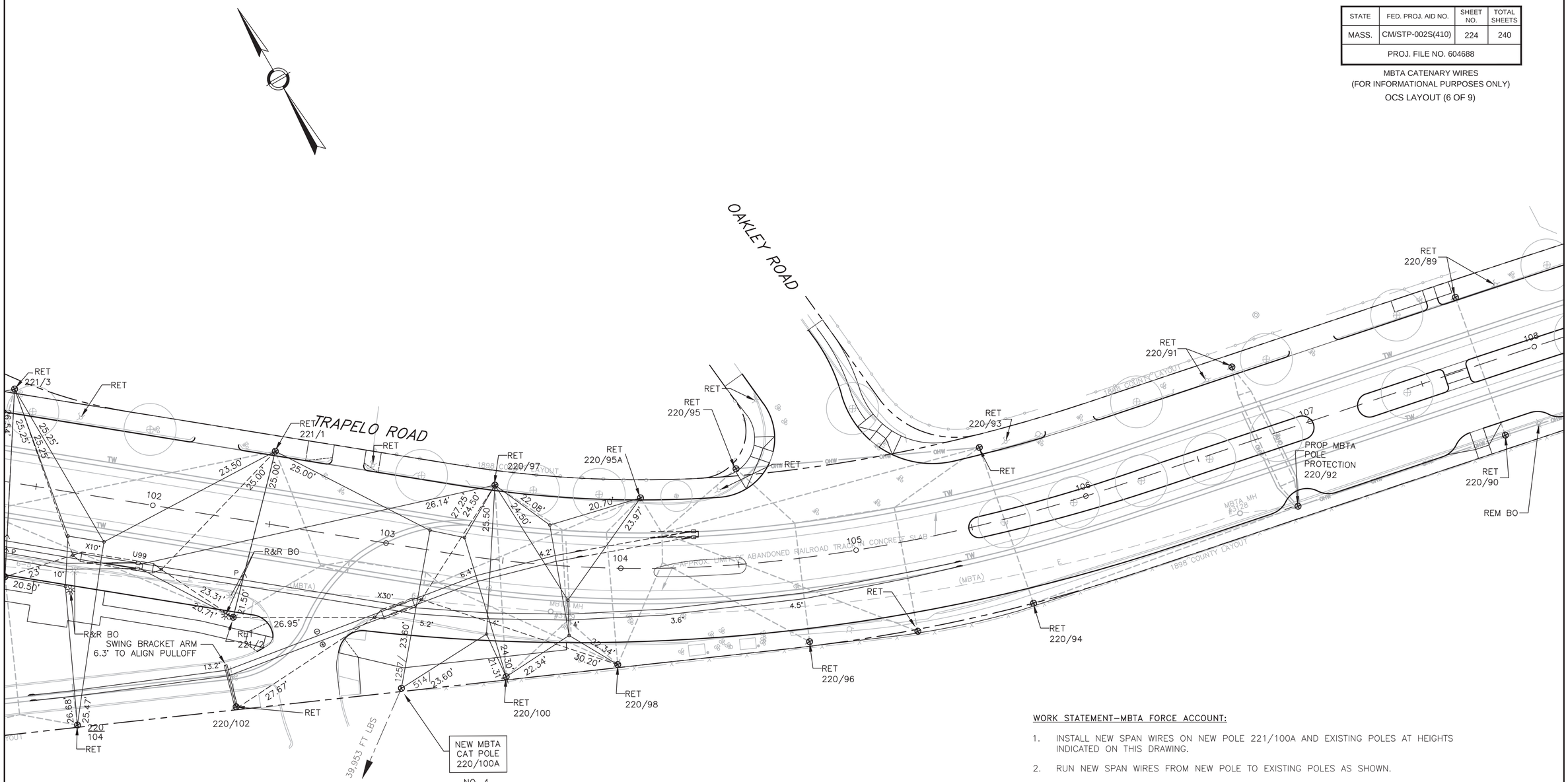


BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	224	240
PROJ. FILE NO. 604688			

MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)

OCS LAYOUT (6 OF 9)



NOTES:

1. FOR GENERAL NOTES AND SYMBOLS SEE DRAWING 212.
2. CHECK TROLLEY WIRE HEIGHT AND ADJUST IF NEEDED BY SLIDING SPAN WIRE CLAMP UP ON POLE.
3. TROLLEY WIRE HEIGHT TO BE A MINIMUM OF 18'–0" BETWEEN SPAN WIRES.
4. RETAIN EXISTING CURVE PENDULUM HANGER ON POLE 220/102.
5. MAINTAIN EXISTING CLAMP HEIGHTS FOR NEW SPANS ON EXISTING POLES.

HOR. SCALE IN FEET
0 20 50 100

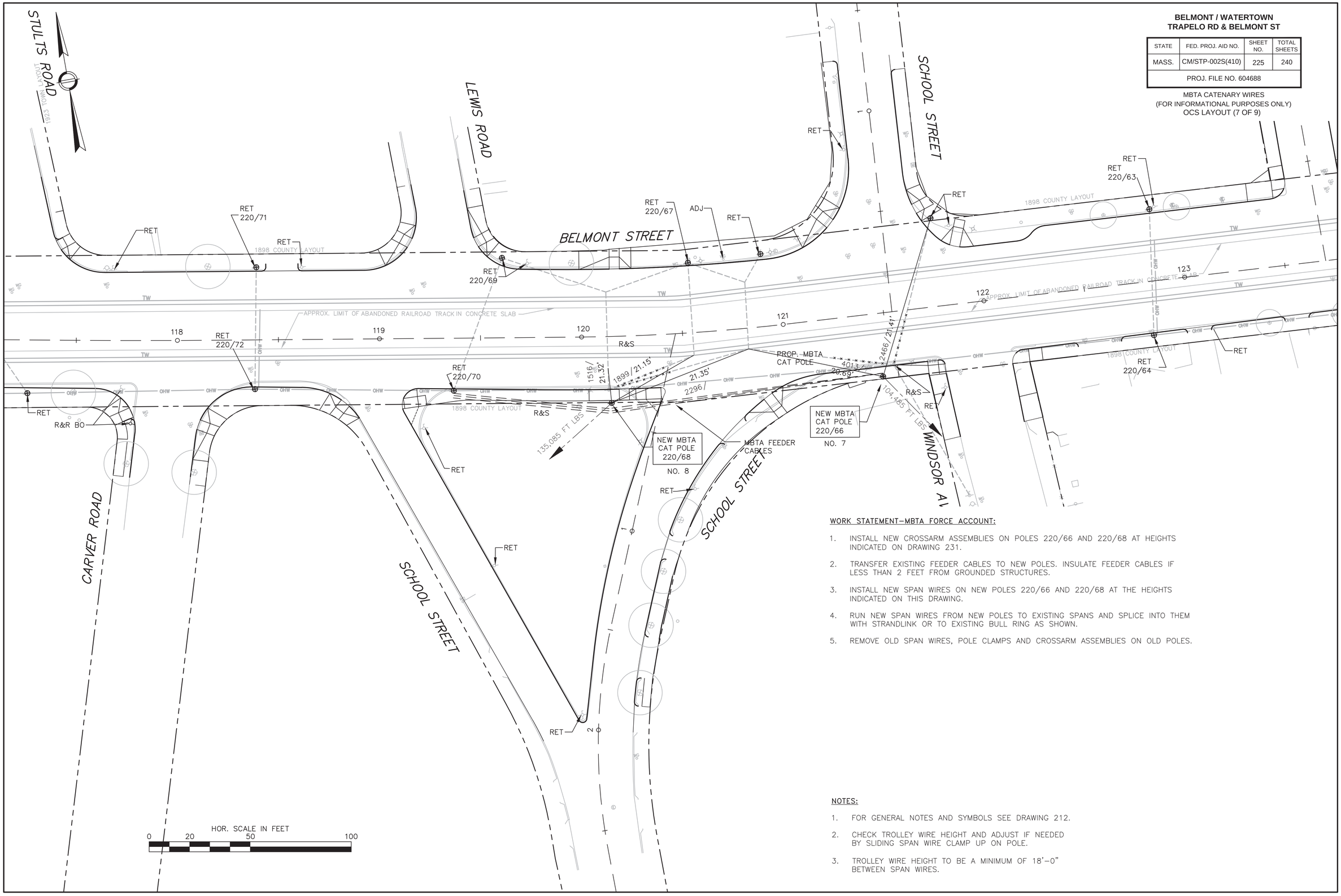
WORK STATEMENT–MBTA FORCE ACCOUNT:

1. INSTALL NEW SPAN WIRES ON NEW POLE 221/100A AND EXISTING POLES AT HEIGHTS INDICATED ON THIS DRAWING.
2. RUN NEW SPAN WIRES FROM NEW POLE TO EXISTING POLES AS SHOWN.
3. AFTER BUILDING NEW SPAN WIRE NETWORK, ATTACH NEW PENDULUM HANGERS AND CURVE PENDULUMS IN PREPARATION FOR STRINGING TROLLEY WIRE.
4. ADJUST BRACKET ARM ON POLE 220/102 BY SWINGING IT INTO LOOP AS SHOWN.
5. INSTALL NEW POSITIVE AND NEGATIVE 4/0 TROLLEY WIRES AS SHOWN BY SPLICING INTO EXISTING 4/0 TROLLEY WIRE AT EXISTING ELECTRIC SWITCH AND RUNNING INTO LOOP PAST BRACKET ARM. SPLICE TO EXISTING 4/0 TROLLEY WIRE IN LOOP PAST BRACKET ARM. SPACING OF NEW POSITIVE AND NEGATIVE WIRES TO BE 30 INCHES.
6. INSTALL NEW K+M CUT IN CROSSOVER AS SHOWN AND SUPPORT WITH TRAPEZE AND HANGERS. SEE DRAWING 229 FOR DETAILS.
7. AFTER TENSIONING TROLLEY WIRES, MAKE ADJUSTMENTS TO TROLLEY WIRE ALIGNMENT.
8. REMOVE OLD SPAN WIRES AND POLE CLAMPS ON EXISTING POLES.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	225	240
PROJ. FILE NO. 604688			

MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)
OCS LAYOUT (7 OF 9)



WORK STATEMENT–MBTA FORCE ACCOUNT:

1. INSTALL NEW CROSSARM ASSEMBLIES ON POLES 220/66 AND 220/68 AT HEIGHTS INDICATED ON DRAWING 231.
2. TRANSFER EXISTING FEEDER CABLES TO NEW POLES. INSULATE FEEDER CABLES IF LESS THAN 2 FEET FROM GROUNDED STRUCTURES.
3. INSTALL NEW SPAN WIRES ON NEW POLES 220/66 AND 220/68 AT THE HEIGHTS INDICATED ON THIS DRAWING.
4. RUN NEW SPAN WIRES FROM NEW POLES TO EXISTING SPANS AND SPLICE INTO THEM WITH STRANDLINK OR TO EXISTING BULL RING AS SHOWN.
5. REMOVE OLD SPAN WIRES, POLE CLAMPS AND CROSSARM ASSEMBLIES ON OLD POLES.

NOTES:

1. FOR GENERAL NOTES AND SYMBOLS SEE DRAWING 212.
2. CHECK TROLLEY WIRE HEIGHT AND ADJUST IF NEEDED BY SLIDING SPAN WIRE CLAMP UP ON POLE.
3. TROLLEY WIRE HEIGHT TO BE A MINIMUM OF 18'–0" BETWEEN SPAN WIRES.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	226	240
PROJ. FILE NO. 604688			

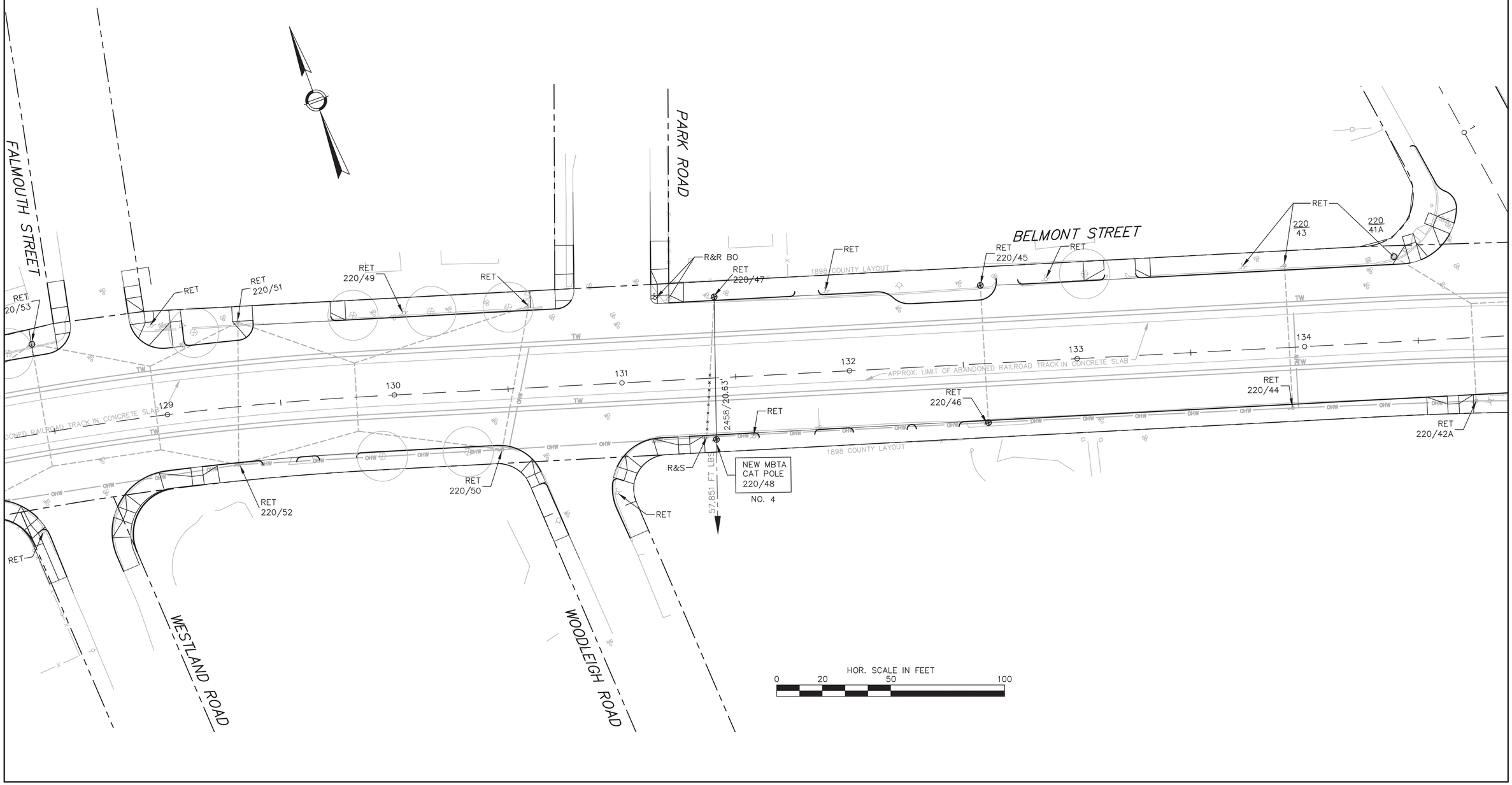
MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)
OCS LAYOUT (8 OF 9)

WORK STATEMENT–MBTA FORCE ACCOUNT:

1. INSTALL NEW CROSS ARM ASSEMBLY ON NEW POLE 220/48 AT HEIGHT INDICATED ON DRAWING 231.
2. TRANSFER EXISTING FEEDER CABLES TO NEW POLES.
3. INSTALL NEW SPAN WIRES ON NEW POLE 220/48 AT HEIGHTS INDICATED ON THIS DRAWING.
4. RUN NEW SPAN WIRE FROM NEW POLE AND SPLICE TO EXISTING SPAN WIRE.
5. REMOVE OLD SPAN WIRE, POLE CLAMPS AND CROSSARM ASSEMBLIES ON OLD POLE.

NOTES:

1. FOR GENERAL NOTES AND SYMBOLS SEE DRAWING 212.
2. CHECK TROLLEY WIRE HEIGHT AND ADJUST IF NEEDED BY SLIDING SPAN WIRE CLAMP UP ON POLE.



BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	227	240
PROJ. FILE NO. 604688			

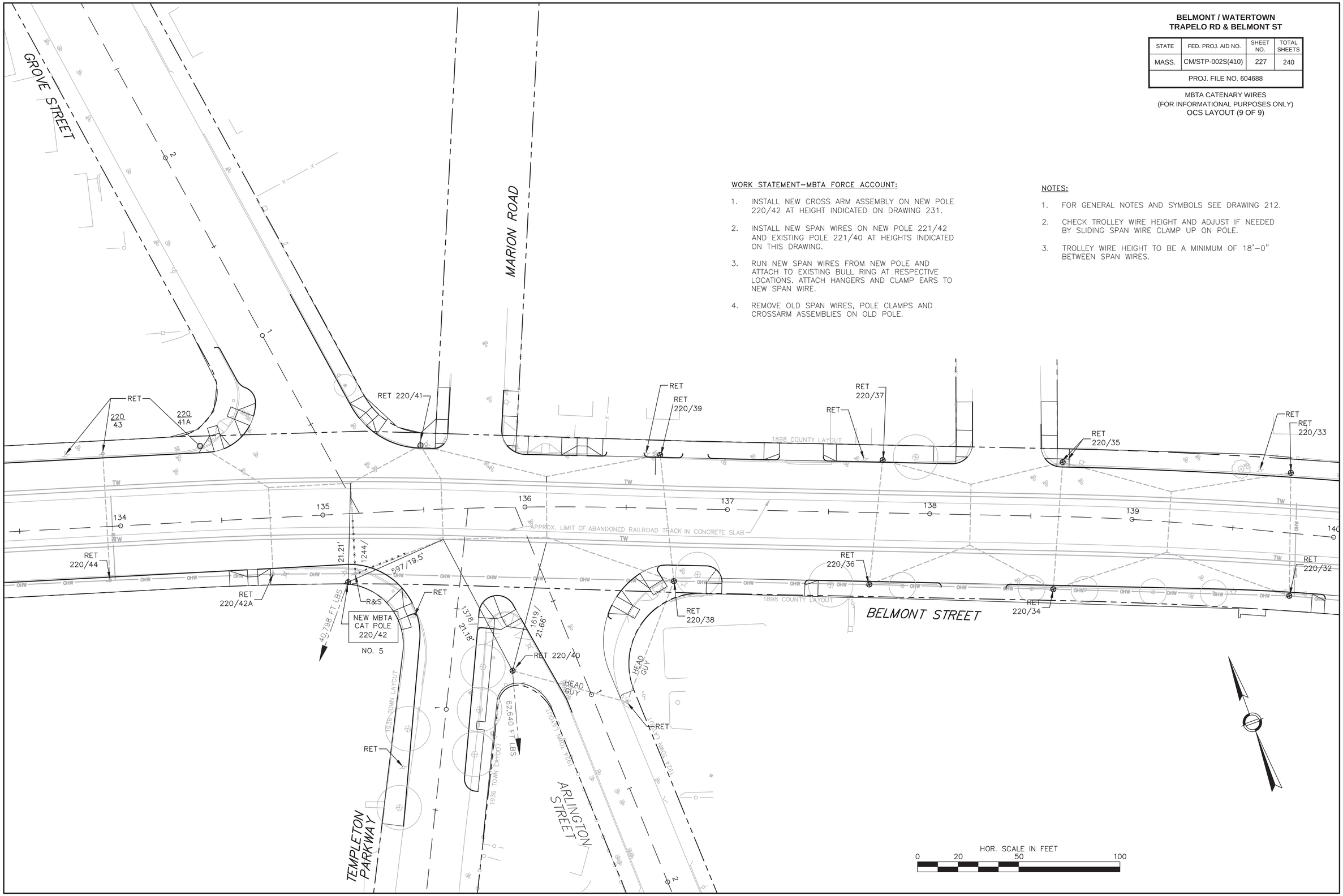
MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)
OCS LAYOUT (9 OF 9)

WORK STATEMENT–MBTA FORCE ACCOUNT:

1. INSTALL NEW CROSS ARM ASSEMBLY ON NEW POLE 220/42 AT HEIGHT INDICATED ON DRAWING 231.
2. INSTALL NEW SPAN WIRES ON NEW POLE 221/42 AND EXISTING POLE 221/40 AT HEIGHTS INDICATED ON THIS DRAWING.
3. RUN NEW SPAN WIRES FROM NEW POLE AND ATTACH TO EXISTING BULL RING AT RESPECTIVE LOCATIONS. ATTACH HANGERS AND CLAMP EARS TO NEW SPAN WIRE.
4. REMOVE OLD SPAN WIRES, POLE CLAMPS AND CROSSARM ASSEMBLIES ON OLD POLE.

NOTES:

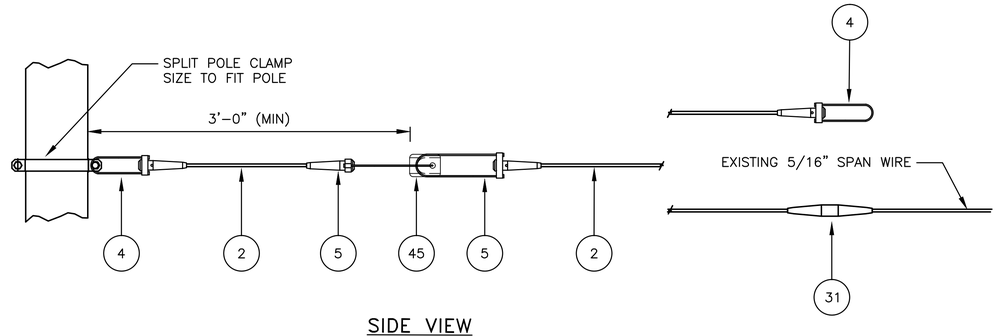
1. FOR GENERAL NOTES AND SYMBOLS SEE DRAWING 212.
2. CHECK TROLLEY WIRE HEIGHT AND ADJUST IF NEEDED BY SLIDING SPAN WIRE CLAMP UP ON POLE.
3. TROLLEY WIRE HEIGHT TO BE A MINIMUM OF 18'–0" BETWEEN SPAN WIRES.



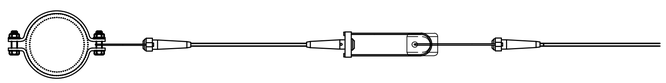
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	228	240
PROJ. FILE NO. 604688			

MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)
CATENARY DETAILS (1 OF 3)

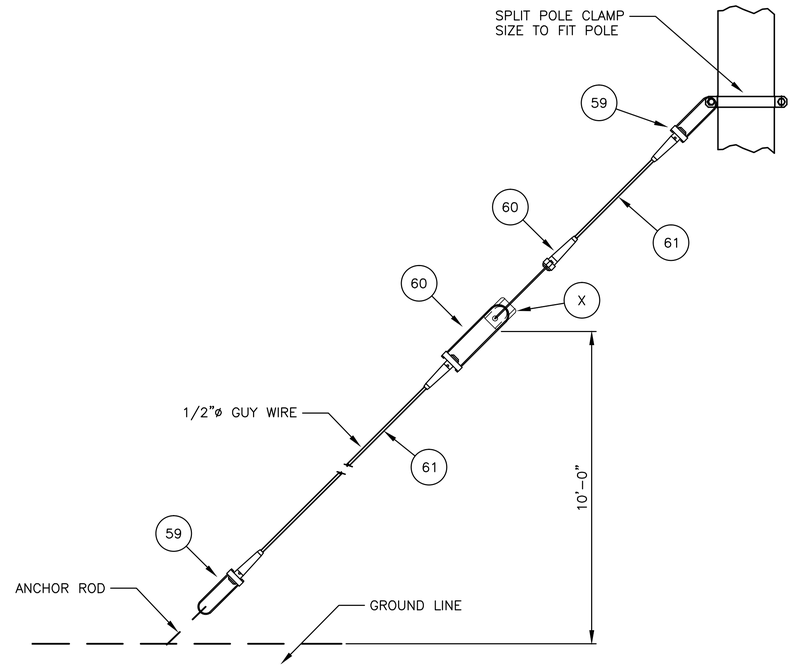


SIDE VIEW

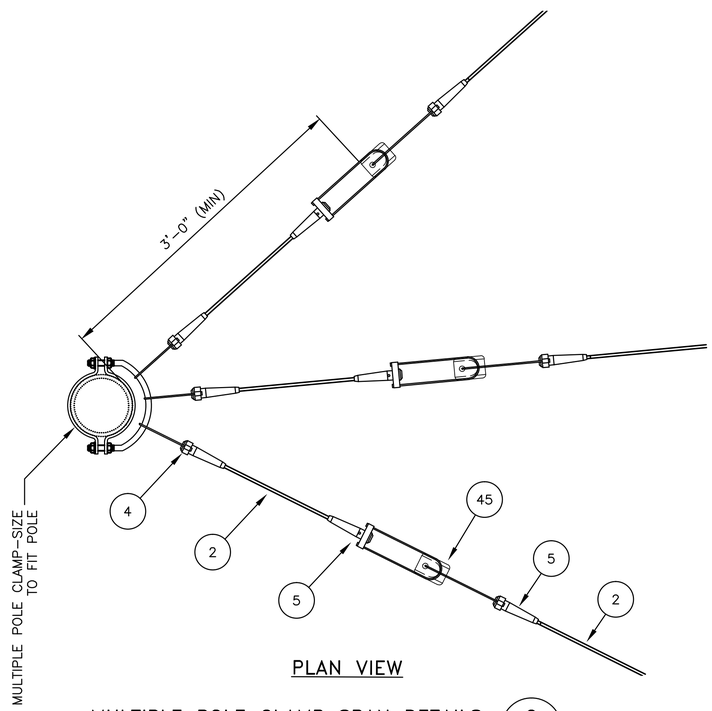


PLAN VIEW

SPLIT POLE CLAMP SPAN DETAILS (1 / -)
SCALE: 1-1/2" = 1'-0"

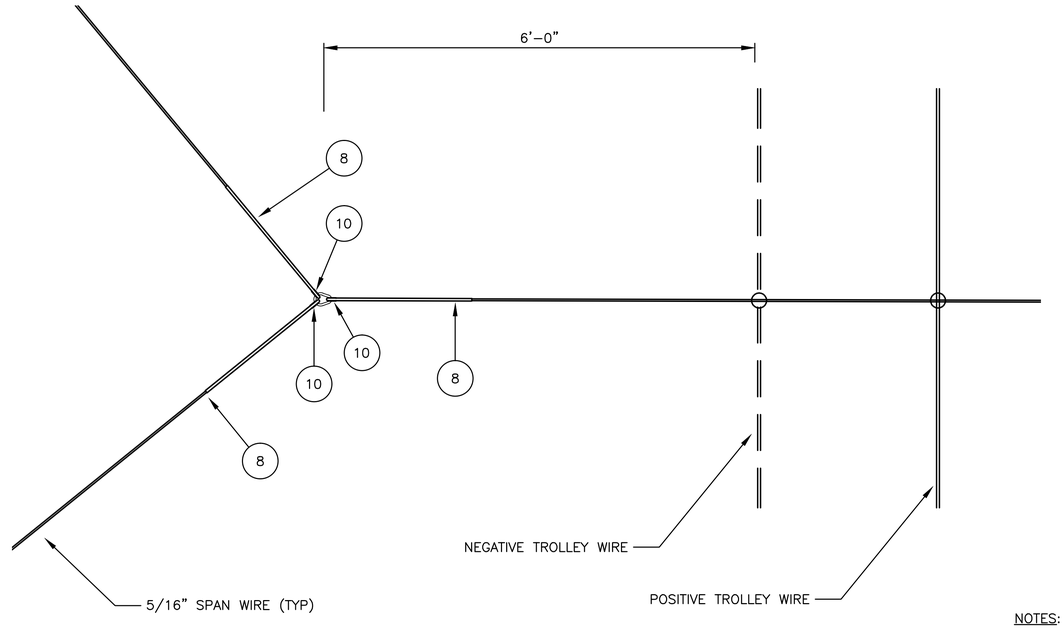


BACK GUY DETAIL (3 / -)
SCALE: NTS



PLAN VIEW

MULTIPLE POLE CLAMP SPAN DETAILS (2 / -)
SCALE: 1-1/2" = 1'-0"



VEE SPAN DETAILS (3 / -)
SCALE: 1" = 1'-0"

NOTES:

1. USE OF STRANDVISE OR PREFORMED END FITTING IS INTERCHANGEABLE. WHEN SPACE IS RESTRICTED, USE A STRANVISE.
2. USE THIMLES WITH PREFORMED END FITTINGS.

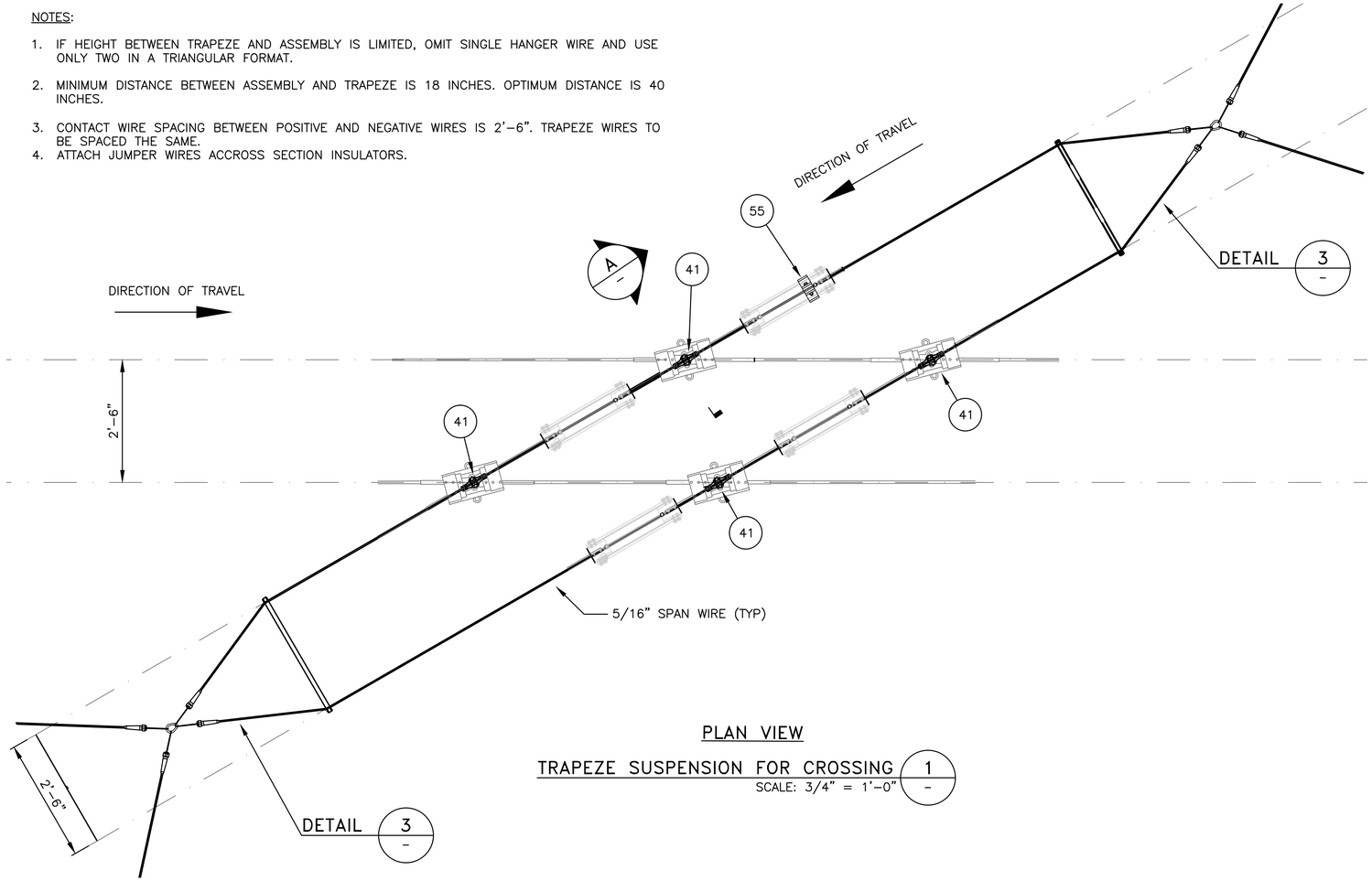
NOTES:

1. IF HEIGHT BETWEEN TRAPEZE AND ASSEMBLY IS LIMITED, OMIT SINGLE HANGER WIRE AND USE ONLY TWO IN A TRIANGULAR FORMAT.
2. MINIMUM DISTANCE BETWEEN ASSEMBLY AND TRAPEZE IS 18 INCHES. OPTIMUM DISTANCE IS 40 INCHES.
3. CONTACT WIRE SPACING BETWEEN POSITIVE AND NEGATIVE WIRES IS 2'–6". TRAPEZE WIRES TO BE SPACED THE SAME.
4. ATTACH JUMPER WIRES ACCROSS SECTION INSULATORS.

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

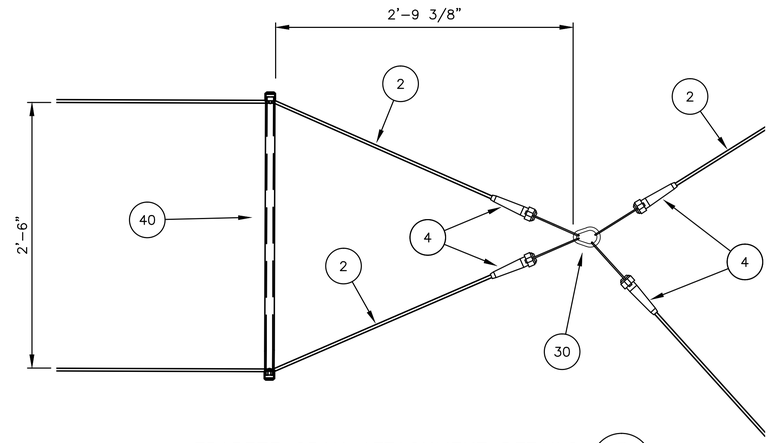
STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	229	240
PROJ. FILE NO. 604688			

MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)
CATENARY DETAILS (2 OF 3)

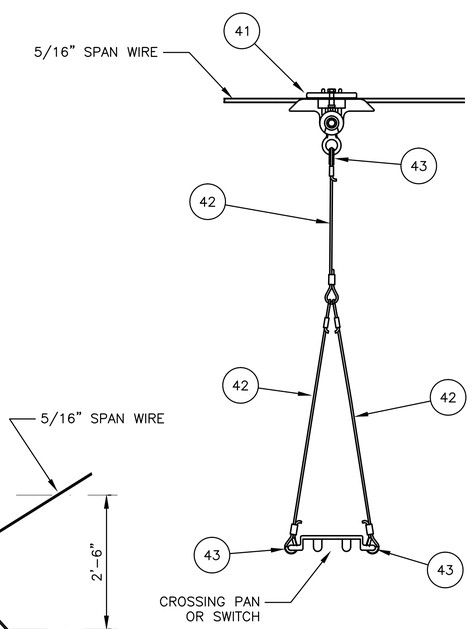


PLAN VIEW

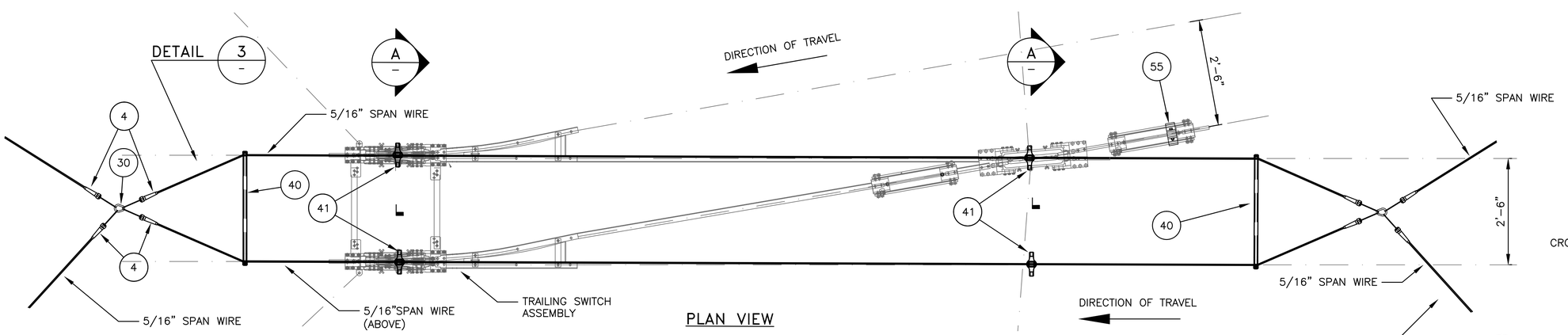
TRAPEZE SUSPENSION FOR CROSSING 1 –
SCALE: 3/4" = 1'–0"



TRAPEZE SPAN ATTACHMENT DETAILS 3 –
SCALE: NTS



TRAPEZE HANGER A –
SCALE: NTS



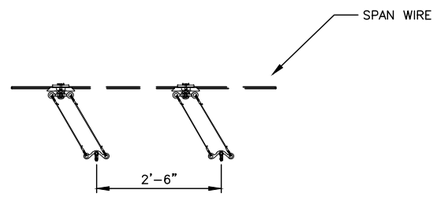
PLAN VIEW

TRAPEZE SUSPENSION FOR SWITCH 2 –
SCALE: 3/4" = 1'–0"

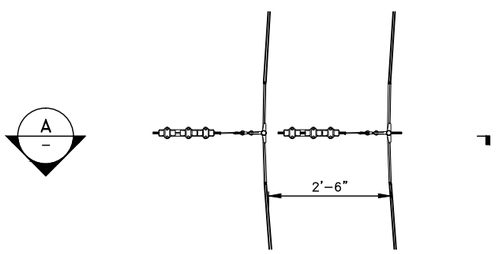
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	230	240
PROJ. FILE NO. 604688			

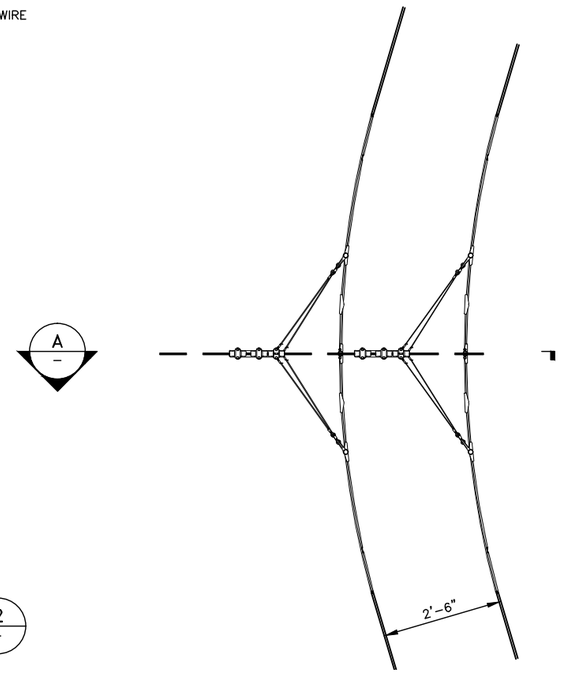
MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)
CATENARY DETAILS (3 OF 3)



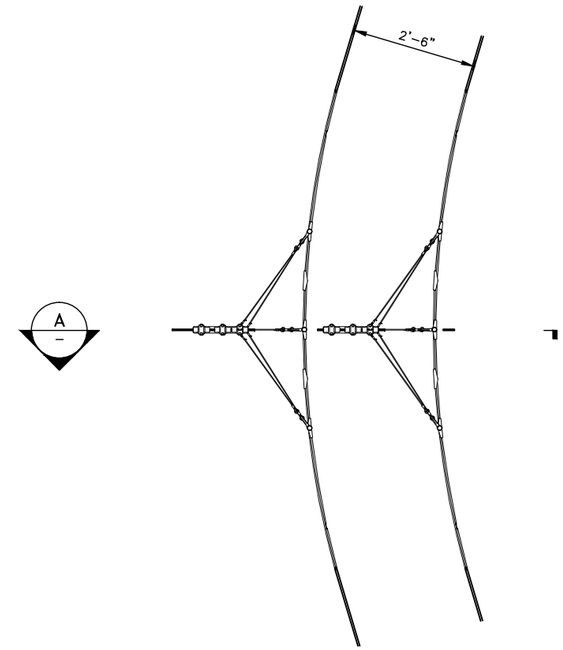
PENDULUM SUSPENSION–1°–2 1/2° (1 / –)
SCALE: 1" = 1'–0"



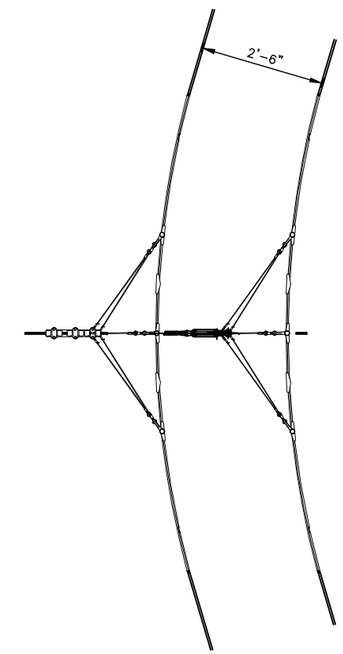
CURVE PENDULUM SUSPENSION 3–5° TYPE 0 (2 / –)
SCALE: 1" = 1'–0"



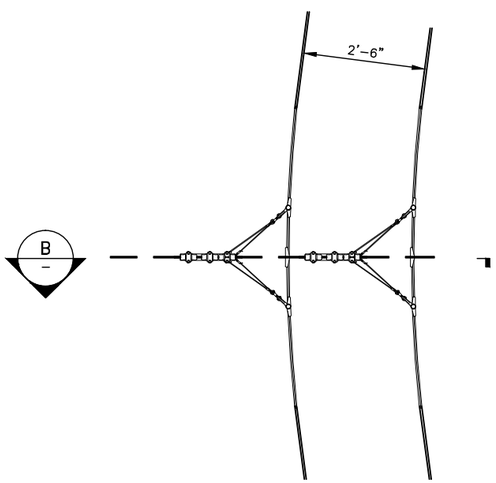
CURVE PENDULUM SUSPENSION
10.5° TO 14° TYPE 3 (4 / –)
SCALE: 1" = 1'–0"



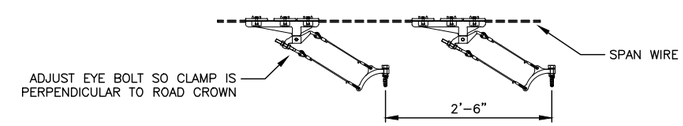
CURVE PENDULUM SUSPENSION
14.5° TO 30° TYPE 4 (5 / –)
SCALE: 1" = 1'–0"



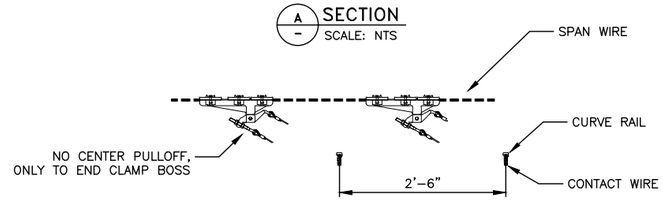
FLYING PULLOFF CURVE PENDULUM SUSPENSION
14.5° TO 30° TYPE 4 (5 / –)
SCALE: 1" = 1'–0"



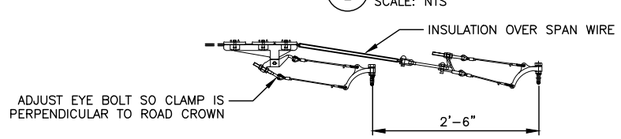
CURVE PENDULUM SUSPENSION
5–1/2 TO 7–1/2° TYPE 1
8° TO 10° TYPE 2 (3 / –)
SCALE: 1" = 1'–0"



A – SECTION
SCALE: NTS



B – SECTION
SCALE: NTS



C – SECTION
SCALE: NTS

NOTES:

1. CURVE PENDULUMS TO BE USED AT BENTON SQUARE LOOP. FOR LOCATIONS OF INSTALLATION, SEE LAYOUT DRAWINGS.
2. REFER TO BILL OF MATERIAL 217 FOR PART NUMBERS AND MANUFACTURER.
3. CONTACT WIRE SPACING TO BE 2'–6"..
4. PULLOFFS TO BE LOCATED USING CENTER OF CURVE RAIL AS REFERENCE.
5. ITEM IDENTIFICATION BUBBLES REFER TO ASSEMBLY AND NOT TO INDIVIDUAL PARTS. REFER TO BILL OF MATERIAL FOR ASSEMBLY PART NUMBER.

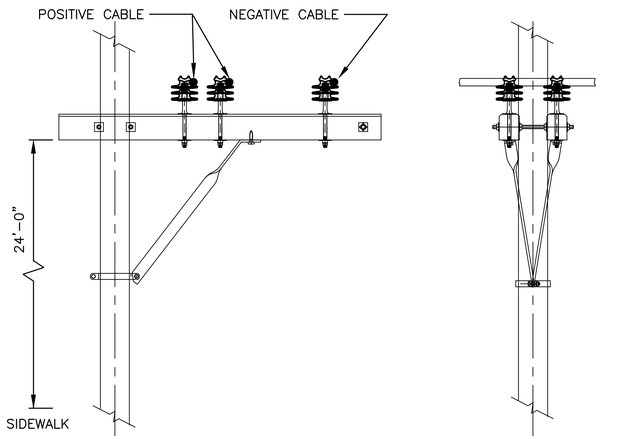
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	231	240
PROJ. FILE NO. 604688			

MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)
CROSSARM INSTALLATION DETAILS

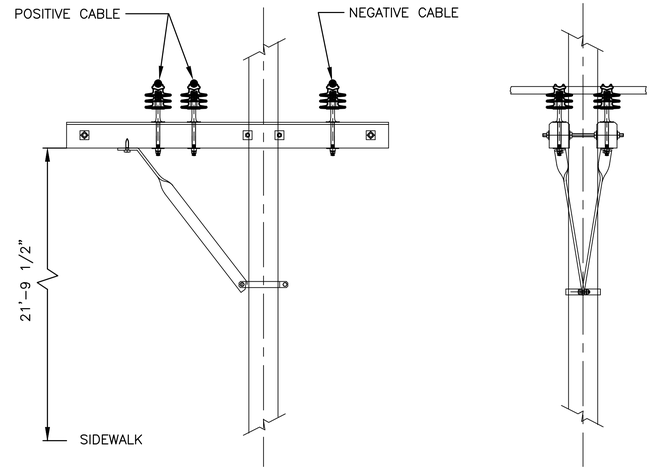
NOTES:

1. CROSSARMS TO BE FACTORY DRILLED. DRILL HOLES FOR POLE ATTACHMENT IN FIELD.
2. ADJUST HEIGHT OF ARMS TO ENSURE HEIGHT OF FEEDER CABLE DUE TO SAG IS GREATER THAN 19'–0" AT CENTER OF SPAN.
3. FEEDER CABLE TO BE SECURED TO PIN INSULATORS WITH NO. 2 AWG INSULATED ANNEALED COPPER TIE WIRES.
4. TOP TIE TO BE BRIDLE–TOP TOP GROOVE TIE. LENGTH OF TIE WIRE TO BE 87 INCHES. SIDE TIE TO BE LOOPED WESTERN UNION SIDE–GROOVE TIE AND LENGTH TO BE 87 INCHES.
5. CABLES ON CURVES OR WITH AN ANGLE ARE TO BE PLACED ON THE SIDE OF THE INSULATOR ON THE INSIDE OF THE CURVE SO THAT THE CABLE BEARS AGAINST THE PIN. STRAIGHT CABLES TO BE PLACED ON THE TOP OF THE INSULATOR.



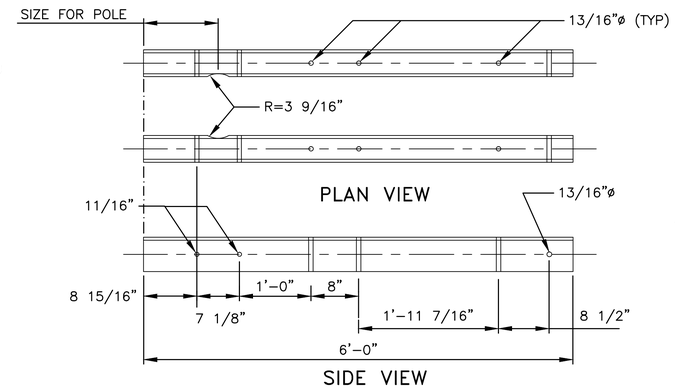
VIEW FACING WEST VIEW FACING SOUTH

POLE 220/42 CROSSARM ASSEMBLY
SCALE: 1/2"=1'–0"

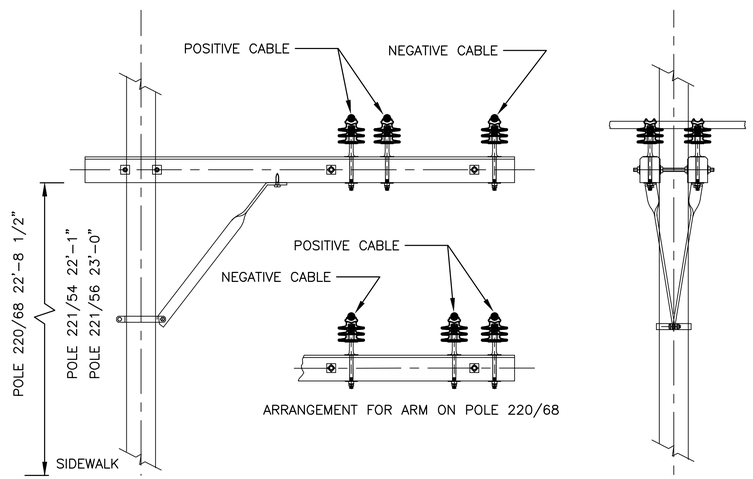


VIEW FACING WEST VIEW FACING SOUTH

POLE 220/48 CROSSARM ASSEMBLY
SCALE: 1/2"=1'–0"

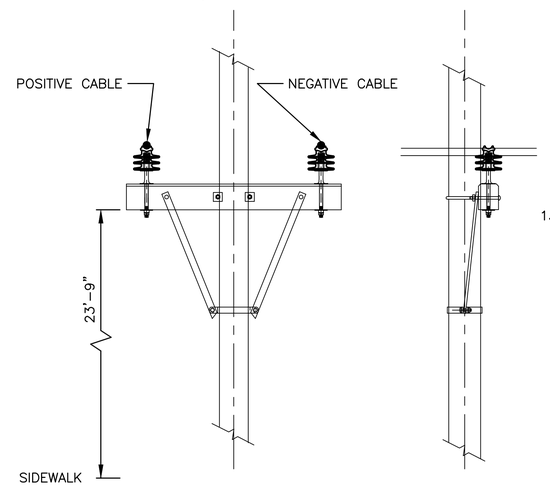


POLE 220/42 CROSSARM DIMENSIONS
SCALE: 1"=1'–0"



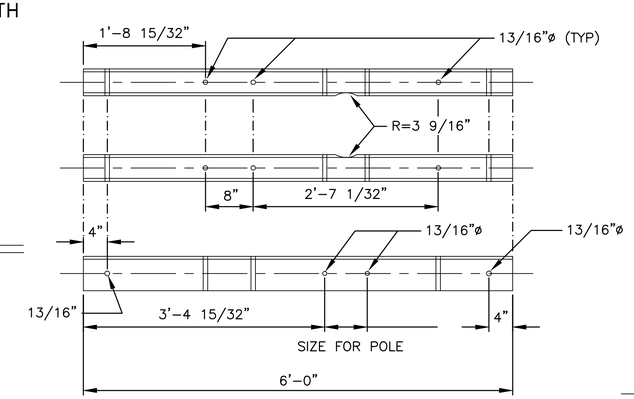
VIEW FACING WEST (FACING EAST FOR 221/68) VIEW FACING SOUTH

POLE 221/54, 221/56 AND 220/68 CROSSARM ASSEMBLY
SCALE: 1/2"=1'–0"

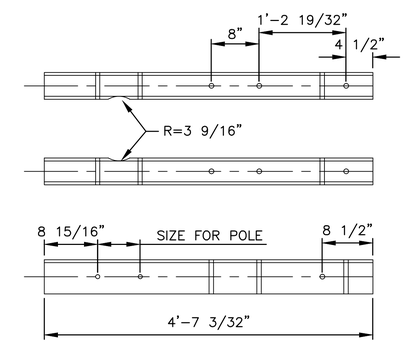


VIEW FACING WEST VIEW FACING SOUTH

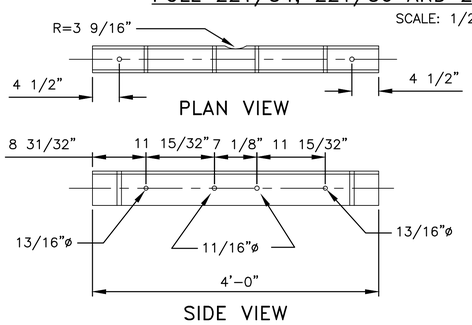
POLE 221/108 CROSSARM ASSEMBLY
SCALE: 1/2"=1'–0"



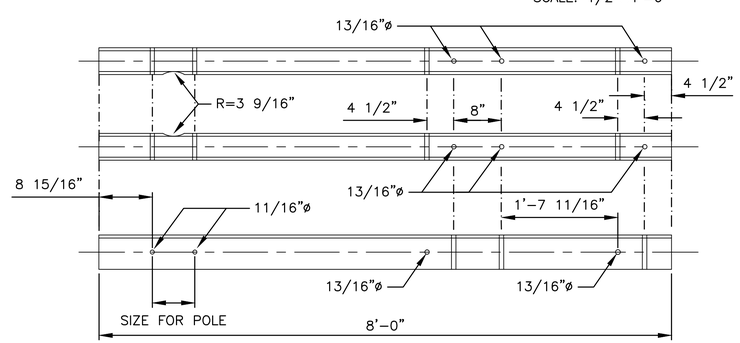
POLE 220/48 CROSSARM DIMENSIONS
SCALE: 1"=1'–0"



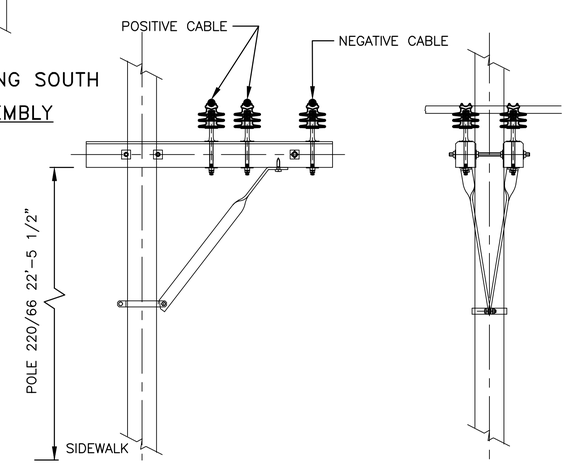
POLE 220/66 CROSSARM DIMENSIONS
SCALE: 1"=1'–0"



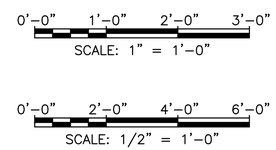
POLE 221/108 CROSSARM DIMENSIONS
SCALE: 1"=1'–0"



POLES 221/54 221/56 AND 220/68 CROSSARM DIMENSIONS
SCALE: 1"=1'–0"



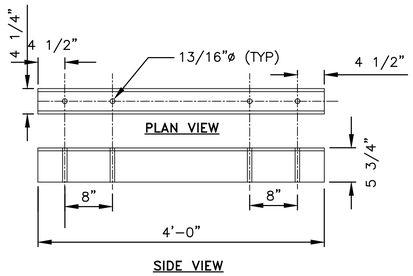
POLE 221/66 CROSSARM ASSEMBLY
SCALE: 1/2"=1'–0"



BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

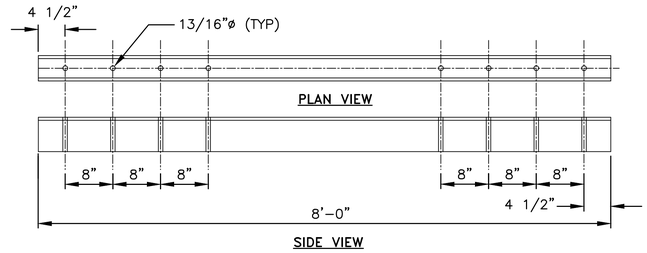
STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	232	240
PROJ. FILE NO. 604688			

MBTA CATENARY WIRES
(FOR INFORMATIONAL PURPOSES ONLY)
CROSSARM MOUNTING HARDWARE



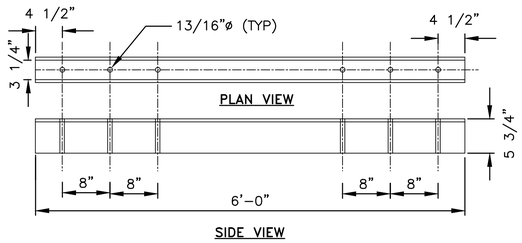
TYPE N CROSSARM

SCALE: 1"=1'–0"



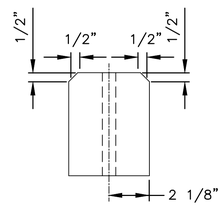
TYPE Q CROSSARM

SCALE: 1"=1'–0"



TYPE QA CROSSARM

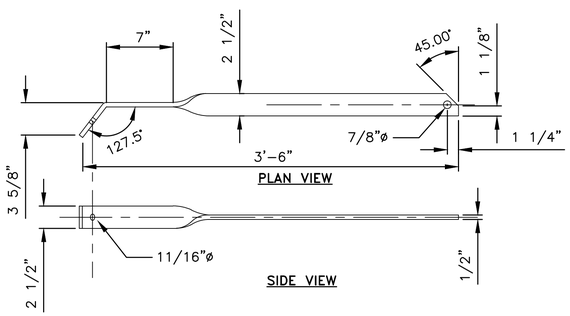
SCALE: 1"=1'–0"



END VIEW
SCALE: 1:4

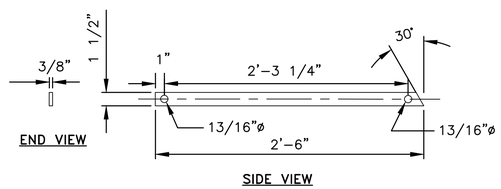
NOTES:

1. CROSSARMS TO BE MADE OF WOOD, DOUGLAS FIR, CONFORMING TO REA SPECIFICATION 1728H–701. THEY SHALL BE TREATED WITH WOOD PRESERVATIVE CONFORMING TO AWPA STANDARD C25–92.
2. PIN HOLES TO BE FACTORY DRILLED TO SUIT LOCATION. POLE SUPPORT HARDWARE TO BE FIELD DRILLED TO SUIT POLE SIZE AND HARDWARE DIAMETER.
3. SPECIAL LENGTH ARMS TO BE SUPPLIED WITH PIN HOLES IN REQUIRED ORIENTATION FOR EACH SITE.
4. CROSSARM BRACE SUPPORT PILOT HOLE TO BE FIELD DRILLED TO ACCOMMODATE 3/4"ø LAG SCREW.



SPECIAL TWISTED CROSSARM BRACE

SCALE: 1–1/2"=1'–0"

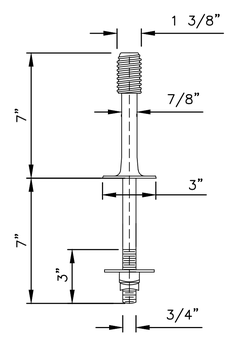


STANDARD CROSSARM BRACE

SCALE: 1–1/2"=1'–0"

NOTES:

1. TWISTED BRACE AND STANDARD BRACE TO BE MADE OF ASTM A572 STEEL, HOT FORGED FOR BENDING.
2. FINISHED BRACE TO BE HOT DIP GALVANIZED PER ASTM A123.

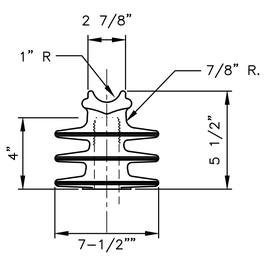


NOTES:

1. PIN TO BE FORGED STEEL PER ASTM A575 WITH NUT PER ANSI C135.1 AND LOCKNUT.
2. FINISH TO BE HOT DIP GALVANIZED PER ASTM A153.
3. THREADS TO BE ROLLED, CLASS 2 ANSI B1.1 & ANSI C135.1 TABLE 8.
4. THREADS TO BE ANSI STANDARD NYLON ALLOY.
5. PIN TO BE A.B. CHANCE 4326 OR EQUIVALENT.

HIGH VOLTAGE FORGED STEEL PIN

SCALE: 3"=1'–0"

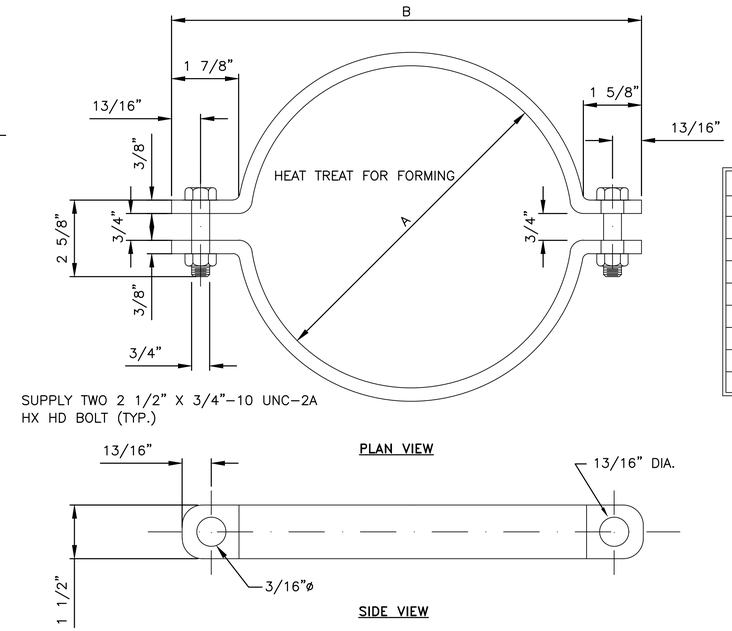


POLYETHYLENE PIN TYPE INSULATOR – TOP TIE

SCALE: 3"=1'–0"

NOTES:

1. INSULATOR TO BE HENDRIX HPI–25–02 OR EQUIVALENT.



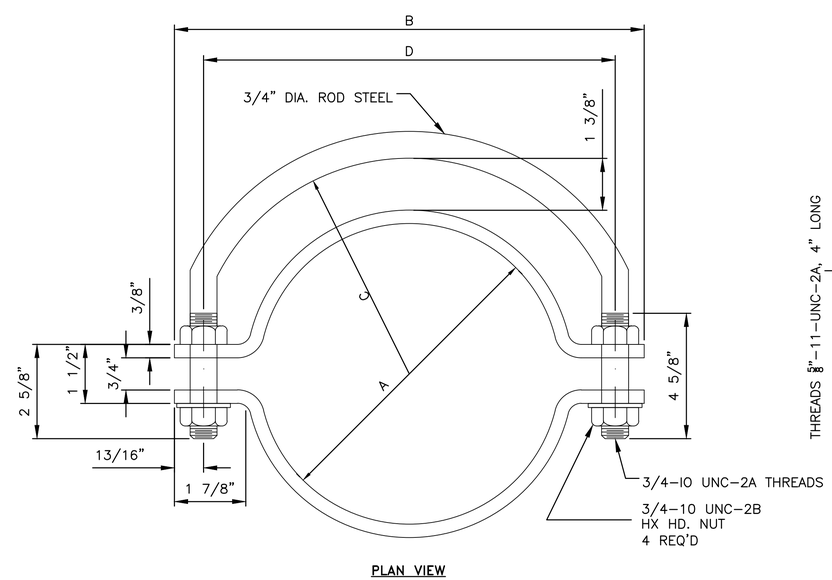
SPLIT POLE CLAMP

SCALE: 3"=1'–0"

MAKE FROM 1–1/2" X 3/8" STEEL
ASTM A572–HOT FORGED

POLE CLAMP DIMENSIONS				
SIZE	A	B	C	D
1	3–1/2"	7–3/4"	3–1/8"	6–3/8"
2	4–1/2"	8–3/4"	3–5/8"	7–3/8"
3	5–9/16"	9–13/16"	4–5/32"	8–7/8"
4	6–5/8"	10–7/8"	4–11/16"	9–1/2"
5	7–5/8"	11–7/8"	5–3/16"	10–1/2"
6	8–5/8"	12–7/8"	6–5/16"	11–3/4"
7	9–5/8"	13–7/8"	6–3/16"	12–3/4"
8	10–3/4"	15–1/4"	6–3/4"	13–5/8"

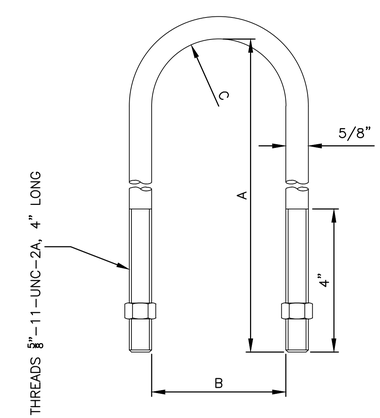
POLE ARM STRAP TABLE			
NO.	A	B	C
8	17–3/8"	10–7/8"	5–7/16"
7	16–1/4"	9–3/4"	4–7/8"
6	15–1/4"	8–3/4"	4–3/8"
5	14–1/4"	7–3/4"	3–7/8"
4	12–7/8"	6–3/4"	3–3/8"
3	11–3/4"	5–3/4"	2–7/8"
2	10–5/8"	4–3/4"	2–3/8"
1	9–5/8"	3–3/4"	1–7/8"



MULTIPLE POLE CLAMP

SCALE: 3"=1'–0"

MAKE FROM 1 1/2" X 3/8" STEEL
ASTM A572–HOT FORGED



POLE ARM STRAP

SCALE: 6"=1'–0"

NOTES:

1. STRAP TO BE MADE OF ASTM A572 STEEL, HOT FORGED FOR BENDING.
2. FINISHED STRAP TO BE HOT DIP GALVANIZED PER ASTM A153.
3. SUPPLY WITH TWO HEX HEAD NUTS, GRADE 5, 5/8"–11 UNC–2B.

0'–0" 0'–4" 0'–8" 1'–0"
SCALE: 6" = 1'–0"

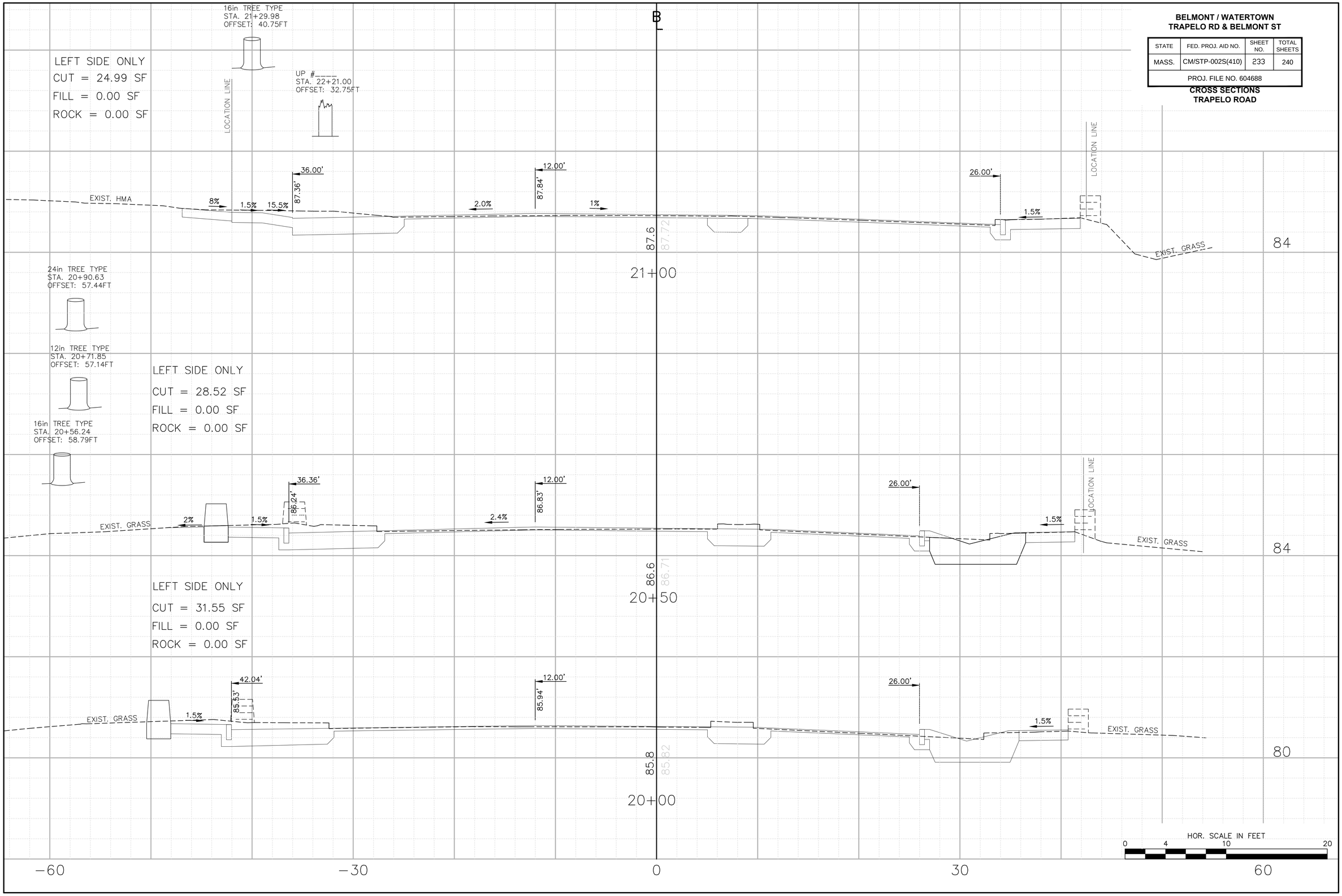
0'–0" 0'–4" 0'–8" 1'–0"
SCALE: 3" = 1'–0"

0'–0" 1'–0" 2'–0" 3'–0"
SCALE: 1" = 1'–0"

BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	233	240
PROJ. FILE NO. 604688			

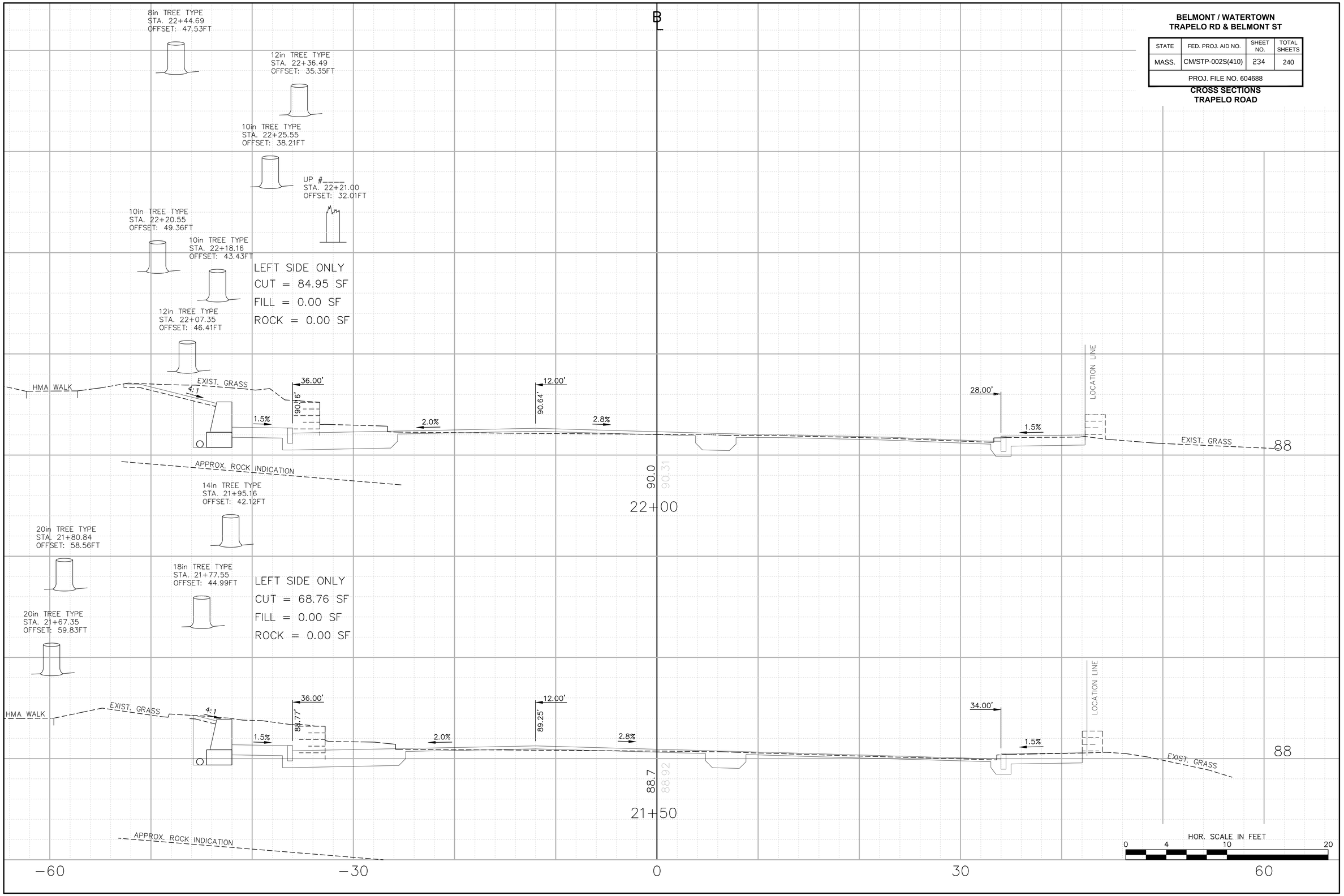
CROSS SECTIONS
TRAPELO ROAD



BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	234	240
PROJ. FILE NO. 604688			

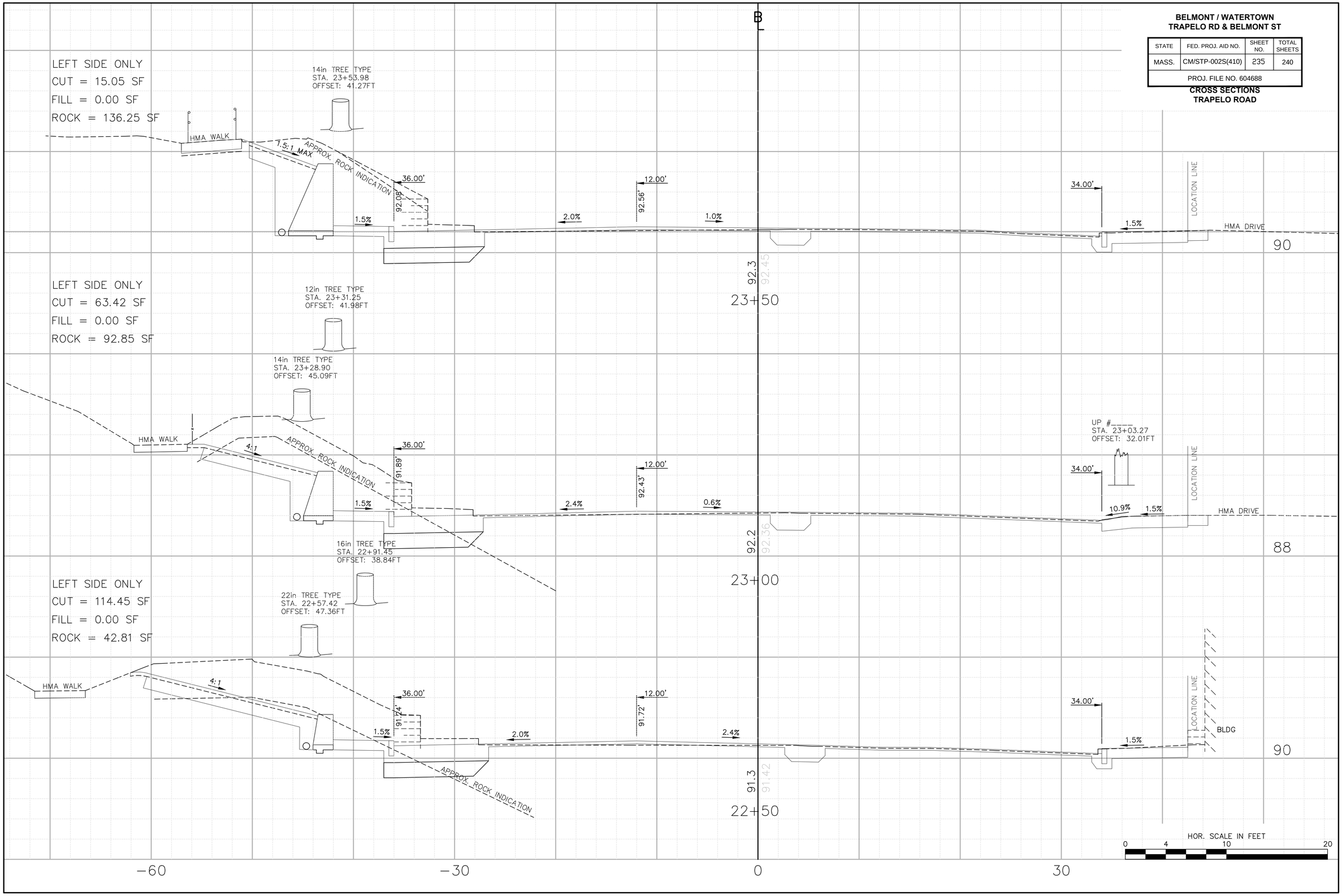
CROSS SECTIONS
TRAPELO ROAD



BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	235	240
PROJ. FILE NO. 604688			

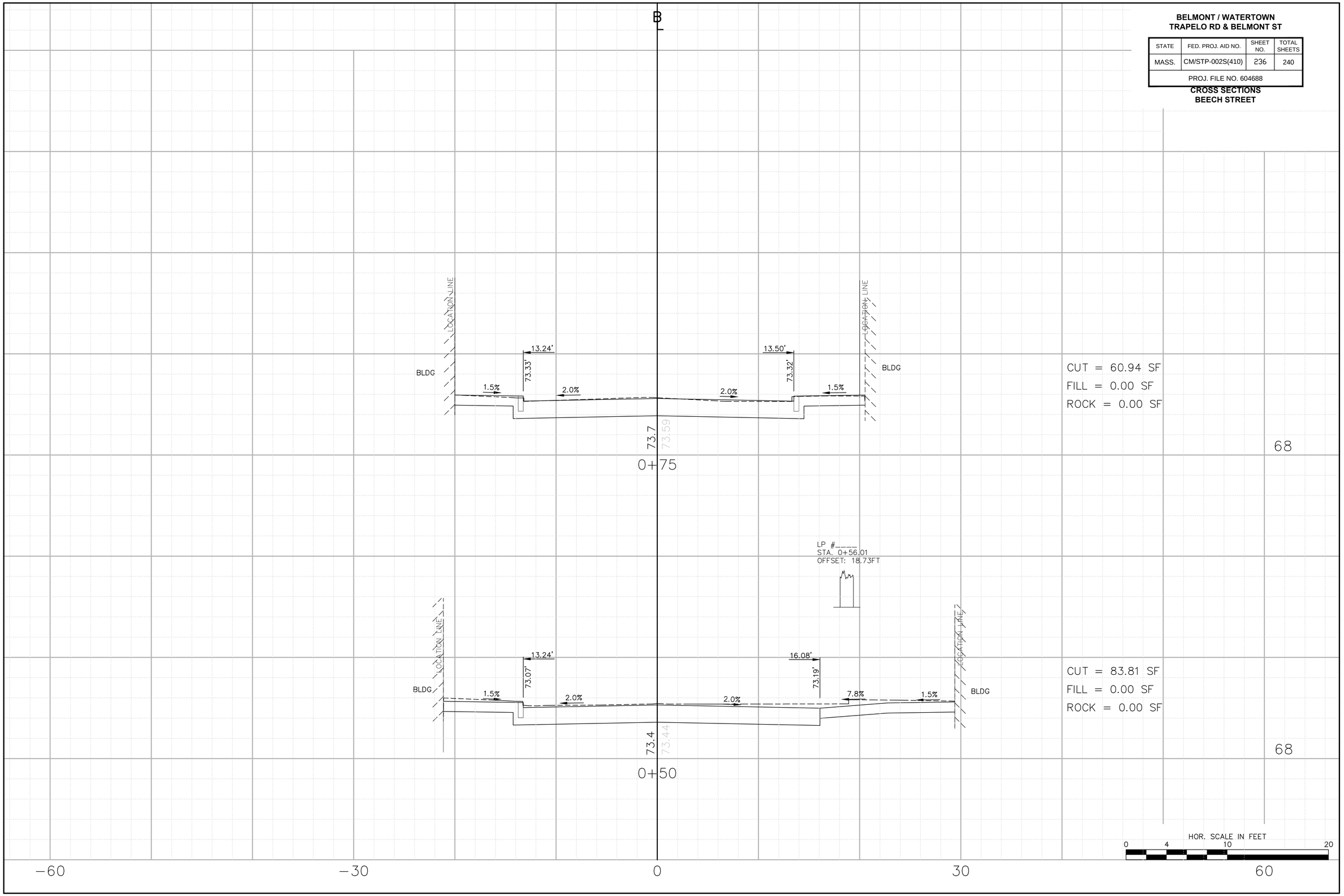
CROSS SECTIONS
TRAPELO ROAD



BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	236	240
PROJ. FILE NO. 604688			

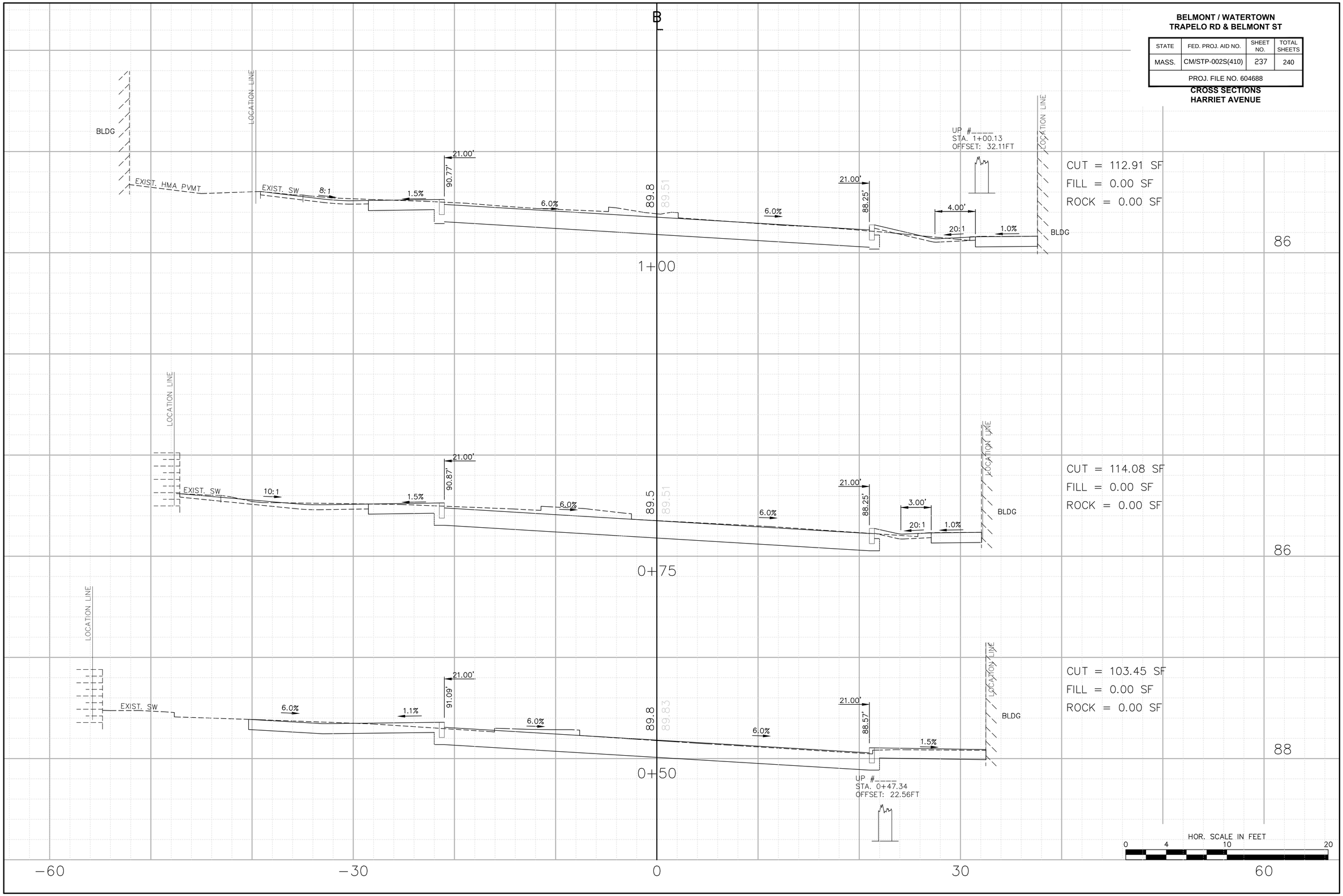
CROSS SECTIONS
BEECH STREET



BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	237	240
PROJ. FILE NO. 604688			

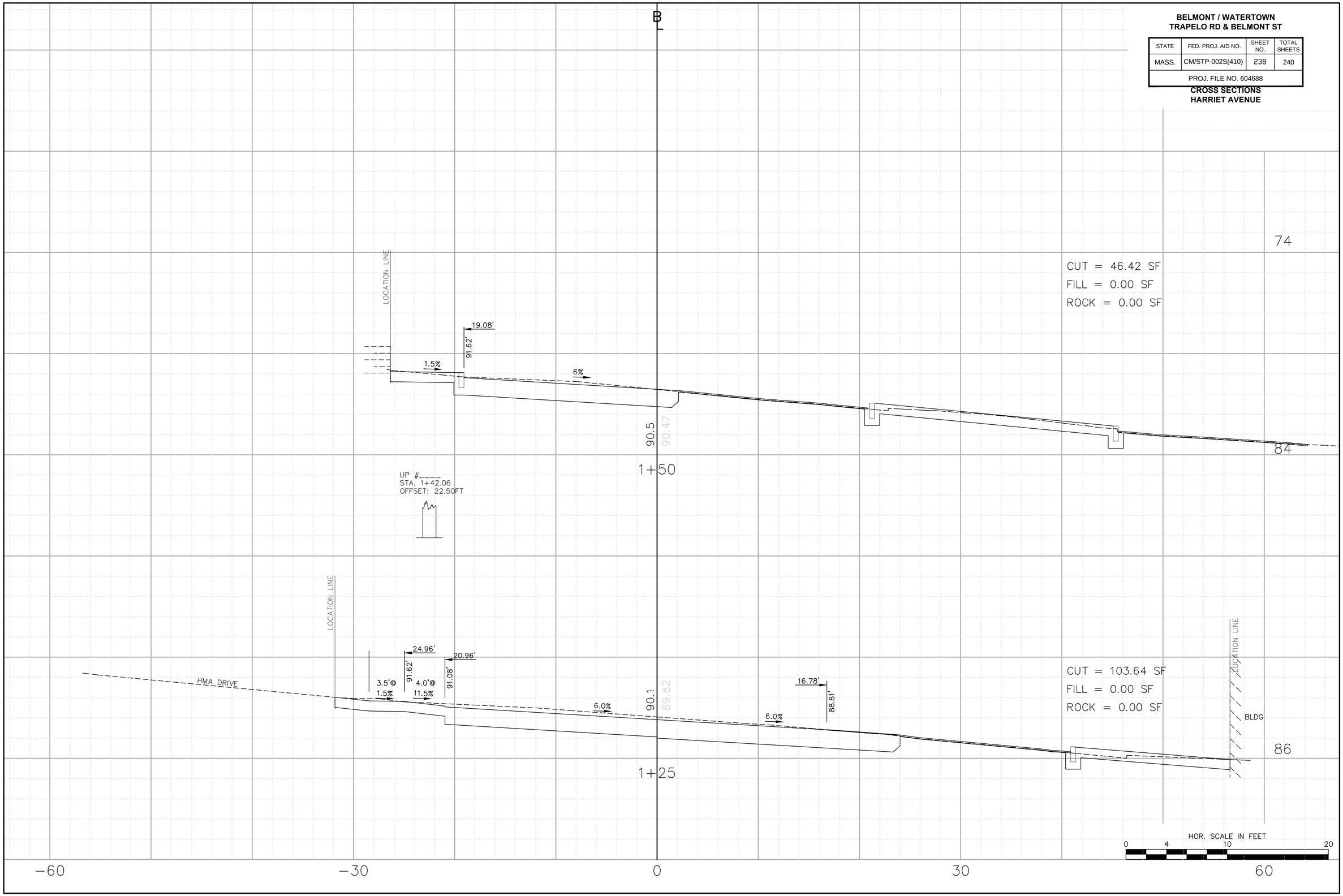
CROSS SECTIONS
HARRIET AVENUE



BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	238	240
PROJ. FILE NO. 604688			

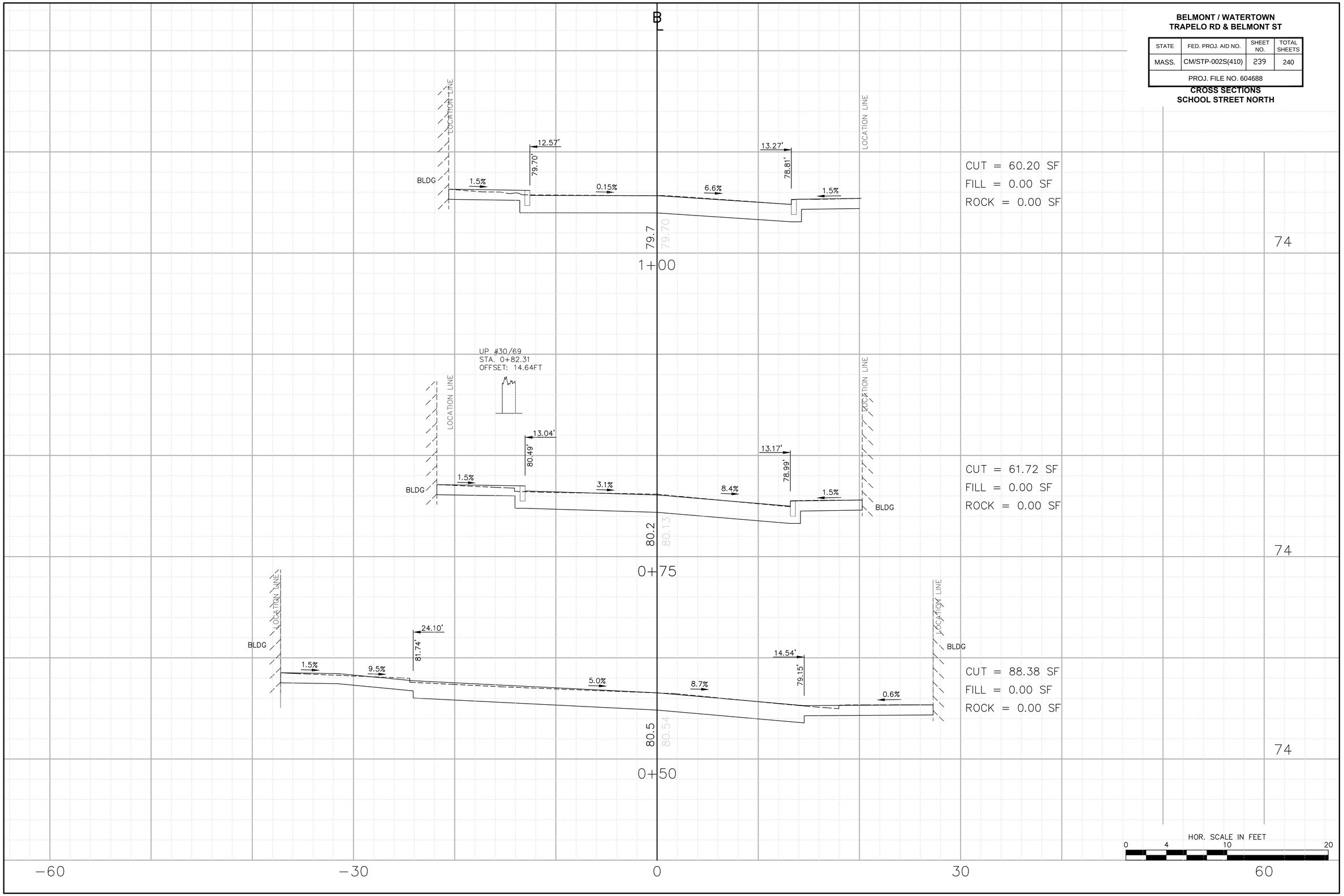
CROSS SECTIONS
HARRIET AVENUE



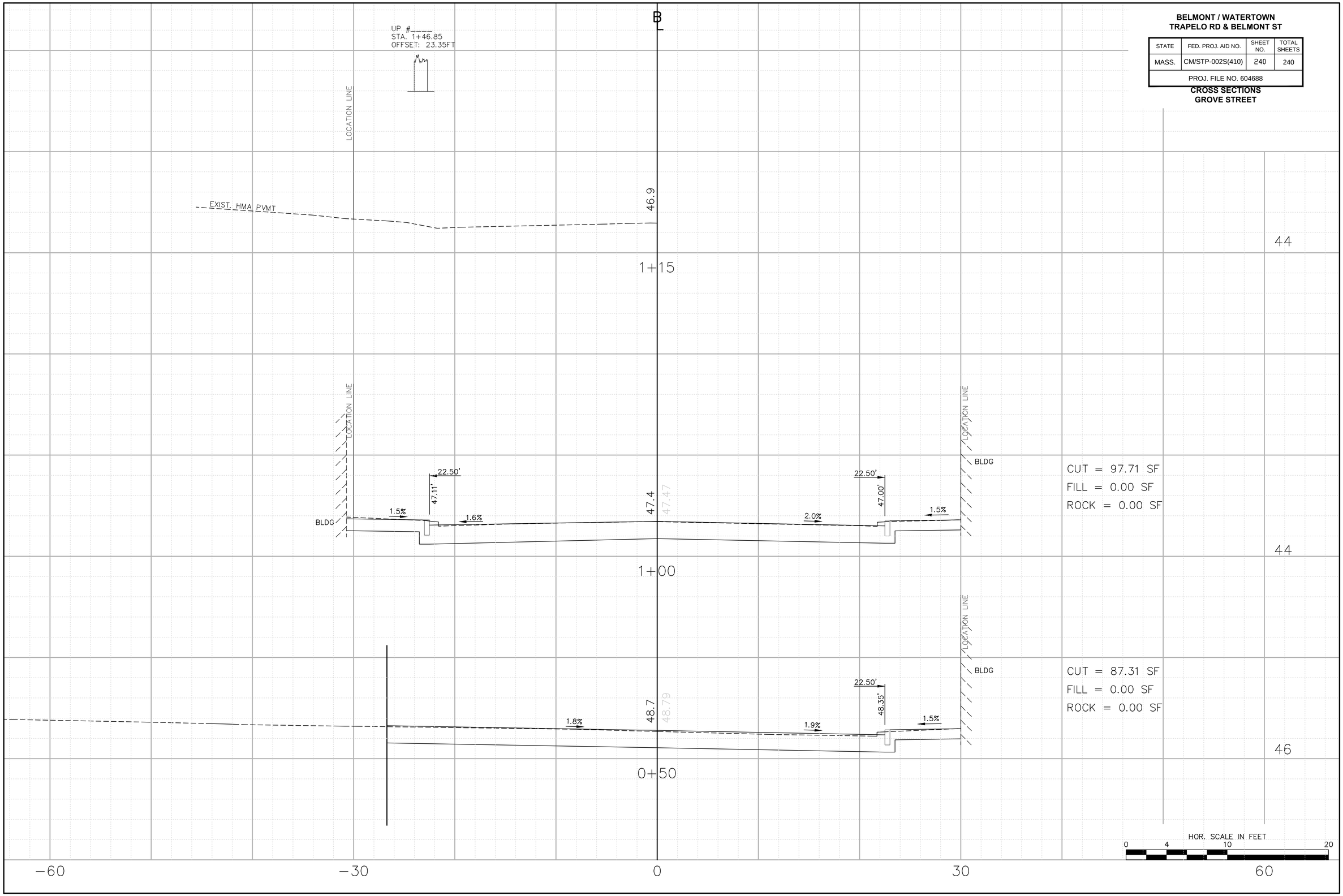
BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	239	240
PROJ. FILE NO. 604688			

CROSS SECTIONS
SCHOOL STREET NORTH



BELMONT / WATERTOWN
TRAPELO RD & BELMONT ST

STATE	FED. PROJ. AID NO.	SHEET NO.	TOTAL SHEETS
MASS.	CM/STP-002S(410)	240	240
PROJ. FILE NO. 604688			

CROSS SECTIONS
GROVE STREET