

NOTIFICATION OF ADDENDUM

ADDENDUM NO. 1

DATED 5/03/2006

Control	0521-04-187, ETC.
Project	STP 2006(457)MM, ETC.
Highway	IH 410
County	BEXAR

Ladies/Gentlemen:

Attached please find an addendum on the above captioned project. Included in the attachment is an addendum notification which details the changes and the respective proposal pages which were added and/or changed.

Except for new bid insert pages, it is unnecessary to return any of the pages attached.

Bid insert pages must be returned with the bid proposal submitted to the Department, unless your firm is submitting a bid using a computer print out. The computer print out must be changed to reflect the new bid item information.

Contractors and material suppliers, etc. who have previously been furnished informational proposals are not being furnished a copy of the addendum. If you have a subcontractor on the above project, please advise them of this addendum. Acknowledgment of this addendum is not requested if your company has been issued a proposal stamped "This Proposal Issued for Informational Purposes."

You are required to acknowledge receipt of this addendum by entering the date, which appears at the top of this letter on the Addendum Acknowledgement Form, contained in your bid proposal.

Failure to Acknowledge receipt of this addendum in your bid proposal will result in your bid not being read.

04/99

SUBJECT: PLANS AND PROPOSAL ADDENDUMS

PROJECT: STP 2006(457)MM

CONTROL: 0521-04-187

COUNTY: BEXAR

LETTING: 05/09/2006

REFERENCE NO: 0502

PROPOSAL ADDENDUMS

PROPOSAL COVER

X BID INSERTS (SH. NO.: 1, 2, 3, 10 THRU 50 OF 50 (SHT 50 IS A NEW SHEET)

X GENERAL NOTES (SH. NO.: A THRU SS (HH THRU SS ARE NEW SHEETS))

X SPEC LIST (SH. NO.: 3 & 4 OF 5)

X SPECIAL PROVISIONS:

ADDED: 000---004

DELETED:

X SPECIAL SPECIFICATIONS:

ADDED: 5327, 6011, 6013, 6026, 6390

DELETED:

X OTHER: SEE CHANGES BELOW

DESCRIPTION OF ABOVE CHANGES

(INCLUDING PLANS SHEET CHANGES)

PROPOSAL:

FORMS -

ADDED CONTRACTOR'S ASSURANCE FORM & DISCLOSURE OF LOBBYING ACTIVITIES FORM

BID INSERTS -

REVISED QUANTITIES FOR BID ITEMS 110-2001, 354-2026, 354-2045, 400-2006, 401-2001, 402-2001, 462-2005, 462-2007, 462-2011, 464-2003, 464-2005, 464-2007, 464-2009, 464-2010, 464-2011, 464-2021, 464-2022, 465-2020, 465-2092, 465-2193, 465-2289, 465-2473, 465-2474, 465-2476, 465-2479, 465-2482, 476-2011, 476-2045, 476-2046, 508-2002, 512-2008, 512-2009, 512-2026, 512-2027, 512-2044, 512-2045, 512-2065, 512-2066, 512-2067, 514-2005, 514-2006, 514-2035, 514-2036, 662-2050, 662-2052, 662-2056, 662-2064, 662-2065, 662-2067, 662-2075, 662-2079, 662-2084, 662-2085, 662-2094, AND 662-2099.

DESCRIPTION OF ABOVE CHANGES

(CONTINUED)

(INCLUDING PLANS SHEET CHANGES)

DELETED BID ITEMS 132-2005, AND 465-2122.

ADDED BID ITEMS 132-2003, 465-2146, 496-2001, 496-2002, 496-2003, 5327-2001, 5327-2002, 5327-2003, 5327-2004, 5327-2005, 5327-2006, 5327-2008, 5327-2009, 5327-2010, 5327-2011, AND ITEM FOR CITY FORCE ACCOUNT WORK TO FURNISH AND INSTALL TRAFFIC SIGNAL EQUIPMENT.

GENERAL NOTES -

ON SPEC DATA SHEETS "A" THRU "GG", REVISED CONTROL NUMBER.

ON SPEC DATA SHEET "A", DELETED MASTER DISTRICT NOTE.

ON SPEC DATA SHEET "G", ADDED NOTESPECIFYING THE WORK START DATE FOR THE PROJECT.

ON SPEC DATA SHEET "H", REVISED THE NUMBER OF WORKING DAYS TO COMPLETE MILESTONES 2 AND 3; SHIFTING OF TEXT OCCURRED DUE TO ADDITION OF NOTE TO ITEM 8.

ON SPEC DATA SHEET "I", SHIFTING OF TEXT FROM PAGE TO PAGE.

ON SPEC DATA SHEET "J", REVISED THE NUMBER OF WORKING DAYS TO COMPLETE MILESTONE 7; SHIFTING OF TEXT FROM PAGE TO PAGE.

ON SPEC DATA SHEET "K", REVISED THE NUMBER OF WORKING DAYS TO COMPLETE MILESTONES 9 AND 10; REVISED TIME CHARGE DEFINITION FOR MILESTONE 10; SHIFTING OF TEXT FROM PAGE TO PAGE.

ON SPEC DATA SHEET "L" THRU "R", SHIFTING OF TEXT FROM PAGE TO PAGE.

ON SPEC DATA SHEET "S", REVISED NOTES FOR ITEM 462; SHIFTING OF TEXT FROM PAGE TO PAGE.

ON SPEC DATA SHEET "T", ADDED NOTE TO NOTIFY ENGINEER PRIOR TO REMOVAL OPERATIONS AT THE SALADO CREEK BRIDGES; SHIFTING OF TEXT FROM PAGE TO PAGE.

ON SPEC DATA SHEET "U", SHIFTING OF TEXT FROM PAGE TO PAGE.

ON SPEC DATA SHEET "V", ADDED NOTES FOR ITEM 506; SHIFTING OF TEXT FROM PAGE TO PAGE.

ON SPEC DATA SHEET "W", ADDED NOTE FOR PAYMENT OF OBJECT MARKER ASSEMBLIES TO ITEM 545; SHIFTING OF TEXT FROM PAGE TO PAGE.

ON SPEC DATA SHEETS "X" THRU "DD", SHIFTING OF TEXT FROM PAGE TO PAGE.

ON SPEC DATA SHEET "EE", ADDED NOTE TO ITEM 666 FOR EXIT NUMBER GORE MARKINGS; SHIFTING OF TEXT FROM PAGE TO PAGE.

ON SPEC DATA SHEET "FF", SHIFTING OF TEXT FROM PAGE TO PAGE.

ON SPEC DATA SHEETS "GG" THRU "SS", ADDED NOTES FOR TMS.
DESCRIPTION OF ABOVE CHANGES
(INCLUDING PLANS SHEET CHANGES)

(CONTINUED)

SPEC LIST -

ADDED SP 000---004.

ADDED SPECIAL SPECIFICATION ITEMS 5327, 6011, 6013, 6026, AND 6390.

ADDED ITEMS 6011, 6013, 6026, AND 6390 AS REFERENCE ITEMS TO ITEM 6369.

PLANS:

PLAN SHEET 2 (INDEX OF SHEETS) -

ADDED SHEETS 58A, 147A, 296A, 296B, 300A, 300B, 330A, AND 487A TO INDEX OF SHEETS.

PLAN SHEET 4 (INDEX OF SHEETS) -

ADDED SHEETS 1169A, AND 1178D THRU 1178R TO INDEX OF SHEETS.

PLAN SHEET 6 (INDEX OF SHEETS) -

ADDED SHEET 1784 TO INDEX OF SHEETS.

PLAN SHEET 33 (GENERAL NOTES) -

ON SPEC DATA SHEET "A", DELETED MASTER DISTRICT NOTES NOTATION; REVISED CONTROL NUMBER TO SHOW 0521-04-187, ETC.

PLAN SHEETS 33A AND 33B (GENERAL NOTES) -

ON SPEC DATA SHEETS "C" THRU "F", REVISED CONTROL NUMBER TO SHOW 0521-04-187, ETC.

PLAN SHEET 33C (GENERAL NOTES) -

ON SPEC DATA SHEETS "G" AND "H", REVISED CONTROL NUMBER TO SHOW 0521-04-187, ETC.; ON SPEC DATA SHEET "G", ADDED NOTE FOR WORK START DATE TO ITEM 8; ON SPEC DATA SHEET "H", REVISED THE NUMBER OF WORKING DAYS TO COMPLETE MILESTONES 2 AND 3; DUE TO ADDITION OF NOTE TO ITEM 8, TEXT SHIFTED FROM PAGE TO PAGE.

PLAN SHEET 33D (GENERAL NOTES) -

ON SPEC DATA SHEETS "I" AND "J", REVISED CONTROL NUMBER TO SHOW 0521-04-187, ETC.; ON SPEC DATA SHEET "J", REVISED THE NUMBER OF WORKING DAYS TO COMPLETE MILESTONE 7; TEXT SHIFTED FROM PAGE TO PAGE.

PLAN SHEET 33E (GENERAL NOTES) -

ON SPEC DATA SHEETS "K" AND "L", REVISED CONTROL NUMBER TO SHOW 0521-04-187, ETC.; TEXT SHIFTED FROM PAGE TO PAGE; ON SPEC DATA SHEET "K", REVISED THE NUMBER OF WORKING DAYS TO COMPLETE MILESTONES 9 AND 10; REVISED TIME CHARGE DEFINITION FOR MILESTONE 10.

PLAN SHEETS 33F THRU 33H (GENERAL NOTES) -

ON SPEC DATA SHEETS "M" THRU "R", REVISED CONTROL NUMBER TO SHOW 0521-04-187, ETC.; TEXT SHIFTED FROM PAGE TO PAGE.

PLAN SHEET 33I (GENERAL NOTES) -
DESCRIPTION OF ABOVE CHANGES (CONTINUED)
(INCLUDING PLANS SHEET CHANGES)

ON SPEC DATA SHEETS "S" AND "T", REVISED CONTROL NUMBER TO SHOW 0521-04-187, ETC.; ON SPEC DATA SHEET "S", REVISED NOTE FOR ITEM 462; ON SPEC DATA SHEET "T", ADDED NOTE TO ITEM 496 TO NOTIFY ENGINEER PRIOR TO REMOVAL OPERATIONS FOR SALADO CREEK BRIDGES; TEXT SHIFTED FROM PAGE TO PAGE.

PLAN SHEET 33J (GENERAL NOTES) -
ON SPEC DATA SHEETS "U" AND "V", REVISED CONTROL NUMBER TO SHOW 0521-04-187, ETC.; TEXT SHIFTED FROM PAGE TO PAGE; ON SPEC DATA SHEET "V", ADDED ITEM 506 AND NOTES TO PLAN SHEET.

PLAN SHEET 33K (GENERAL NOTES) -
ON SPEC DATA SHEETS "W" AND "X", REVISED CONTROL NUMBER TO SHOW 0521-04-187, ETC.; ON SPEC DATA SHEET "W", ADDED NOTE TO ITEM 545 RELATING TO PAYMENT FOR OBJECT MARKER ASSEMBLIES; TEXT SHIFTED FROM PAGE TO PAGE.

PLAN SHEETS 33L THRU 33N (GENERAL NOTES) -
ON SPEC DATA SHEETS "Y" THRU "DD", REVISED CONTROL NUMBER TO SHOW 0521-04-187, ETC.; TEXT SHIFTED FROM PAGE TO PAGE.

PLAN SHEET 33O (GENERAL NOTES) -
ON SPEC DATA SHEETS "EE" AND "FF", REVISED CONTROL NUMBER TO SHOW 0521-04-187, ETC.; ON SPEC DATA SHEET "EE", ADDED NOTE TO ITEM 666 FOR EXIT NUMBER GORE MARKINGS; TEXT SHIFTED FROM PAGE TO PAGE.

PLAN SHEET 33P THRU 33V (GENERAL NOTES) -
ON SPEC DATA SHEET "GG" REVISED CONTROL NUMBER TO SHOW 0521-04-187, ETC.; ON SPEC DATA SHEET "GG" AND CONTINUING THROUGH SPEC DATA SHEET "SS" ADDED TMS GENERAL NOTES.

PLAN SHEET 34 (ESTIMATE & QUANTITY SHEET) -
DELETED ITEM 132-2005 FROM PLAN SHEET; ADDED ITEM 132-2003 AND ITS QUANTITY TO PLAN SHEET; REVISED QUANTITIES FOR ITEMS 110-2001, 354-2026, 354-2045, 400-2006, 401-2001, AND 402-2001.

PLAN SHEET 34A (ESTIMATE & QUANTITY SHEET) -
REVISED QUANTITY FOR ITEM 462-2005.

PLAN SHEET 34B (ESTIMATE & QUANTITY SHEET) -
DELETED ITEM 465-2122; ADDED ITEM 465-2146; REVISED QUANTITIES FOR ITEMS 462-2007, 462-2011, 464-2003, 464-2005, 464-2007, 464-2009, 464-2010, 464-2011, 464-2021, 464-2022, 465-2020, 465-2092, 465-2193, 465-2289, 465-2473, 465-2474, 464-2476, 465-2479.

PLAN SHEET 34C (ESTIMATE & QUANTITY SHEET) -
ADDED ITEMS 496-2001, 496-2002, AND 496-2003; REVISED QUANTITIES FOR ITEMS 465-2482, 476-2011, 476-2045, 476-2046, 508-2002, 512-2008, 512-2009, 512-2026, 512-2027, 512-2044, 512-2045, 512-2065, 512-2066, 512-2067,

514-2005, 514-2006, AND 514-2035; TEXT SHIFTED FROM PAGE TO PAGE DUE TO ADDITION OF ITEMS.

PLAN SHEET 34D (ESTIMATE & QUANTITY SHEET) -
REVISED QUANTITY FOR ITEM 514-2036; TEXT SHIFTED FROM PAGE TO PAGE.

PLAN SHEET 34E (ESTIMATE & QUANTITY SHEET) -
DESCRIPTION OF ABOVE CHANGES (CONTINUED)
(INCLUDING PLANS SHEET CHANGES)

REVISED QUANTITY FOR ITEMS 662-2050, 662-2052, 662-2056, AND 662-2064;
TEXT SHIFTED FROM PAGE TO PAGE.

PLAN SHEET 34F (ESTIMATE & QUANTITY SHEET) -
REVISED QUANTITIES FOR ITEMS 662-2065, 662-2067, 662-2075, 662-2079,
662-2084, 662-2085, 662-2094, AND 662-2099; TEXT SHIFTED FROM PAGE TO PAGE

PLAN SHEETS 34G (ESTIMATE AND QUANTITY SHEET) -
TEXT SHIFTED FROM PAGE TO PAGE.

PLAN SHEET 34H (ESTIMATE AND QUANTITY SHEET) -
ADDED ITEMS 5327-2001, 5327-2002, 5327-2003, 5327-2004, 5327-2005,
5327-2006, 5327-2008, 5327-2009, 5327-2010, AND 5327-2011; TEXT SHIFTED
FROM PAGE TO PAGE.

PLAN SHEET 34I (ESTIMATE AND QUANTITY SHEET) -
TEXT SHIFTED FROM PAGE TO PAGE.

PLAN SHEET 34J (ESTIMATE & QUANTITY SHEET) -
ADDED CITY FORCE ACCOUNT WORK IN ORDER TO FURNISH AND INSTALL TRAFFIC
SIGNAL EQUIPMENT; TEXT SHIFTED FROM PAGE TO PAGE.

PLAN SHEET 35 (TRAFFIC CONTROL PLAN SUMMARY) -
REMOVED ROWS IN PHASE 1-1: ROW 17 OR 27 AND ROW 18 OF 27; REVISED
QUANTITIES AND TOTALS FOR PHASE 1-1.

PLAN SHEET 36 (TRAFFIC CONTROL PLAN SUMMARY) -
REMOVED ROWS FOR STARCREST - STEPS 1 & 2.

PLAN SHEET 37 (TRAFFIC CONTROL PLAN SUMMARY) -
REVISED QUANTITIES AND TOTALS IN PHASE 1-1.

PLAN SHEET 38 (TRAFFIC CONTROL PLAN SUMMARY) -
REVISED QUANTITIES AND TOTALS IN PHASE 1-2.

PLAN SHEET 39 (TRAFFIC CONTROL PLAN SUMMARY) -
REVISED QUANTITIES AND TOTALS IN PHASE 2-1.

PLAN SHEET 40 (TRAFFIC CONTROL PLAN SUMMARY) -
REVISED QUANTITIES AND TOTALS IN PHASE 2-1 AND PHASE 2-2.

PLAN SHEETS 41 AND 42 (TRAFFIC CONTROL PLAN SUMMARY) -
REVISED QUANTITIES AND TOTALS IN PHASE 3-1; ADDED TABLE FOR QUANTITIES IN
PHASE 3-2.

PLAN SHEET 43 (TRAFFIC CONTROL PLAN SUMMARY) -
ADDED ROW OF QUANTITIES TO PHASES 4-1 AND 5-1; REVISED QUANTITIES IN PHASE
5-1; UPDATED STAGE TOTALS IN PHASE 4-1 FOR SHEETS 5 OF 9 AND 6 OF 9 FOR
ITEM 512-2066.

PLAN SHEET 44 (TRAFFIC CONTROL PLAN SUMMARY) -
ADDED ROW OF QUANTITIES TO PHASES 5-1; REVISED QUANTITIES IN PHASES 4-1
AND 5-1; UPDATED SHEET TOTALS IN PHASE 4-1 FOR SHEETS 2 OF 9, 4 OF 9, 5 OF
9, AND 6 OF 9 DUE TO REVISIONS IN ITEM 512-2066; REVISED THE SHEET TOTALS.
DESCRIPTION OF ABOVE CHANGES (CONTINUED)
(INCLUDING PLANS SHEET CHANGES)

PLAN SHEET 45 (TRAFFIC CONTROL PLAN SUMMARY) -
REVISED SHEET QUANTITY TOTALS AND PROJECT QUANTITY TOTALS; REVISED SHEET 9
OF 12 TOTALS FOR ITEM 512-2066; REVISED THE PROJECT TOTALS.

PLAN SHEET 46 (TRAFFIC CONTROL PLAN SUMMARY) -
REVISED SHEET QUANTITY TOTALS AND PROJECT QUANTITY TOTALS; REVISED SHEET 8
OF 12 AND SHEET 10 OF 12 TOTALS DUE TO REVISIONS IN ITEMS 662-2050,
662-2052, 662-2056, 662-2064, 662-2067, 662-2084, 662-2094, AND 662-2099.

PLAN SHEET 47 (TEMPORARY SHORING SUMMARY) -
REVISED ITEM DESCRIPTION FOR ITEM 423-2005; REVISED PHASE ON SHEET 15 FROM
PHASE 1-1 TO PHASE 3-1.

PLAN SHEET 49 (PLANING SUMMARY) -
REVISED SHEET QUANTITIES ON SHEET 19 OF 19 AND PROJECT TOTALS FOR ITEMS
354-2026 AND 354-2045.

PLAN SHEET 50 (GRADING SUMMARY) -
REVISED SHEET QUANTITIES ON SHEETS 51 OF 57 AND 56 OF 57; REVISED PROJECT
TOTALS FOR ITEMS 110-2001, 514-2005, AND 514-2006; DELETED ITEM 132-2005;
ADDED ITEM 132-2003 FOR TYPE B EMBANKMENT WITH A NEW QUANTITY; REVISED
EARTHWORK QUANTITIES.

PLAN SHEET 51 (GRADING SUMMARY) -
REVISED SHEET QUANTITIES ON SHEETS 1 OF 57, 2 OF 57, AND 4 OF 57; REVISED
PROJECT TOTALS FOR ITEMS 514-2035 AND 514-2036.

PLAN SHEET 54 (EARTHWORK SUMMARY) -
REVISED EARTHWORK QUANTITIES; REVISED GRAND TOTALS.

PLAN SHEET 56 (RETAINING WALL SUMMARY) -
REVISED QUANTITIES THROUGHOUT SHEET.

PLAN SHEET 58A (EXISTING STORM DRAIN SUMMARY) -
NEW SHEET ADDED TO PLAN SET.

PLAN SHEET 59 (STORM DRAIN SUMMARY) -
REVISED QUANTITIES THROUGHOUT SHEET; REMOVED RC PIPE (CL. IV) (24 IN) FROM
TABLE.

PLAN SHEET 60 (STORM DRAIN SUMMARY) -
REVISED QUANTITIES THROUGHOUT SHEET.

PLAN SHEET 61 (STORM DRAIN SUMMARY) -
REVISED QUANTITIES FOR ITEMS RC PIPE (CL III) (42 IN) AND MANHOLE
(COMPLETE) (DROP) (TY Y-1).

PLAN SHEET 61A (STORM DRAIN SUMMARY) -
REVISED QUANTITIES THROUGHOUT SHEET.

PLAN SHEET 65 (SUMMARY OF BRIDGES) -
REVISED QUANTITY FOR ITEM 496-2010.

DESCRIPTION OF ABOVE CHANGES (CONTINUED)
(INCLUDING PLANS SHEET CHANGES)

PLAN SHEET 96 (STORM WATER POLLUTION PREVENTION SUMMARY) -
REVISED ITEM 132 TO INDICATE TYPE B EMBANKMENT.

PLAN SHEET 97 (SEQUENCE OF WORK) -
ADDED UTILITY CONSTRAINT DATES TO SHEET.

PLAN SHEET 98 (SEQUENCE OF WORK) -
REVISED CONSTRUCTION MILESTONE LINE (10) FROM PHASE 1 STAGE 2 TO PHASE 2
STAGE 1.

PLAN SHEET 99 (SEQUENCE OF WORK) -
REMOVED "IH-410 WESTBOUND FRONTAGE ROAD OVER QUAIL CREEK" FROM PHASE 1
STAGE 1 BOX; REVISED NOTES UNDER (A) NOTIFICATION REQUIREMENT FOR
ENVIRONMENTALLY SENSITIVE AREA; REVISED LINE (K) FROM STA. 336+00 TO STA.
300+00 "A2"; MODIFIED LINE (M) - REMOVED LETTERS J AND K TO PHASE 3-1;
REMOVED LINE "(P)" FROM PHASE 1 AND STAGE 2; REVISED LINE (V) FROM STA.
336+00 "A2" TO STA 291+33 "A1"; ADDED CONSTRUCTION OF HARRY WURZBACH.

PLAN SHEET 100 (SEQUENCE OF WORK) -
REVISED PHASE 1 STAGE 2 DESCRIPTION BOX: QUAIL CREEK REVISED TO EB
FRONTAGE ROAD; REMOVED "BEGINNING OF MILESTONE 10"; LINE (G) MOVED L AND K
TO PHASE 3-2; LINE (N) REVISED STATION FROM 332+00 "A2" TO 291+33 "A1"; LINE
(R) MOVED TO PHASE 3-2.

PLAN SHEET 101 (SEQUENCE OF WORK) -
ADDED BEGIN MILESTONE 10 TO PHASE 2 STAGE 1 BOX.

PLAN SHEET 102 (SEQUENCE OF WORK) -
REMOVED PHASE 2-1 LINE (S); REMOVED PHASE 2-2 LINE (N); ADDED CONSTRUCTION
OF STORM DRAINAGE TO PHASE 2-3 LINE (A).

PLAN SHEET 103 (SEQUENCE OF WORK) -
ADDED CONSTRUCTION OF WBFR AFTER LINE (A) TO PHASE 3-1;

PLAN SHEET 104 (SEQUENCE OF WORK) -
ADDED J AND K TO PHASE 3-1 LINE (L); ADDED PHASE 3 STAGE 2 DESCRIPTION AND
LINES A THROUGH C.

PLAN SHEET 105 (SEQUENCE OF WORK) -
REMOVED LINES (G), (L), AND (R) FROM PHASE 5-1; ADDED CONSTRUCTION OF STORM
DRAINAGE AFTER LINE (A) IN PHASE 5-2.

PLAN SHEET 106 (SEQUENCE OF WORK) -
ADDED LINE D TO PHASE 7-1.

PLAN SHEET 107 (TRAFFIC CONTROL PLAN GENERAL NOTES) -
REVISED NOTE 12 TO INDICATE WORK IS SUBSIDIARY TO ITEM 100 RATHER THAN
ITEM 508.

PLAN SHEET 109 (CONSTRUCTION PHASING LAYOUT) -
REVISED HATCHING ON CONSTRUCTION OF WB FRONTAGE ROAD FROM STARCREST TO
PERRIN-BEITEL RD PHASE 1 TO INDICATE CONSTRUCTION IN PHASE 3.

PLAN SHEET 121 (PHASE 1 DETOUR HORIZONTAL ALIGNMENT DATA SHEET) -
DESCRIPTION OF ABOVE CHANGES (CONTINUED)
(INCLUDING PLANS SHEET CHANGES)

DELETED DETOUR ALIGNMENT 1-13 FROM PLAN SHEET.

PLAN SHEET 147 (PHASE 4 DETOUR HORIZONTAL ALIGNMENT DATA SHEET) -
ADDED DETOUR ALIGNMENT 4-5 TO PLAN SHEET.

PLAN SHEET 147A (PHASE 4 DETOUR HORIZONTAL ALIGNMENT DATA SHEET) -
ADDED SHEET TO PLANS TO ADD DETOUR ALIGNMENTS 4-5 AND 4-6.

PLAN SHEET 178 (TRAFFIC CONTROL PLAN PHASE 1 STAGE 1) -
REVISED ENVIRONMENTALLY SENSITIVE AREA.

PLAN SHEET 179 (TRAFFIC CONTROL PLAN PHASE 1 STAGE 1) -
MOVED WORK ON WB FRONTAGE ROAD, EAST OF STARCREST TO PHASE 3-1; REVISED
SHEET QUANTITIES.

PLAN SHEET 180 (TRAFFIC CONTROL PLAN PHASE 1 STAGE 1) -
MOVED WORK ON STARCREST TO PHASE 3-1; REVISED SHEET QUANTITIES.

PLAN SHEET 181 (TRAFFIC CONTROL PLAN PHASE 1 STAGE 1) -
OMITTED SHEET; WORK MOVED TO PHASE 4-1 (SEE NEW SHEET 300A).

PLAN SHEET 182 (TRAFFIC CONTROL PLAN PHASE 1 STAGE 1) -
OMITTED SHEET; WORK MOVED TO PHASE 4-1 (SEE NEW SHEET 300B).

PLAN SHEETS 183 THRU 185 (TRAFFIC CONTROL PLAN PHASE 1 STAGE 1) -
MOVED WORK ON WB FRONTAGE ROAD TO PHASE 3-1; REVISED SHEET QUANTITIES.

PLAN SHEET 186 (TRAFFIC CONTROL PLAN PHASE 1 STAGE 1) -
MOVED WORK ON WB FRONTAGE ROAD (WEST OF PERRIN-BEITEL) TO PHASE 3-1;
REVISED SHEET QUANTITIES.

PLAN SHEET 187 (TRAFFIC CONTROL PLAN PHASE 1 STAGE 1) -
OMITTED SHEET; WORK MOVED TO PHASE 4-1 (SEE NEW SHEET 296A).

PLAN SHEET 188 (TRAFFIC CONTROL PLAN PHASE 1 STAGE 1) -

REMOVED MATCHLINE FROM PLAN SHEET.

PLAN SHEET 189 (TRAFFIC CONTROL PLAN PHASE 1 STAGE 1) -
OMITTED SHEET; WORK MOVED TO PHASE 4-1 (SEE NEW SHEET 296B).

PLAN SHEET 190 (TRAFFIC CONTROL PLAN PHASE 1 STAGE 1) -
REMOVED MATCHLINE FROM PLAN SHEET.

PLAN SHEET 191 (TRAFFIC CONTROL PLAN PHASE 1 STAGE 1) -
MOVED WORK ON WB FRONTAGE ROAD TO PHASE 3-1; REVISED SHEET QUANTITIES.

PLAN SHEET 206 (TRAFFIC CONTROL PLAN PHASE 1 STAGE 2) -
REMOVED GORE STRIPING; REVISED SHEET QUANTITIES.

PLAN SHEET 207 (TRAFFIC CONTROL PLAN PHASE 1 STAGE 2) -
MOVED STARCREST STRIPING TO PHASE 3-1, MOVED WORK ON WB FRONTAGE ROAD
(EAST OF STARCREST) TO PHASE 3-2; REVISED SHEET QUANTITIES.

PLAN SHEET 208 (TRAFFIC CONTROL PLAN PHASE 1 STAGE 2) -
DESCRIPTION OF ABOVE CHANGES (CONTINUED)
(INCLUDING PLANS SHEET CHANGES)

(OMITTED SHEET FROM PLAN SET.

PLAN SHEETS 209 THRU 211 (TRAFFIC CONTROL PLAN PHASE 1 STAGE 2) -
MOVED WORK ON WB FRONTAGE ROAD TO PHASE 3-2; REVISED SHEET QUANTITIES.

PLAN SHEET 212 (TRAFFIC CONTROL PLAN PHASE 1 STAGE 2) -
UPDATED LINE WORK TO REFLECT EXISTING CONDITIONS ON WB FRONTAGE ROAD.

PLAN SHEET 213 (TRAFFIC CONTROL PLAN PHASE 1 STAGE 2) -
MOVED WORK ON WB FRONTAGE ROAD TO PHASE 3-2; REVISED SHEET QUANTITIES.

PLAN SHEET 214 (TRAFFIC CONTROL PLAN PHASE 1 STAGE 2) -
UPDATED LINE WORK TO REFLECT EXISTING CONDITIONS ON WB FRONTAGE ROAD.

PLAN SHEET 215 (TRAFFIC CONTROL PLAN PHASE 1 STAGE 2) -
MOVED WORK ON WB FRONTAGE ROAD TO PHASE 3-2; REVISED SHEET QUANTITIES.

PLAN SHEET 232 (TRAFFIC CONTROL PLAN PHASE 2 STAGE 1) -
MOVED WORK ON WB FRONTAGE ROAD (EAST OF STARCREST) TO PHASE 3-2; REVISED
SHEET QUANTITIES; ADDED NOTE 3 AND TEMPORARY PAVEMENT.

PLAN SHEETS 233 THRU 235 (TRAFFIC CONTROL PLAN PHASE 2 STAGE 1) -
REMOVED WORK ON WB FRONTAGE ROAD TO PHASE 3-2; REVISED SHEET QUANTITIES.

PLAN SHEET 236 (TRAFFIC CONTROL PLAN PHASE 2 STAGE 1) -
REMOVED WORK ON WB FRONTAGE ROAD TO PHASE 3-2; REVISED SHEET QUANTITIES;
UPDATED LINE WORK (EAST OF PERRIN-BEITEL) TO REFLECT EXISTING CONDITIONS
ON WB FRONTAGE ROAD.

PLAN SHEET 237 (TRAFFIC CONTROL PLAN PHASE 2 STAGE 1) -
UPDATED LINE WORK TO REFLECT EXISTING CONDITIONS ON WB FRONTAGE ROAD.

PLAN SHEET 250 (TRAFFIC CONTROL PLAN PHASE 2 STAGE 2) -
UPDATED LINE WORK TO REFLECT EXISTING CONDITIONS ON WB FRONTAGE ROAD EAST
OF STARCREST.

PLAN SHEET 292 (TRAFFIC CONTROL PLAN PHASE 3 STAGE 1) -
ADDED WB FRONTAGE ROAD WORK (EAST OF STARCREST) FROM PHASE 1-1; REVISED
SHEET QUANTITIES.

PLAN SHEETS 293 THRU 296 (TRAFFIC CONTROL PLAN PHASE 3 STAGE 1) -
ADDED WB FRONTAGE ROAD WORK FROM PHASE 1-1; REVISED SHEET QUANTITIES.

PLAN SHEETS 296A AND 296B (TRAFFIC CONTROL PLAN PHASE 3 STAGE 1) -
REMOVED MATCHLINE FROM PLAN SHEETS.

PLAN SHEET 297 (TRAFFIC CONTROL PLAN PHASE 3 STAGE 1) -
ADDED WB FRONTAGE ROAD WORK FROM PHASE 1-1; REVISED SHEET QUANTITIES.

PLAN SHEETS 297A THRU 297F (TRAFFIC CONTROL PLAN PHASE 3 STAGE 2) -
NEW SHEETS ADDED TO PLAN SET.

PLAN SHEETS 300A AND 300B (TRAFFIC CONTROL PLAN PHASE 4 STAGE 1) -
REVISED DETOUR NAME; ADDED CHANNELIZING DEVICES; REVISED PAVEMENT MARKINGS
DESCRIPTION OF ABOVE CHANGES (CONTINUED)
(INCLUDING PLANS SHEET CHANGES)

PLAN SHEET 301 (TRAFFIC CONTROL PLAN PHASE 4 STAGE 1) -
REVISED EXISTING PAVEMENT MARKINGS TO PROPOSED FOR WB FRONTAGE ROAD WEST
OF STARCREST; ADDED PROPOSED YELLOW STRIPING AT THE EAST TURNAROUND;
REVISED ESTIMATED SHEET QUANTITIES TO REFLECT CHANGES.

PLAN SHEET 303 (TRAFFIC CONTROL PLAN PHASE 4 STAGE 1) -
REVISED EXISTING PAVEMENT MARKINGS ON WB FRONTAGE ROAD TO SHOW AS PROPOSED
ON THE STAGE; ADDED PROPOSED YELLOW STRIPING AT THE END OF THE EAST
TURNAROUND; UPDATED ESTIMATED SHEET QUANTITIES TO REFLECT CHANGES.

PLAN SHEETS 304 AND 305 (TRAFFIC CONTROL PLAN PHASE 4 STAGE 1) -
REVISED EXISTING PAVEMENT MARKINGS ON WB FRONTAGE ROAD TO SHOW AS PROPOSED
ON THE STAGE; UPDATED ESTIMATED SHEET QUANTITIES TO REFLECT CHANGES.

PLAN SHEET 330 (TRAFFIC CONTROL PLAN PHASE 5 STAGE 1) -
REVISED STARCREST INTERSECTION STRIPING; REVISED SHEET QUANTITIES.

PLAN SHEET 330A (TRAFFIC CONTROL PLAN PHASE 5 STAGE 1) -
NEW SHEET ADDED TO PLAN SET.

PLAN SHEET 371 (TEMPORARY ILLUMINATION LAYOUT PHASE 1) -
MOVED CONSTRUCTION OF WB FRONTAGE ROAD (EAST OF STARCREST) TO PHASE 3.

PLAN SHEETS 372 THRU 374 (TEMPORARY ILLUMINATION LAYOUT PHASE 1) -
MOVED CONSTRUCTION OF WB FRONTAGE ROAD TO PHASE 3.

PLAN SHEET 375 (TEMPORARY ILLUMINATION LAYOUT PHASE 1) -
MOVED CONSTRUCTION OF WB FRONTAGE ROAD (WEST OF PERRIN-BEITEL) TO PHASE 3.

PLAN SHEETS 410 THRU 414 (TEMPORARY ILLUMINATION LAYOUT PHASE 3) -
UPDATED WB FRONTAGE ROAD TO SHOW CONSTRUCTION AREA.

PLAN SHEET 487A (DETOUR DIAGRAM DETOUR 19) -
NEW SHEET ADDED TO PLAN SET: ADDED DETOUR DIAGRAM TO REFLECT PHASE 3-1
CONSTRUCTION OF STARCREST INTERSECTION.

PLAN SHEET 507 (SHORING ELEVATION) -
REVISED CONSTRUCTION PHASE FROM PHASE 1-1 TO PHASE 3-1.

PLAN SHEET 636 (PLANING PLAN LAYOUT) -
REVISED SHAPES AT APPROACH SLAB AND SHOULDERS.

PLAN SHEETS 637, 638, AND 640 (PROPOSED PLAN LAYOUT) -
REVISED BARRIER TYPE; REVISED BARRIER QUANTITIES; REVISED EARTHWORK
QUANTITIES.

PLAN SHEETS 642, 646, 649, 650, 652 (PROPOSED PLAN LAYOUT) -
REVISED EMBANKMENT TYPE; REVISED EARTHWORK QUANTITIES.

PLAN SHEET 653 (PROPOSED PLAN LAYOUT) -
REVISED EMBANKMENT TYPE.

PLAN SHEETS 656, AND 660 (PROPOSED PLAN LAYOUT) -
DESCRIPTION OF ABOVE CHANGES (CONTINUED)
(INCLUDING PLANS SHEET CHANGES)

REVISED EMBANKMENT TYPE; REVISED EARTHWORK QUANTITIES.

PLAN SHEET 663 (PROPOSED PLAN LAYOUT) -
SHADED W23 AS FULL DEPTH ASPHALT PAVEMENT; ADDED NOTE; REVISED EMBANKMENT
TYPE; REVISED EARTHWORK QUANTITIES.

PLAN SHEETS 667, 671, 676, 679, AND 683 (PROPOSED PLAN LAYOUT) -
REVISED EMBANKMENT TYPE; REVISED EARTHWORK QUANTITIES.

PLAN SHEETS 687 AND 692 (PROPOSED PLAN LAYOUT) -
REVISED EMBANKMENT AND EXCAVATION SHEET TOTALS; REVISED EMBANKMENT TYPE.
REVISED EARTHWORK QUANTITIES.

PLAN SHEET 698 (INTERSECTION LAYOUT STARCREST DRIVE "T") -
REVISED SAWCUT LINE TO MATCH PLAN SHEETS.

PLAN SHEET 737 (HARDSCAPE RIPRAP SURFACE DRAINAGE LAYOUT) -
ADDED NOTE REFERRING TO NEXT SHEET FOR DETAIL.

PLAN SHEET 738 (HARDSCAPE RIPRAP SURFACE DRAINAGE LAYOUT) -
ADDED RIPRAP (SPECIAL) DETAIL.

PLAN SHEET 772 (IH 410 MISCELLANEOUS ROADWAY DETAILS) -
REVISED DETAILS THROUGHOUT SHEET.

PLAN SHEET 774 (IH 410 MISCELLANEOUS ROADWAY DETAILS) -

ADDED BUS STOP PAD DETAIL.

PLAN SHEET 820 (RETAINING WALL 7 LAYOUT) -
ADDED SHORING SHAPE AND REVISED SHORING QUANTITY.

PLAN SHEET 824 (RETAINING WALL 8 LAYOUT) -
REVISED SHORING QUANTITY.

PLAN SHEET 839 (RETAINING WALL 15 LAYOUT) -
REMOVED SSTR QUANTITY AND ADDED LEADER LINE.

PLAN SHEET 840 (RETAINING WALL 16 LAYOUT) -
REVISED CLASS C CONCRETE AND REVISED SSTR QUANTITY.

PLAN SHEET 852 (RETAINING WALL 23 LAYOUT) -
REVISED CLASS C CONCRETE AND REVISED SSTR QUANTITY; REMOVED MOMENT SLAB
FROM TYPICAL SECTION; CHANGED BEGIN RAIL STATION.

PLAN SHEET 853 (RETAINING WALL 23 LAYOUT) -
REMOVED MOMENT SLAB FROM TYPICAL SECTION.

PLAN SHEET 854 (RETAINING WALL 24 LAYOUT) -
REMOVED SSTR RAIL ON TOP OF RETAINING WALL 24; REVISED RAIL QUANTITY.

PLAN SHEET 856 (RETAINING WALL 26 LAYOUT) -
REVISED THE LIMIT OF SSTR RAIL IN FRONT OF WALL 26.

PLAN SHEET 862 (RETAINING WALL 28 LAYOUT) -
DESCRIPTION OF ABOVE CHANGES
(INCLUDING PLANS SHEET CHANGES)

(CONTINUED)

REVISED THE LIMIT OF SSTR RAIL IN FRON TO WALL 28.

PLAN SHEETS 865 AND 866 (RETAINING WALL 31 LAYOUT) -
ADDED SHORING SHAPE AND QUANTITY.

PLAN SHEET 867 (RETAINING WALL 31A LAYOUT) -
REVISED SSTR QUANTITY.

PLAN SHEET 869 (RETAINING WALL 31B LAYOUT) -
REVISED CLASS C CONCRETE AND SSTR QUANTITY.

PLAN SHEETS 874 AND 875 (RETAINING WALL 35 LAYOUT) -
ADDED SHORING SHAPE AND QUANTITY.

PLAN SHEET 885 (RETAINING WALL 24 GEOMETRY DATA) -
REMOVED SSTR RAIL ON TOP OF RETINING WALL 24.

PLAN SHEET 952 (INTERIOR DRAINAGE AREA MAP) -
REVISED SMALL DRAINAGE AREA.

PLAN SHEET 963 (INTERIOR DRAINAGE AREA COMPUTATIONS SHEET SYSTEM K) -
ADDED DRAINAGE AREA K-38 TO PLAN SHEET.

PLAN SHEETS 965 THRU 967 (SALADO CREEK EBFH HYDRAULIC DATA SHEET STRUCTURES GREATER THAN 1500 CFS) -
REVISED WATER SURFACE ELEVATIONS AND VELOCITIES.

PLAN SHEETS 970 (QUAIL CREEK EBFH HYDRAULIC DATA SHEET STRUCTURES GREATER THAN 1500 CFS) -
REVISED WATER SURFACE ELEVATIONS, VELOCITIES AND Q'S.

PLAN SHEET 971 (QUAIL CREEK MAIN LANES HYDRAULIC DATA SHEET STRUCTURES GREATER THAN 1500 CFS) -
REVISED WATER SURFACE ELEVATIONS, VELOCITIES AND Q'S.

PLAN SHEET 972 (QUAIL CREEK MAIN LANES HYDRAULIC DATA SHEET STRUCTURES GREATER THAN 1500 CFS) -
REVISED WATER SURFACE ELEVATIONS, VELOCITIES AND Q'S.

PLAN SHEET 973 (EXISTING QUAIL CREEK CULVERT FOUR CROSS SECTIONS) -
REVISED OUTPUT.

PLAN SHEETS 974 AND 974A (PROPOSED QUAIL CREEK BRIDGE SIX CROSS SECTIONS) -
REVISED OUTPUT.

PLAN SHEET 1001 (CURB INLET COMPUTATIONS SYSTEM K) -
REVISED VARIOUS OFFSETS.

PLAN SHEET 1008 (DROP INLET COMPUTATIONS SYSTEM K) -
REVISED VARIOUS OFFSETS.

PLAN SHEET 1016 (STORM DRAIN COMPUTATIONS SYSTEM G) -
REVISIONS TO LINE LENGTHS, SLOPES, AND VELOCITIES.

DESCRIPTION OF ABOVE CHANGES (INCLUDING PLANS SHEET CHANGES) (CONTINUED)

PLAN SHEET 1017 (STORM DRAIN COMPUTATIONS SYSTEM G) -
MOVED LINE G-4 COMPUTATIONS FROM SHEET 1016 TO SHEET 1017.

PLAN SHEET 1021 (STORM DRAIN COMPUTATIONS SYSTEM K) -
REVISED LINE K-2 COMPUTATIONS.

PLAN SHEET 1032 (DRAINAGE AND UTILITY LAYOUT) -
REVISED INLET OFFSETS AND MOVED T1-G26.

PLAN SHEET 1033 (DRAINAGE AND UTILITY LAYOUT) -
MOVED OUTFALL LOCATIONS OF LINE G-1.

PLAN SHEET 1039 (DRAINAGE AND UTILITY LAYOUT) -
RELOCATED A PORTION OF LINE G-2 AND LINE G2-6.

PLAN SHEET 1073 (IH 410 STORMDRAIN PROFILES LINE "G-1") -
REVISED LINE G-1 SLOPE.

PLAN SHEET 1074 (IH 410 STORMDRAIN PROFILES LINES "G-1", "G1-1" THRU "G1-4", "G1-6", "G1-7", & "G1-8") -

REVISED VARIOUS SLOPES AND QUANTITIES; REMOVED MH G-34 AND G-18.

PLAN SHEET 1079 (IH 410 STORMDRAIN PROFILES LINE "G2-8, G2-9, G-3, G-4, G-5, G-6, G6-1") -
REVISED PIPE SLOPE FOR SLOWER VELOCITIES.

PLAN SHEET 1089 (IH 410 STORMDRAIN PROFILES LINE "H1-2, H1-3, H1-4, H1-5, H1-6, H-2") -
REVISED ELEVATION OF C1-H16.

PLAN SHEET 1091 (IH 410 STORMDRAIN PROFILES LINE "J-1") -
REVISED LENGTHS AND ELEVATIONS OF LINE J-1.

PLAN SHEET 1092 (IH 410 STORMDRAIN PROFILES LINE "J-1, J1-1, J1-2, J1-3, J1-4, J1-5, J1-6") -
REVISED ESTIMATED QUANTITY OF CONCRETE BOX CULVERT (8' X 4').

PLAN SHEET 1095 (IH 410 STORMDRAIN PROFILES LINE "J1-13, J1-14, J-2, J2-1, J2-2, J2-3, J2-4, J2-5, J2-6") -
REVISED LOCATION OF LINE "J2-4".

PLAN SHEET 1101 (IH 410 STORMDRAIN PROFILES LINE "K-1 & K-2") -
REVISIONS DUE TO RELOCATION OF LINE K-2.

PLAN SHEET 1102 (IH 410 STORMDRAIN PROFILES LINE "K-2, K2-1, K2-2, & K2-3) -
REVISIONS DUE TO RELOCATION OF LINE K-2.

PLAN SHEET 1103 (IH 410 STORMDRAIN PROFILES LINE "K2-4, K2-5 & K2-6") -
REVISIONS DUE TO RELOCATION OF A PORTION OF LINE K2-6.

PLAN SHEET 1104 (IH 410 STORMDRAIN PROFILES LINE "K2-7, K2-9, K2-10, K2-11, K2-12 & K2-13") -
REVISIONS TO LINE K2-12 & K2-13 TO REFLECT RELOCATION OF LINE K-2 & K-6.
DESCRIPTION OF ABOVE CHANGES (CONTINUED)
(INCLUDING PLANS SHEET CHANGES)

PLAN SHEET 1105 (IH 410 STORMDRAIN PROFILES LINE "K2-14, K2-15, K2-16 & K-4") -
DELETED LINE K2-14; REVISED VARIOUS SLOPES DUE TO RELOCATION OF LINE K-2.

PLAN SHEET 1115 (CULVERT LAYOUT STRUCTURE 3) -
ADDED REMOVAL OF EXISTING RCP SUBSIDIARY TO CULVERT.

PLAN SHEET 1146B (MISCELLANEOUS DRAINAGE DETAILS) -
ADDED CUT AND RESTORE DETAILS.

PLAN SHEET 1169A (DROP INLET TYPE Y-1) -
ADDED SAN ANTONIO DISTRICT STANDARD: DROP INLET TYPE Y-1.

PLAN SHEETS 1178D THRU 1178R (CPS ENERGY) -
NEW CPS SHEETS FOR NATURAL GAS PIPELINE ADDED TO PLAN SET.

PLAN SHEET 1179Y (IH 410: NACOGDOCHES TO LOOP 368 (AUSTIN HWY) PROJECT) -
ADDED WATER LINE CONFLICT IDENTIFICATION NUMBERS; ADDED TOP OF CASING
ELEVATIONS.

PLAN SHEET 1179AE (IH 410: NACOGDOCHES TO LOOP 368 (AUSTIN HWY) PROJECT) -
ADDED TOP OF CASING ELEVATIONS.

PLAN SHEET 1179AP (IH 410: NACOGDOCHES TO LOOP 368 (AUSTIN HWY) PROJECT) -
ADDED WATER LINE CONFLICT IDENTIFICATION NUMBERS; ADDED TOP OF CASING
ELEVATIONS.

PLAN SHEET 1179AQ (IH 410: NACOGDOCHES TO LOOP 368 (AUSTIN HWY) PROJECT) -
ADDED TOP OF CASING ELEVATIONS.

PLAN SHEET 1179AV (IH 410: NACOGDOCHES TO LOOP 368 (AUSTIN HWY) PROJECT) -
ADDED WATER LINE CONFLICT IDENTIFICATION NUMBERS.

PLAN SHEET 1179CV (IH 410: NACOGDOCHES TO LOOP 368 (AUSTIN HWY) PROJECT) -
ADDED DATA FOR CONFLICTS 32-36. REVISED TABLE FOR ELEVATIONS, OFFSETS,
AND STATION LOCATIONS.

PLAN SHEET 1259 (IH 410 OVERPASS AT HARRY WURZBACH RD) -
REVISED DETAILS.

PLAN SHEETS 1271 & 1272 (IH 410 EBML OVERPASS AT SALADO CREEK) -
REVISED SALADO CREEK HYDRAULIC DATA.

PLAN SHEETS 1291 & 1292 (IH 410 WBML OVERPASS AT SALADO CREEK) -
REVISED SALADO CREEK HYDRAULIC DATA.

PLAN SHEETS 1322 & 1323 (IH 410 EBFR OVERPASS AT SALADO CREEK) -
REVISED SALADO CREEK HYDRAULIC DATA.

PLAN SHEETS 1341 & 1342 (IH 410 WBFR OVERPASS AT SALADO CREEK) -
REVISED SALADO CREEK HYDRAULIC DATA.

PLAN SHEET 1362 (IH 410 UNDERPASS AT STARCREST DRIVE NB NAD EAST T/A) -
DESCRIPTION OF ABOVE CHANGES (CONTINUED)
(INCLUDING PLANS SHEET CHANGES)

DELETED QUANTITIES FOR ITEM 496-2010.

PLAN SHEETS 1397 AND 1398 (IH 410 MAINLANES OVERPASS AT QUAIL CREEK) -
REVISED QUAIL CREEK HYDRAULIC DATA.

PLAN SHEET 1421 (IH 410 EBFR OVERPASS AT QUAIL CREEK) -
REVISED QUAIL CREEK HYDRAULIC DATA.

PLAN SHEET 1435 (IH 410 WBFR OVERPASS AT QUAIL CREEK) -
REVISED QUAIL CREEK HYDRAULIC DATA.

PLAN SHEET 1784 (EXIT NUMBER GORE MARKINGS FOR AERIAL VIEW DETAIL) -
INCLUDED NEW STANDARD PM(7)-06.

PLAN SHEET 1872 (ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC)) -
REVISED NOTE 3 AND DELETED NOTE 4 UNDER SECTION III

PLAN SHEET 1883 (SW3P LAYOUT PHASE 1) -
REVISED SHAPE OF "ENVIRONMENTALLY SENSITIVE AREA".

PLAN SHEET 1899 (SW3P LAYOUT PHASE 2) -
REVISED SHAPE OF "ENVIRONMENTALLY SENSITIVE AREA".

PLAN SHEET 1915 (SW3P LAYOUT PHASE 3) -
REVISED SHAPE OF "ENVIRONMENTALLY SENSITIVE AREA".

PLAN SHEET 1922 (SW3P LAYOUT PHASE 4) -
REVISED SHAPE OF "ENVIRONMENTALLY SENSITIVE AREA".

PLAN SHEET 1938 (SW3P LAYOUT PHASE 5) -
REVISED SHAPE OF "ENVIRONMENTALLY SENSITIVE AREA".

PLAN SHEET 1954 (SW3P LAYOUT PHASE 6) -
REVISED SHAPE OF "ENVIRONMENTALLY SENSITIVE AREA".

PLAN SHEET 1960 (HAZMAT TRAP 1 SW SALADO CREEK) -
REVISED EMBANKMENT TYPE.

PLAN SHEET 1961 (HAZMAT TRAP 2 SE SALADO CREEK) -
REVISED EMBANKMENT TYPE.

PLAN SHEET 1962 (HAZMAT TRAP 3 SW QUAIL CREEK) -
REVISED EMBANKMENT TYPE.

PLAN SHEET 1963 (HAZMAT TRAP 4 SE QUAIL CREEK) -
REVISED EMBANKMENT TYPE.

PLAN SHEET 1964 (HAZMAT TRAP 5 SW BEITEL CREEK) -
REVISED EMBANKMENT TYPE.

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	100	2002	001	PREPARING ROW DOLLARS and CENTS	STA	175.100	1
	110	2001		EXCAVATION (ROADWAY) DOLLARS and CENTS	CY	205,732.000	2
	132	2003		EMBANKMENT (FINAL)(ORD COMP)(TY B) DOLLARS and CENTS	CY	153,146.700	3
	132	2028		EMBANK (FINAL)(DC)(TY C) CSBE DOLLARS and CENTS	CY	973.000	4
	161	2005		COMPOST MANUF TOPSOIL (PB) (4") DOLLARS and CENTS	SY	414.000	5
	161	2014		COMPOST MANUF TOPSOIL (BOS OR PB) (4") DOLLARS and CENTS	SY	75,339.700	6
	162	2002		BLOCK SODDING DOLLARS and CENTS	SY	75,753.700	7
	164	2041		DRILL SEEDING (TEMP) (WARM) DOLLARS and CENTS	SY	39,898.000	8
	164	2043		DRILL SEEDING (TEMP) (COOL) DOLLARS and CENTS	SY	39,898.000	9
	168	2001		VEGETATIVE WATERING DOLLARS and CENTS	MG	4,520.382	10
	316	2028		ASPH(AC-5 OR 10,CRS/HFRS-2,RS/CRS-1P) DOLLARS and CENTS	GAL	132,677.000	11

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	316	2365		AGGREGATE (TY B GR 4) DOLLARS and CENTS	CY	4,393.000	12
	341	2004		D-GR HMA(QCQA) TY-A PG64-22 DOLLARS and CENTS	TON	229,847.000	13
	341	2034		D-GR HMA(QCQA) TY-C PG64-22 DOLLARS and CENTS	TON	33,430.000	14
	341	2063		D-GR HMA(QCQA) TY-C SAC-A PG76-22 DOLLARS and CENTS	TON	47,579.000	15
	354	2026		PLANE ASPH CONC PAV(6" TO 8") DOLLARS and CENTS	SY	94,982.000	16
	354	2032		PLANE ASPH CONC PAV(12" TO 24") DOLLARS and CENTS	SY	29,015.000	17
	354	2045		PLANE ASPH CONC PAV (2") DOLLARS and CENTS	SY	122,722.000	18
	354	2056		PLAN & TEXT CONC PAV (2" TO 6") DOLLARS and CENTS	SY	79,513.000	19
	400	2002		STRUCT EXCAV (BOX) DOLLARS and CENTS	CY	8,842.000	20
	400	2005		CEM STABIL BKFL DOLLARS and CENTS	CY	1,902.100	21
	400	2006		CUT & RESTORING PAV DOLLARS and CENTS	SY	8,013.000	22

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	401	2001		FLOWABLE BACKFILL DOLLARS and CENTS	CY	21,257.600	23
	402	2001		TRENCH EXCAVATION PROTECTION DOLLARS and CENTS	LF	54,815.400	24
	403	2001		TEMPORARY SPL SHORING DOLLARS and CENTS	SF	99,383.000	25
	416	2001	001	DRILL SHAFT (18 IN) DOLLARS and CENTS	LF	629.000	26
	416	2002	001	DRILL SHAFT (24 IN) DOLLARS and CENTS	LF	3,585.000	27
	416	2003	001	DRILL SHAFT (30 IN) DOLLARS and CENTS	LF	3,590.000	28
	416	2004	001	DRILL SHAFT (36 IN) DOLLARS and CENTS	LF	6,000.000	29
	416	2006	001	DRILL SHAFT (48 IN) DOLLARS and CENTS	LF	28,462.000	30
	416	2015	001	DRILL SHAFT (NON-REINFORCED)(12 IN) DOLLARS and CENTS	LF	189.000	31
	416	2018	001	DRILL SHAFT (SIGN MTS)(24 IN) DOLLARS and CENTS	LF	36.000	32
	416	2020	001	DRILL SHAFT (SIGN MTS)(36 IN) DOLLARS and CENTS	LF	90.000	33

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	416	2022	001	DRILL SHAFT (SIGN MTS)(48 IN) DOLLARS and CENTS	LF	80.000	34
	416	2023	001	DRILL SHAFT (SIGN MTS)(54 IN) DOLLARS and CENTS	LF	56.000	35
	416	2029	001	DRILL SHAFT (RDWY ILL POLE) (30 IN) DOLLARS and CENTS	LF	598.000	36
	416	2031	001	DRILL SHAFT (TRF SIG POLE) (30 IN) DOLLARS and CENTS	LF	45.200	37
	416	2032	001	DRILL SHAFT (TRF SIG POLE) (36 IN) DOLLARS and CENTS	LF	252.200	38
	420	2001	003	CL A CONC (MISC) DOLLARS and CENTS	CY	4,223.000	39
	420	2003	003	CL C CONC (ABUT) DOLLARS and CENTS	CY	1,330.500	40
	420	2004	003	CL C CONC (BENT) DOLLARS and CENTS	CY	1,495.200	41
	420	2006	003	CL C CONC (RAIL FOUNDATION) DOLLARS and CENTS	CY	2,247.000	42
	420	2013	003	CL C CONC (MISC) DOLLARS and CENTS	CY	626.300	43
	420	2017	003	CL C CONC (BENT)(MASS PLACEMENT) DOLLARS and CENTS	CY	4,906.600	44

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	420	2018	003	CL C CONC (FOOTING)(MASS PLACEMENT) DOLLARS and CENTS	CY	1,745.500	45
	420	2029	003	CL S CONC (SLAB) DOLLARS and CENTS	CY	1,668.800	46
	420	2031	003	CL S CONC (SHEAR KEY) DOLLARS and CENTS	CY	585.100	47
	420	2033	003	CL S CONC (APPR SLAB) DOLLARS and CENTS	CY	2,287.700	48
	420	2034	003	CL S CONC (BRIDGE SDWLK) DOLLARS and CENTS	CY	256.500	49
	420	2049	003	CL S CONC (BRIDGE MEDIAN) DOLLARS and CENTS	CY	31.200	50
	420	2091		CL B CONC (MISC) DOLLARS and CENTS	CY	28.000	51
	422	2001		REINF CONC SLAB DOLLARS and CENTS	SF	298,730.000	52
	423	2001		RETAINING WALL (MSE) DOLLARS and CENTS	SF	138,800.000	53
	423	2005		RETAINING WALL (TEMP WALL) DOLLARS and CENTS	SF	32,816.000	54
	423	2007		RETAINING WALL (SPREAD FOOTING) DOLLARS and CENTS	SF	189.400	55

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	423	2011		RETAINING WALL (DRILL SHAFT)(FACIA) DOLLARS and CENTS	SF	45,367.000	56
	423	2015		RETAINING WALL (TY E) DOLLARS and CENTS	SF	2,784.000	57
	425	2003		PRESTR CONC BEAM (TY C) DOLLARS and CENTS	LF	6,485.610	58
	425	2004		PRESTR CONC BEAM (TY IV) DOLLARS and CENTS	LF	36,453.540	59
	425	2006		PRESTR CONC BOX BEAM (4B20) DOLLARS and CENTS	LF	3,343.540	60
	425	2007		PRESTR CONC BOX BEAM (5B20) DOLLARS and CENTS	LF	6,138.160	61
	425	2010		PRESTR CONC BOX BEAM (4B34) DOLLARS and CENTS	LF	1,083.040	62
	425	2011		PRESTR CONC BOX BEAM (5B34) DOLLARS and CENTS	LF	5,631.790	63
	425	2014		PRESTR CONC SLAB BEAM (4SB12) DOLLARS and CENTS	LF	689.150	64
	425	2015		PRESTR CONC SLAB BEAM (5SB12) DOLLARS and CENTS	LF	196.900	65
	425	2016		PRESTR CONC SLAB BEAM (4SB15) DOLLARS and CENTS	LF	1,404.750	66

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	425	2017		PRESTR CONC SLAB BEAM (5SB15) DOLLARS and CENTS	LF	280.950	67
	425	2050		PRESTR CONC BOX (4B34)(MOD) DOLLARS and CENTS	LF	433.220	68
	427	2002		CONCETE PAINT FINISH DOLLARS and CENTS	SF	9,371.000	69
	428	2001		CONC SURF TREAT (CLASS I) DOLLARS and CENTS	SY	47,298.000	70
	429	2001		CONC STRUCT REPAIR DOLLARS and CENTS	SF	41.000	71
	430	2002		CL C CONC FOR EXT STR (ABUT) DOLLARS and CENTS	CY	111.400	72
	430	2004		CL S CONC FOR EXT STR (SLAB) DOLLARS and CENTS	CY	533.500	73
	432	2001		RIPRAP (CONC)(4 IN) DOLLARS and CENTS	CY	455.000	74
	432	2027		RIPRAP (SPECIAL) DOLLARS and CENTS	CY	1,199.800	75
	432	2032		RIPRAP (CONC)(EXPOSED AGGREGATE) DOLLARS and CENTS	CY	32.100	76
	432	2038		RIPRAP (CONC) (CL A) DOLLARS and CENTS	CY	754.400	77

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	432	2039		RIPRAP (MOW STRIP)(4 IN) and DOLLARS CENTS	CY	54.300	78
	432	2050		RIPRAP (CONC)(CL B)(5 IN) and DOLLARS CENTS	CY	674.000	79
	432	2066		RIPRAP (CONC)(CL B) and DOLLARS CENTS	CY	2,115.200	80
	442	2005	005	STR STL (MISCELLANEOUS) and DOLLARS CENTS	LB	4,352.000	81
	446	2001		CLEAN & PAINT EXIST STR (SYSTEM I) and DOLLARS CENTS	LS	1.000	82
	450	2003		RAIL (TY T203) and DOLLARS CENTS	LF	2,398.500	83
	450	2013		RAIL (TY SSTR) and DOLLARS CENTS	LF	43,057.300	84
	450	2018		RAIL (TY C411) and DOLLARS CENTS	LF	549.800	85
	450	2025		RAIL (TY PR1) and DOLLARS CENTS	LF	819.300	86
	450	2026		RAIL (TY PR2) and DOLLARS CENTS	LF	1,692.000	87
	450	2028		RAIL (TY C411)(MOD) and DOLLARS CENTS	LF	260.600	88

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	450	2030		RAIL(TY SSTR)(RETROFIT) and DOLLARS CENTS	LF	616.600	89
	450	2097		RAIL (TY C203)(MOD) and DOLLARS CENTS	LF	1,233.500	90
	454	2002		SEALED EXPANSION JOINT (4 IN)(SEJ-P) and DOLLARS CENTS	LF	2,752.600	91
	454	2004		ARMOR JOINT and DOLLARS CENTS	LF	327.000	92
	454	2006		HEADER TYPE EXPANSION JOINT and DOLLARS CENTS	LF	514.000	93
	460	2003		CMP (GAL STL 18 IN) and DOLLARS CENTS	LF	284.000	94
	460	2008		CMP (GAL STL 42 IN) and DOLLARS CENTS	LF	2,976.540	95
	462	2001		CONC BOX CULV (3 FT X 2 FT) and DOLLARS CENTS	LF	155.000	96
	462	2002		CONC BOX CULV (3 FT X 3 FT) and DOLLARS CENTS	LF	1,170.000	97
	462	2003		CONC BOX CULV (4 FT X 2 FT) and DOLLARS CENTS	LF	168.000	98
	462	2004		CONC BOX CULV (4 FT X 3 FT) and DOLLARS CENTS	LF	726.040	99

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	462	2005		CONC BOX CULV (4 FT X 4 FT) and DOLLARS CENTS	LF	2,115.870	100
	462	2007		CONC BOX CULV (5 FT X 3 FT) and DOLLARS CENTS	LF	1,292.000	101
	462	2008		CONC BOX CULV (5 FT X 4 FT) and DOLLARS CENTS	LF	40.000	102
	462	2010		CONC BOX CULV (6 FT X 3 FT) and DOLLARS CENTS	LF	20.000	103
	462	2011		CONC BOX CULV (6 FT X 4 FT) and DOLLARS CENTS	LF	456.000	104
	462	2014		CONC BOX CULV (7 FT X 3 FT) and DOLLARS CENTS	LF	4.690	105
	462	2015		CONC BOX CULV (7 FT X 4 FT) and DOLLARS CENTS	LF	532.000	106
	462	2019		CONC BOX CULV (8 FT X 4 FT) and DOLLARS CENTS	LF	208.660	107
	462	2021		CONC BOX CULV (8 FT X 6 FT) and DOLLARS CENTS	LF	337.370	108
	462	2025		CONC BOX CULV (9 FT X 6 FT) and DOLLARS CENTS	LF	1,218.780	109
	462	2026		CONC BOX CULV (9 FT X 7 FT) and DOLLARS CENTS	LF	174.760	110

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	462	2064		CONC BOX CULV (9 FT X 6 FT)(MOD) DOLLARS and CENTS	LF	500.000	111
	464	2003		RC PIPE (CL III)(18 IN) DOLLARS and CENTS	LF	19,263.000	112
	464	2005		RC PIPE (CL III)(24 IN) DOLLARS and CENTS	LF	8,346.000	113
	464	2007		RC PIPE (CL III)(30 IN) DOLLARS and CENTS	LF	3,306.000	114
	464	2009		RC PIPE (CL III)(36 IN) DOLLARS and CENTS	LF	1,892.000	115
	464	2010		RC PIPE (CL III)(42 IN) DOLLARS and CENTS	LF	1,659.000	116
	464	2011		RC PIPE (CL III)(48 IN) DOLLARS and CENTS	LF	185.000	117
	464	2021		RC PIPE (CL IV)(18 IN) DOLLARS and CENTS	LF	326.000	118
	464	2022		RC PIPE (CL IV)(24 IN) DOLLARS and CENTS	LF	447.000	119
	465	2001		INLET (COMPL)(TY C) DOLLARS and CENTS	EA	79.000	120
	465	2005		MANH (COMPL)(TY M) DOLLARS and CENTS	EA	1.000	121

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	465	2013		MANH (COMPL)(TY A) and DOLLARS CENTS	EA	36.000	122
	465	2020		INLET (COMPL)(CURB)(TY II) and DOLLARS CENTS	EA	8.000	123
	465	2091		MANH (COMPL)(JUNCT BOX)(SPL) and DOLLARS CENTS	EA	6.000	124
	465	2092		MANH (COMPL)(TY 1) and DOLLARS CENTS	EA	111.000	125
	465	2094		MANH (COMPL)(TY 2)(PIPE RISER) and DOLLARS CENTS	EA	2.000	126
	465	2110		INLET (COMPL)(ARMOR CURB SLOT) and DOLLARS CENTS	EA	5.000	127
	465	2143		INLET (COMPL)(TRAFFIC)(TY X-1) and DOLLARS CENTS	EA	2.000	128
	465	2144		INLET (COMPL)(TRAFFIC)(TY X-2) and DOLLARS CENTS	EA	1.000	129
	465	2145		INLET (COMPL)(TRAFFIC)(TY X-3) and DOLLARS CENTS	EA	3.000	130
	465	2146		INLET (COMPL)(TRAFFIC)(TY X-4) and DOLLARS CENTS	EA	1.000	131
	465	2148		INLET (COMPL)(TRAFFIC)(TY X-6) and DOLLARS CENTS	EA	2.000	132

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	465	2188		INLET (COMPL)(DROP)(TY Y-1) and DOLLARS CENTS	EA	7.000	133
	465	2189		INLET (COMPL)(DROP)(TY Y-1A) and DOLLARS CENTS	EA	6.000	134
	465	2190		INLET (COMPL)(DROP)(TY W-1) and DOLLARS CENTS	EA	9.000	135
	465	2191		INLET (COMPL)(DROP)(TY Y-2) and DOLLARS CENTS	EA	3.000	136
	465	2192		INLET EXT (TY I-E) and DOLLARS CENTS	EA	10.000	137
	465	2193		MANH (COMPL)(TY 2) and DOLLARS CENTS	EA	13.000	138
	465	2194		MANH (COMPL)(TY 4) and DOLLARS CENTS	EA	10.000	139
	465	2195		INLET (COMPL)(CURB)(TY 1) and DOLLARS CENTS	EA	53.000	140
	465	2253		INLET (COMPL)(CTB)(TY M) and DOLLARS CENTS	EA	19.000	141
	465	2254		INLET (COMPL)(DROP)(TY Y-3) and DOLLARS CENTS	EA	2.000	142
	465	2289		MANH (COMPL)(TY 3) and DOLLARS CENTS	EA	6.000	143

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	465	2473		INLET EXT (TY II-E) and DOLLARS CENTS	EA	10.000	144
	465	2474		INLET EXT (TY C-E) and DOLLARS CENTS	EA	24.000	145
	465	2475		INLET (COMP)(DROP)(TY 6) and DOLLARS CENTS	EA	1.000	146
	465	2476		INLET (COMPL)(TY M)(MOD) and DOLLARS CENTS	EA	53.000	147
	465	2477		INLET (COMP)(DROP)(TY W-2) and DOLLARS CENTS	EA	1.000	148
	465	2478		INLET (COMPL)(TY RWIR) and DOLLARS CENTS	EA	120.000	149
	465	2479		MANH (COMPL)(TY 5) and DOLLARS CENTS	EA	7.000	150
	465	2480		INLET (COMPL)(TY G-1) and DOLLARS CENTS	EA	16.000	151
	465	2481		INLET (COMPL)(TY G-2) and DOLLARS CENTS	EA	6.000	152
	465	2482		INLET (COMPL)(TY G-3) and DOLLARS CENTS	EA	7.000	153
	465	2483		INLET (COMP)(TRAFFIC)(TY W-5) and DOLLARS CENTS	EA	1.000	154

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	466	2050		WINGWALL (PW)(HW=6 FT) and DOLLARS CENTS	EA	2.000	155
	466	2054		WINGWALL (PW)(HW=10 FT) and DOLLARS CENTS	EA	1.000	156
	466	2055		WINGWALL (PW)(HW=11 FT) and DOLLARS CENTS	EA	1.000	157
	467	2224		SET (TY II)(24 IN)(RCP)(4:1)(C) and DOLLARS CENTS	EA	1.000	158
	471	2003		GRATE & FRAME and DOLLARS CENTS	EA	33.000	159
	476	2011		JACK BOR OR TUN PIPE(18 IN)(RC)(CL IV) and DOLLARS CENTS	LF	211.000	160
	476	2012		JACK BOR OR TUN PIPE(24 IN)(RC)(CL IV) and DOLLARS CENTS	LF	247.000	161
	476	2013		JACK BOR OR TUN PIPE(30 IN)(RC)(CL IV) and DOLLARS CENTS	LF	144.000	162
	476	2030		JACK BOR OR TUN PIPE(72 IN)(RC)(CL V) and DOLLARS CENTS	LF	665.650	163
	476	2045		JACK OR TUN BOX CULV (4 FT X 4 FT) and DOLLARS CENTS	LF	41.000	164
	476	2046		JACK OR TUN BOX CULV (5 FT X 3 FT) and DOLLARS CENTS	LF	135.000	165

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	481	2017		PVC PIPE (SCH 40)(16 IN) and DOLLARS CENTS	LF	154.600	166
	496	2001		REMOV STR (BOX CULVERT) and DOLLARS CENTS	EA	1.000	167
	496	2002		REMOV STR (INLET) and DOLLARS CENTS	EA	62.000	168
	496	2003		REMOV STR (MANHOLE) and DOLLARS CENTS	EA	8.000	169
	496	2010		REMOV STR (BRIDGE 100-499 FT LENGTH) and DOLLARS CENTS	EA	7.000	170
	496	2011		REMOV STR (BRIDGE 500-999 FT LENGTH) and DOLLARS CENTS	EA	4.000	171
	499	2001		ADJUST STL SHOES and DOLLARS CENTS	EA	1.000	172
	500	2001		MOBILIZATION and DOLLARS CENTS	LS	1.000	173
	502	2001		BARRICADES, SIGNS AND TRAFFIC HAN- DLING and DOLLARS CENTS	MO	42.000	174
	506	2002		ROCK FILTER DAMS (INSTALL) (TY 2) and DOLLARS CENTS	LF	47.000	175

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	506	2004		ROCK FILTER DAMS (INSTALL) (TY 4) DOLLARS and CENTS	LF	864.000	176
	506	2007		ROCK FILTER DAMS (INSTALL) (TY 3) DOLLARS and CENTS	CY	42.000	177
	506	2009		ROCK FILTER DAMS (REMOVE) DOLLARS and CENTS	LF	953.000	178
	506	2016		CONSTRUCTION EXITS (INSTALL) (TY 1) DOLLARS and CENTS	SY	2,573.000	179
	506	2019		CONSTRUCTION EXITS (REMOVE) DOLLARS and CENTS	SY	2,573.000	180
	506	2024		BACKHOE WORK (EROSION & SEDM CONT) DOLLARS and CENTS	HR	540.000	181
	506	2026		FRNT END LOADER WORK (ERSN & SEDM CONT) DOLLARS and CENTS	HR	540.000	182
	506	2034		TEMPORARY SEDIMENT CONTROL FENCE DOLLARS and CENTS	LF	11,444.000	183
	506	2036		SANDBAGS FOR EROSION CONTROL (6 IN) DOLLARS and CENTS	LF	6,646.000	184
	508	2002		CONSTRUCTING DETOURS DOLLARS and CENTS	SY	48,426.000	185

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	512	2003		PORT CTB (FUR & INST)(SAFETY SH)(TY 3) DOLLARS and CENTS	LF	20.000	186
	512	2008		PORT CTB (FUR & INST)(LOW PROF)(TY 1) DOLLARS and CENTS	LF	17,146.000	187
	512	2009		PORT CTB (FUR & INST)(LOW PROF)(TY 2) DOLLARS and CENTS	LF	1,038.000	188
	512	2026		PORT CTB (MOVE)(LOW PROF)(TY 1) DOLLARS and CENTS	LF	53,364.000	189
	512	2027		PORT CTB (MOVE)(LOW PROF)(TY 2) DOLLARS and CENTS	LF	2,080.000	190
	512	2044		PORT CTB (REMOVE)(LOW PROF)(TY 1) DOLLARS and CENTS	LF	17,146.000	191
	512	2045		PORT CTB (REMOVE)(LOW PROF)(TY 2) DOLLARS and CENTS	LF	1,038.000	192
	512	2065		PCTB(F&I) (SNGL SLP TY2)OR(F-SHAPE TY1) DOLLARS and CENTS	LF	41,831.000	193
	512	2066		PCTB(MOVE)(SNGL SLP TY2)OR(F-SHAPE TY1) DOLLARS and CENTS	LF	107,661.000	194
	512	2067		PCTB(RMOV)(SNGL SLP TY2)OR(F-SHAPE TY1) DOLLARS and CENTS	LF	41,831.000	195

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	514	2004		PERM CONC TRF BARR (SGL SLP)(TY 1)(42") DOLLARS and CENTS	LF	1,930.700	196
	514	2005		PERM CONC TRF BARR (SGL SLP)(TY 2)(42") DOLLARS and CENTS	LF	8,561.000	197
	514	2006		PERM CONC TRF BARR (SGL SLP)(TY 3)(42") DOLLARS and CENTS	LF	1,632.000	198
	514	2022		PERM CONC TRF BARR (SGL SLP)(TY 4)(42") DOLLARS and CENTS	LF	570.000	199
	514	2035		PCTB(SGL SLP)(SPLIT BARRIER)(SPL)(42") DOLLARS and CENTS	LF	608.000	200
	514	2036		PERM CONC TRF BARR(SGL SLP)(TY 6)(42") DOLLARS and CENTS	LF	3,526.000	201
	514	2037		PERM CONC TRF BARR (SGL SLP)(TY 5)(36") DOLLARS and CENTS	LF	513.000	202
	528	2001		COLORED TEXTURED CONC (4") DOLLARS and CENTS	SY	21,726.600	203
	529	2014		CONC CURB (TY C) DOLLARS and CENTS	LF	375.000	204
	529	2036		CONC CURB (TY A) DOLLARS and CENTS	LF	61,336.000	205
	530	2010		DRIVEWAYS (CONC) DOLLARS and CENTS	SY	11,676.000	206

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	531	2005		CURB RAMPS (TY 1) and DOLLARS CENTS	EA	12.000	207
	531	2006		CURB RAMPS (TY 2) and DOLLARS CENTS	EA	38.000	208
	531	2008		CURB RAMPS (TY 4) and DOLLARS CENTS	EA	2.000	209
	531	2010		CURB RAMPS (TY 7) and DOLLARS CENTS	EA	6.000	210
	531	2014		CURB RAMPS (TY 22) and DOLLARS CENTS	EA	4.000	211
	531	2017		CURB RAMPS (TY 21) and DOLLARS CENTS	EA	4.000	212
	531	2024		CONC SIDEWALK (5") and DOLLARS CENTS	SY	15,043.000	213
	540	2001		MTL W-BEAM GD FEN (TIM POST) and DOLLARS CENTS	LF	2,525.000	214
	540	2005		TERMINAL ANCHOR SECTION and DOLLARS CENTS	EA	13.000	215
	540	2011		MTL BEAM GD FEN TRANS (THRIE-BEAM) and DOLLARS CENTS	EA	7.000	216
	542	2001		REMOVING METAL BEAM GUARD FENCE and DOLLARS CENTS	LF	21,916.000	217

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	542	2002		REMOVING TERMINAL ANCHOR SECTION DOLLARS and CENTS	EA	66.000	218
	544	2001		GUARDRAIL END TREATMENT (INSTALL) DOLLARS and CENTS	EA	11.000	219
	544	2012		GDRAIL END TRT(REMOV)(WOOD POST)TY III DOLLARS and CENTS	EA	44.000	220
	545	2001		CRASH CUSH ATTEN (INSTL) DOLLARS and CENTS	EA	13.000	221
	545	2002		CRASH CUSH ATTEN (MOVE & RESET) DOLLARS and CENTS	EA	27.000	222
	545	2003		CRASH CUSH ATTEN (REMOVE) DOLLARS and CENTS	EA	13.000	223
	610	2019		INS RD IL AM (TY SA) 30T-8 (.25 KW)S DOLLARS and CENTS	EA	19.000	224
	610	2049		INS RD IL AM (TY SP) 48S-10-10(.4 KW)S DOLLARS and CENTS	EA	19.000	225
	610	2059		INS RD IL AM (U/P) (TY IF) (.15KW) DOLLARS and CENTS	EA	12.000	226
	610	2064		RELOCATE RD IL ASM (TRANS-BASE) DOLLARS and CENTS	EA	1.000	227

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	610	2069		REMOVE RD IL ASM (U/P) DOLLARS and CENTS	EA	20.000	228
	610	2072		REMOVE RDWY ILL ASSEM DOLLARS and CENTS	EA	158.000	229
	610	2080		INS RD IL AM (TY SA) 20T-8 (.25 KW)S DOLLARS and CENTS	EA	1.000	230
	610	2081		INS RD IL AM (TY SP) 30S-8 (.25 KW)S DOLLARS and CENTS	EA	2.000	231
	610	2082		INS RD IL AM (TY SA)48S-10-10(.4 KW)S DOLLARS and CENTS	EA	1.000	232
	617	2003		TEMP RD IL (TIMBER POLES W/ARMS) DOLLARS and CENTS	MO	36.000	233
	618	2014		CONDT (PVC) (SCHD 40) (1 1/4") DOLLARS and CENTS	LF	555.000	234
	618	2018		CONDT (PVC) (SCHD 40) (2") DOLLARS and CENTS	LF	30,210.000	235
	618	2034		CONDT (PVC) (SCHD 80) (2") DOLLARS and CENTS	LF	11,150.000	236
	618	2035		CONDT (PVC) (SCHD 80) (2") (BORE) DOLLARS and CENTS	LF	4,710.000	237
	618	2038		CONDT (PVC) (SCHD 80) (3") DOLLARS and CENTS	LF	1,695.000	238

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	618	2039		CONDT (PVC) (SCHD 80) (3") (BORE) DOLLARS and CENTS	LF	3,510.000	239
	618	2044		CONDT (RM) (3/4") DOLLARS and CENTS	LF	475.000	240
	618	2046		CONDT (RM) (1") DOLLARS and CENTS	LF	610.000	241
	618	2048		CONDT (RM) (1 1/4") DOLLARS and CENTS	LF	285.000	242
	618	2053		CONDT (RM) (2") (BORE) DOLLARS and CENTS	LF	2,190.000	243
	618	2066		CONDT (PVC)(SCHD 40)(3/4") DOLLARS and CENTS	LF	595.000	244
	618	2078		CONDUIT (PVC)(SCHD 40)(2")(STL ENCSE) DOLLARS and CENTS	LF	768.000	245
	618	2079		CONDUIT (PVC)(SCHD 40)(4")(STL ENCSE) DOLLARS and CENTS	LF	1,896.000	246
	618	2080		CONDUIT (PVC)(SCHD 40)(2")(CONC ENCSE) DOLLARS and CENTS	LF	344.000	247
	618	2081		CONDUIT (PVC)(SCHD 40)(4")(CONC ENCSE) DOLLARS and CENTS	LF	798.000	248
	620	2007	001	ELEC CONDR (NO. 4) BARE DOLLARS and CENTS	LF	1,905.000	249

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	620	2008	001	ELEC CONDR (NO. 4) INSULATED DOLLARS and CENTS	LF	20,210.000	250
	620	2009	001	ELEC CONDR (NO. 6) BARE DOLLARS and CENTS	LF	6,897.000	251
	620	2010	001	ELEC CONDR (NO. 6) INSULATED DOLLARS and CENTS	LF	4,025.000	252
	620	2011	001	ELEC CONDR (NO. 8) BARE DOLLARS and CENTS	LF	32,690.000	253
	620	2012	001	ELEC CONDR (NO. 8) INSULATED DOLLARS and CENTS	LF	76,750.000	254
	620	2015	001	ELEC CONDR (NO.12) BARE DOLLARS and CENTS	LF	2,425.000	255
	620	2016	001	ELEC CONDR (NO.12) INSULATED DOLLARS and CENTS	LF	6,510.000	256
	624	2007		GROUND BOX TY A (122311) DOLLARS and CENTS	EA	21.000	257
	624	2008		GROUND BOX TY A (122311) W/APRON DOLLARS and CENTS	EA	76.000	258
	624	2010		GROUND BOX TY B (122322) W/APRON DOLLARS and CENTS	EA	3.000	259
	624	2014		GROUND BOX TY D (162922) W/APRON DOLLARS and CENTS	EA	60.000	260

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	628	2036		ELC SRV TY A 240/480 100 (NS)SS(E)TP(O) DOLLARS and CENTS	EA	5.000	261
	628	2065		ELC SRV TY D 120/240 060 (NS)GS(N)TP(O) DOLLARS and CENTS	EA	12.000	262
	628	2089		ELC SRV TY D 120/240 070 (NS)GS(N)TP(O) DOLLARS and CENTS	EA	1.000	263
	628	2116		ELC SRV TY D 120/240 100 (NS)GS(N)TP(O) DOLLARS and CENTS	EA	3.000	264
	628	2148		ELC SRV TY T 120/240 000 (NS)GS(N)SP(U) DOLLARS and CENTS	EA	4.000	265
	628	2158		REMOVE ELECTRICAL SERVICES DOLLARS and CENTS	EA	17.000	266
	636	2001		ALUMINUM SIGNS (TY A) DOLLARS and CENTS	SF	533.780	267
	636	2002		ALUMINUM SIGNS (TY G) DOLLARS and CENTS	SF	1,064.500	268
	636	2003		ALUMINUM SIGNS (TY O) DOLLARS and CENTS	SF	4,987.250	269
	636	2006		REFURBISH ALUMINUM SIGNS (TY O) DOLLARS and CENTS	EA	1.000	270
	644	2022		INS SM RD SN SUP&AM TY S80(1) SA(P) DOLLARS and CENTS	EA	121.000	271

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	644	2025		INS SM RD SN SUP&AM TY S80(1) SA(T) DOLLARS and CENTS	EA	82.000	272
	644	2027		INS SM RD SN SUP&AM TY S80(1) SA(U) DOLLARS and CENTS	EA	7.000	273
	644	2028		INS SM RD SN SUP&AM TY S80(1)SA(U-1EXT) DOLLARS and CENTS	EA	1.000	274
	644	2058		RELOCATE SM RD SN SUP & AM TY S80 DOLLARS and CENTS	EA	31.000	275
	644	2060		REMOVE SM RD SN SUP & AM DOLLARS and CENTS	EA	344.000	276
	647	2001		INSTALL LRSS (STRUCT STEEL) DOLLARS and CENTS	LB	6,342.000	277
	647	2002		RELOCATE LRSA DOLLARS and CENTS	EA	3.000	278
	647	2003		REMOVE LRSA DOLLARS and CENTS	EA	26.000	279
	650	2025		INS OH SN SUP(30 FT BAL TEE) DOLLARS and CENTS	EA	2.000	280
	650	2058		INS OH SN SUP(55 FT BRDG) DOLLARS and CENTS	EA	1.000	281
	650	2063		INS OH SN SUP(60 FT BRDG) DOLLARS and CENTS	EA	1.000	282

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	650	2068		INS OH SN SUP(65 FT BRDG) and DOLLARS CENTS	EA	1.000	283
	650	2073		INS OH SN SUP(70 FT BRDG) and DOLLARS CENTS	EA	1.000	284
	650	2078		INS OH SN SUP(75 FT BRDG) and DOLLARS CENTS	EA	1.000	285
	650	2088		INS OH SN SUP(85 FT BRDG) and DOLLARS CENTS	EA	4.000	286
	650	2098		INS OH SN SUP(95 FT BRDG) and DOLLARS CENTS	EA	9.000	287
	650	2113		INS OH SN SUP(110 FT BRDG) and DOLLARS CENTS	EA	1.000	288
	650	2173		REMOVE OVERHD SIGN SUP and DOLLARS CENTS	EA	15.000	289
	658	2255		INSTL DEL ASSM (D-SW)SZ 2(WC) GND and DOLLARS CENTS	EA	41.000	290
	658	2258		INSTL DEL ASSM (D-SW)SZ (TYC)CTB and DOLLARS CENTS	EA	111.000	291
	658	2275		INSTL DEL ASSM (D-SY)SZ 2(WC)GND and DOLLARS CENTS	EA	28.000	292
	658	2277		INSTL DEL ASSM (D-SY)SZ (TYC)CTB and DOLLARS CENTS	EA	7.000	293

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	658	2300		INSTL DEL ASSM (D-DW)SZ 2(WC) GND DOLLARS and CENTS	EA	45.000	294
	658	2315		INSTL OM ASSM (OM-2Y)(WC) GND DOLLARS and CENTS	EA	1.000	295
	658	2318		INSTL OM ASSM (OM-2Z)(FLX)SRF DOLLARS and CENTS	EA	68.000	296
	662	2050		WK ZN PAV MRK REMOV (REFL) TY I-A DOLLARS and CENTS	EA	11,164.000	297
	662	2052		WK ZN PAV MRK REMOV (REFL) TY I-C DOLLARS and CENTS	EA	14,262.000	298
	662	2056		WK ZN PAV MRK REMOV (REFL) TY II-C-R DOLLARS and CENTS	EA	7,177.000	299
	662	2064		WK ZN PAV MRK REMOV (W) 4" (BRK) DOLLARS and CENTS	LF	67,437.000	300
	662	2065		WK ZN PAV MRK REMOV (W) 4" (DOT) DOLLARS and CENTS	LF	503.000	301
	662	2067		WK ZN PAV MRK REMOV (W) 4" (SLD) DOLLARS and CENTS	LF	186,418.000	302
	662	2074		WK ZN PAV MRK REMOV (W) 8" (LNDP) DOLLARS and CENTS	LF	453.000	303
	662	2075		WK ZN PAV MRK REMOV (W) 8" (SLD) DOLLARS and CENTS	LF	35,719.000	304

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	662	2079		WK ZN PAV MRK REMOV (W) 24" (SLD) DOLLARS and CENTS	LF	528.000	305
	662	2084		WK ZN PAV MRK REMOV (W) (ARROW) DOLLARS and CENTS	EA	79.000	306
	662	2085		WK ZN PAV MRK REMOV (W) (DBL ARROW) DOLLARS and CENTS	EA	31.000	307
	662	2094		WK ZN PAV MRK REMOV (W) (WORD) DOLLARS and CENTS	EA	83.000	308
	662	2099		WK ZN PAV MRK REMOV (Y) 4" (SLD) DOLLARS and CENTS	LF	215,191.000	309
	662	2113		WK ZN PAV MRK SHT TERM (TAB) TY W DOLLARS and CENTS	EA	16,000.000	310
	662	2114		WK ZN PAV MRK SHT TERM (TAB) TY Y DOLLARS and CENTS	EA	3,000.000	311
	662	2115		WK ZN PAV MRK SHT TERM (TAB) TY Y-2 DOLLARS and CENTS	EA	300.000	312
	666	2054		REFL PAV MRK TY I (W) (ARROW) (100MIL) DOLLARS and CENTS	EA	84.000	313
	666	2069		REFL PAV MRK TY I(W)(DBL ARROW)(100MIL) DOLLARS and CENTS	EA	38.000	314

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	666	2096		REFL PAV MRK TY I (W) (WORD) (100MIL) DOLLARS and CENTS	EA	84.000	315
	666	2141		REFL PAV MRK TY I (Y)(MED NOSE)(100MIL) DOLLARS and CENTS	EA	7.000	316
	666	2160		REF PAV MRK TY II (W) (ARROW) DOLLARS and CENTS	EA	84.000	317
	666	2165		REF PAV MRK TY II (W) (DBL ARROW) DOLLARS and CENTS	EA	38.000	318
	666	2173		REF PAV MRK TY II (W) (WORD) DOLLARS and CENTS	EA	84.000	319
	666	2188		REF PAV MRK TY II (Y) (MED NOSE) DOLLARS and CENTS	EA	7.000	320
	672	2014		REFL PAV MRKR TY I-R DOLLARS and CENTS	EA	252.000	321
	672	2015		REFL PAV MRKR TY II-A-A DOLLARS and CENTS	EA	354.000	322
	672	2017		REFL PAV MRKR TY II-C-R DOLLARS and CENTS	EA	6,423.000	323
	678	2001		PAV SURF PREP FOR MRK (4") DOLLARS and CENTS	LF	147,412.000	324
	678	2003		PAV SURF PREP FOR MRK (8") DOLLARS and CENTS	LF	14,374.000	325

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	678	2004		PAV SURF PREP FOR MRK (12") DOLLARS and CENTS	LF	3,604.000	326
	678	2006		PAV SURF PREP FOR MRK (24") DOLLARS and CENTS	LF	8,870.000	327
	678	2007		PAV SURF PREP FOR MRK (ARROW) DOLLARS and CENTS	EA	84.000	328
	678	2008		PAV SURF PREP FOR MRK (DBL ARROW) DOLLARS and CENTS	EA	38.000	329
	678	2012		PAV SURF PREP FOR MRK (MED NOSE) DOLLARS and CENTS	EA	7.000	330
	678	2018		PAV SURF PREP FOR MRK (WORD) DOLLARS and CENTS	EA	84.000	331
	680	2003		INSTALL HWY TRF SIG (SYSTEM) DOLLARS and CENTS	EA	4.000	332
	681	2001		TEMP TRAF SIGNALS DOLLARS and CENTS	EA	4.000	333
	682	2001		BACK PLATE (12 IN) (3 SEC) DOLLARS and CENTS	EA	51.000	334
	682	2003		BACK PLATE (12 IN) (5 SEC) DOLLARS and CENTS	EA	9.000	335
	682	2022		VEH SIG SEC (12 IN) LED (GRN ARW) DOLLARS and CENTS	EA	9.000	336

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	682	2023		VEH SIG SEC (12 IN) LED (GRN) DOLLARS and CENTS	EA	60.000	337
	682	2024		VEH SIG SEC (12 IN) LED (YEL ARW) DOLLARS and CENTS	EA	9.000	338
	682	2025		VEH SIG SEC (12 IN) LED (YEL) DOLLARS and CENTS	EA	60.000	339
	682	2027		VEH SIG SEC (12 IN) LED (RED) DOLLARS and CENTS	EA	60.000	340
	684	2028		TRF SIG CBL (TY A) (14 AWG) (2 CONDR) DOLLARS and CENTS	LF	9,009.000	341
	684	2033		TRF SIG CBL (TY A) (14 AWG) (7 CONDR) DOLLARS and CENTS	LF	6,248.000	342
	684	2035		TRF SIG CBL (TY A) (14 AWG) (9 CONDR) DOLLARS and CENTS	LF	5,967.000	343
	686	2005		INS TRF SIG PL AM(S) STR (TY B) DOLLARS and CENTS	EA	3.000	344
	686	2031		INS TRF SIG PL AM(S) 1 ARM (32') DOLLARS and CENTS	EA	4.000	345
	686	2039		INS TRF SIG PL AM(S) 1 ARM (40') DOLLARS and CENTS	EA	4.000	346
	686	2043		INS TRF SIG PL AM(S) 1 ARM (44') DOLLARS and CENTS	EA	2.000	347

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	686	2047		INS TRF SIG PL AM(S) 1 ARM (48') DOLLARS and CENTS	EA	8.000	348
	686	2143		INS TRF SIG PL AM(S) 2 ARM (40-36') DOLLARS and CENTS	EA	1.000	349
	686	2159		INS TRF SIG PL AM(S) 2 ARM (44-32') DOLLARS and CENTS	EA	1.000	350
	687	2001		PED POLE ASSEMBLY DOLLARS and CENTS	EA	10.000	351
	730	2003		SPOT MOWING DOLLARS and CENTS	AC	200.000	352
	734	2001		LITTER REMOVAL DOLLARS and CENTS	AC	100.000	353
	738	2001		CLEANING/SWEEPING (CENTER MEDIAN) DOLLARS and CENTS	CYC	84.000	354
	738	2003		CLEANING/SWEEPING (OUTSIDE MAIN LANE) DOLLARS and CENTS	CYC	72.000	355
	738	2005		CLEANING/SWEEPING (FRONTAGE ROAD) DOLLARS and CENTS	CYC	48.000	356
	4167	2001		SOUND WALL (8 FT) DOLLARS and CENTS	LF	1,960.000	357

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	5301	2002		SAN SEW (TRENCH EXCAVATION PROTECTION) DOLLARS CENTS and	LF	4,181.000	358
	5301	2004		SAN SEW (ADJUST MANHOLE) DOLLARS CENTS and	EA	8.000	359
	5301	2006		SAN SEW (CASNG)(JACK OR BORE)(STL)(30") DOLLARS CENTS and	LF	333.000	360
	5301	2007		SAN SEW (CASNG)(JACK OR BORE)(STL)(48") DOLLARS CENTS and	LF	160.000	361
	5301	2008		SAN SEW (CASNG)(OPEN CUT)(STL)(24") DOLLARS CENTS and	LF	61.000	362
	5301	2009		SAN SEW (LATERAL) (6 IN) DOLLARS CENTS and	LF	160.000	363
	5301	2010		SAN SEW (MANHOLE STRUCTURE)(COMPLETE) DOLLARS CENTS and	EA	43.000	364
	5301	2011		SAN SEW (ABANDON MANHOLE) DOLLARS CENTS and	EA	7.000	365
	5301	2012		SAN SEW (FLOWABLE BACKFILL) DOLLARS CENTS and	CY	161.200	366
	5301	2013		SAN SEW (CONC ENCSMNT,CRDLS SDDL&CLLRS) DOLLARS CENTS and	CY	122.300	367

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	5301	2014		SAN SEW (CONC DRIVEWAY) DOLLARS and CENTS	SY	108.000	368
	5301	2015		SAN SEW (CONC CURB) DOLLARS and CENTS	LF	101.000	369
	5301	2016		SAN SEW (CUT & RESTORE PAVEMENT) DOLLARS and CENTS	SY	106.000	370
	5301	2017		SAN SEW (ABANDON PIPE)(8 IN) DOLLARS and CENTS	LF	424.000	371
	5301	2018		SAN SEW (ABANDON PIPE)(12 IN) DOLLARS and CENTS	LF	1,211.000	372
	5301	2019		SAN SEW (ABANDON PIPE)(15 IN) DOLLARS and CENTS	LF	135.000	373
	5301	2020		SAN SEW (ABANDON PIPE)(30 IN) DOLLARS and CENTS	LF	626.000	374
	5301	2021		SAN SEW (TELEVISION INSPECTION) DOLLARS and CENTS	LF	11,169.000	375
	5301	2023		SAN SEW (BY-PASS PUMPING) DOLLARS and CENTS	LS	1.000	376
	5301	2029		SAN SEW (8 IN)(PVC)(SDR-26) DOLLARS and CENTS	LF	2,171.000	377
	5301	2030		SAN SEW (12 IN)(PVC)(SDR-26) DOLLARS and CENTS	LF	1,415.000	378

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	5301	2031		SAN SEW (15 IN)(PVC)(SDR-26) DOLLARS and CENTS	LF	1,546.000	379
	5301	2032		SAN SEW (30 IN)(HDPE) DOLLARS and CENTS	LF	630.000	380
	5301	2033		SAN SEW (CASNG)(JACK OR BORE)(STL)(24") DOLLARS and CENTS	LF	865.000	381
	5301	2034		SAN SEW (CLEANOUT) DOLLARS and CENTS	EA	14.000	382
	5301	2035		SAN SEW (RECONSTRUCT MANHOLES) DOLLARS and CENTS	EA	1.000	383
	5302	2001		TRENCH EXCAVATION PROTECTION DOLLARS and CENTS	LF	6,723.000	384
	5302	2005		TEMPORARY BLOW-OFF (COMPLETE) (2 IN) DOLLARS and CENTS	EA	28.000	385
	5302	2006		TEMPORARY BLOW-OFF (COMPLETE) (4 IN) DOLLARS and CENTS	EA	10.000	386
	5302	2007		HYDROSTATIC TEST DOLLARS and CENTS	EA	19.000	387
	5302	2008		GATE VALVE AND BOX (COMPLETE) (12 IN) DOLLARS and CENTS	EA	1.000	388
	5302	2009		GATE VALVE AND BOX (COMPLETE) (16 IN) DOLLARS and CENTS	EA	10.000	389

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	5302	2011		TIE-IN (COMPLETE) (16 IN) DOLLARS and CENTS	EA	24.000	390
	5302	2012		TIE-IN (COMPLETE) (20 IN) DOLLARS and CENTS	EA	10.000	391
	5302	2013		DUCTILE IRON FITTINGS DOLLARS and CENTS	TON	45.455	392
	5302	2014		BUTTTERFLY VALVE & BOX (COM- PLETE)(20") DOLLARS and CENTS	EA	1.000	393
	5302	2015		TAP SLV, VLV & BOX(COMPLT)(12" X 8") DOLLARS and CENTS	EA	1.000	394
	5302	2019		ADJUST EXIST VALVE BOX DOLLARS and CENTS	EA	44.000	395
	5302	2020		CONC ENCSMNT, CRDLS, SDDL & CLLRS DOLLARS and CENTS	CY	14.200	396
	5302	2021		FIRE HYDRNT W/6" VALVE & BOX DOLLARS and CENTS	EA	5.000	397
	5302	2022		FIRE HYDRNT W/TAP SLV & BOX (16" X 6") DOLLARS and CENTS	EA	19.000	398
	5302	2023		FIRE HYDRNT W/TAP SLV & BOX (20" X 6") DOLLARS and CENTS	EA	6.000	399

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	5302	2024		AUTO AIR RELEASE VALVE (COMPLETE)(1") DOLLARS and CENTS	EA	1.000	400
	5302	2025		AUTO AIR RELEASE VALVE (COMPLETE)(2") DOLLARS and CENTS	EA	2.000	401
	5302	2028		RELAY SHORT SERV (NEW MAIN) (6") DOLLARS and CENTS	EA	6.000	402
	5302	2029		RELAY SHORT SERV (NEW MAIN) (2") DOLLARS and CENTS	EA	4.000	403
	5302	2030		RELAY SHORT SERV (NEW MAIN) (1.5") DOLLARS and CENTS	EA	4.000	404
	5302	2031		RELAY SHORT SERV (NEW MAIN) (1") DOLLARS and CENTS	EA	3.000	405
	5302	2032		RELAY SHORT FIRE LINE SERVICE DOLLARS and CENTS	EA	3.000	406
	5302	2033		CUT AND REPLACE ASPHLTC PAVMNT DOLLARS and CENTS	SF	25,214.200	407
	5302	2036		RELOCATE ENST METER & NEW METER BOX DOLLARS and CENTS	EA	30.000	408
	5302	2040		TIE-IN (COMPLETE) (6 IN) DOLLARS and CENTS	EA	1.000	409
	5302	2041		TIE-IN (COMPLETE) (8 IN) DOLLARS and CENTS	EA	1.000	410

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	5302	2048		FLOWABLE BACKFILL DOLLARS and CENTS	CY	2,663.400	411
	5302	2050		PIPE WATER MAIN (PVC) (6") DOLLARS and CENTS	LF	31.000	412
	5302	2051		PIPE WATER MAIN (PVC) (8") DOLLARS and CENTS	LF	405.000	413
	5302	2052		PIPE WATER MAIN (PVC) (12") DOLLARS and CENTS	LF	273.000	414
	5302	2053		PIPE WATER MAIN (PVC) (16") DOLLARS and CENTS	LF	5,077.000	415
	5302	2054		PIPE WATER MAIN (PVC) (20") DOLLARS and CENTS	LF	1,143.000	416
	5302	2055		PIPE WATER MAIN STL CASING (24") DOLLARS and CENTS	LF	119.000	417
	5302	2056		PIPE WATER MAIN STL CASING (30") DOLLARS and CENTS	LF	563.000	418
	5302	2057		PIPE WATER MAIN STL CASING (36") DOLLARS and CENTS	LF	120.000	419
	5302	2058		JACK, BORE OR TUN CASSING (STL)(24") DOLLARS and CENTS	LF	124.000	420
	5302	2059		JACK, BORE OR TUN CASSING (STL)(30") DOLLARS and CENTS	LF	405.000	421

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	5302	2060		GATE VALVE AND BOX (COMPLETE) (6 IN) DOLLARS and CENTS	EA	1.000	422
	5302	2061		GATE VALVE AND BOX (COMPLETE) (8 IN) DOLLARS and CENTS	EA	1.000	423
	5302	2062		TAP SLV, VLV & BOX(COMPLT)(20" X 16") DOLLARS and CENTS	EA	1.000	424
	5302	2063		TAP SLV, VLV & BOX(COMPLT)(16" X 8") DOLLARS and CENTS	EA	1.000	425
	5302	2064		CUT IN TEE (COMPLETE) (12" X 12") DOLLARS and CENTS	EA	1.000	426
	5302	2065		CUT IN TEE (COMPLETE) (16" X 16") DOLLARS and CENTS	EA	1.000	427
	5327	2001		NGP (MAIN)(PLASTIC)(2") DOLLARS and CENTS	LF	155.000	428
	5327	2002		NGP (MAIN)(PLASTIC)(4") DOLLARS and CENTS	LF	2,343.000	429
	5327	2003		NGP (MAIN)(PLASTIC)(6") DOLLARS and CENTS	LF	630.000	430
	5327	2004		NGP (CASING)(STEEL)(8") DOLLARS and CENTS	LF	765.000	431
	5327	2005		NGP (INSERT)(PLASTIC)(4") DOLLARS and CENTS	LF	437.000	432

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	5327	2006		NGP (INSERT)(PLASTIC)(6") DOLLARS and CENTS	LF	328.000	433
	5327	2008		NGP (SHT/LNG SRVC)(EXST MN TO PRPT LN) DOLLARS and CENTS	EA	6.000	434
	5327	2009		NGP (SHT/LNG SRVC)(NEW MAIN TO METER) DOLLARS and CENTS	EA	2.000	435
	5327	2010		NGP (SHT/LNG SRVC)(EXST MN TO METER) DOLLARS and CENTS	EA	11.000	436
	5327	2011		NGP (CAPPING SERVICE AT MAIN) DOLLARS and CENTS	EA	1.000	437
	6006	2001		SPREAD SPECTRUM RADIO DOLLARS and CENTS	EA	8.000	438
	6006	2003		HELIAX CABLE DOLLARS and CENTS	LF	773.000	439
	6006	2004		ANTENNA (OMNI-DIRECTIONAL) DOLLARS and CENTS	EA	4.000	440
	6006	2005		ANTENNA (UNI-DIRECTIONAL) DOLLARS and CENTS	EA	4.000	441
	6007	2001		REMOVING TRAFFIC SIGNALS DOLLARS and CENTS	EA	4.000	442
	6008	2001		SHIFT OVERHEAD SIGN PANELS DOLLARS and CENTS	EA	5.000	443

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	6008	2002		REMOVE OVERHEAD SIGN PANELS DOLLARS and CENTS	EA	1.000	444
	6009	2001		ITS SYSTEM SUPPORT EQUIPMENT DOLLARS and CENTS	LS	1.000	445
	6010	2031		COMM CABLE (22 AWG)(6 PAIR) DOLLARS and CENTS	LF	1,930.000	446
	6010	2033		COMM CABLE (22 AWG)(25 PAIR) DOLLARS and CENTS	LF	475.000	447
	6038	2001		PORTABLE CHANGEABLE MESSAGE SIGN DOLLARS and CENTS	DAY	1,500.000	448
	6110	2006		REF PAV MRK TY I (Y)(4")(BRK)(90 MIL) DOLLARS and CENTS	LF	130.000	449
	6110	2010		REF PAV MRK TY I (W)(4")(SLD)(100 MIL) DOLLARS and CENTS	LF	46,038.000	450
	6110	2015		REF PAV MRK TY I (W)(4")(BRK)(100 MIL) DOLLARS and CENTS	LF	42,333.000	451
	6110	2021		REF PAV MRK TY I (W)(4")(DOT)(100 MIL) DOLLARS and CENTS	LF	648.000	452
	6110	2036		REF PAV MRK TY I (W)(8")(SLD)(100 MIL) DOLLARS and CENTS	LF	13,297.000	453
	6110	2039		REF PAV MRK TY I (W)(8")(LNDP)(100 MIL) DOLLARS and CENTS	LF	606.000	454

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	6110	2042		REF PAV MRK TY I (W)(12")(SLD)(100 MIL) DOLLARS and CENTS	LF	1,952.000	455
	6110	2045		REF PAV MRK TY I(W)(12")(LNDP)(100 MIL) DOLLARS and CENTS	LF	1,652.000	456
	6110	2051		REF PAV MRK TY I (W)(24")(SLD)(100 MIL) DOLLARS and CENTS	LF	7,750.000	457
	6110	2057		REF PAV MRK TY I (Y)(4")(SLD)(100 MIL) DOLLARS and CENTS	LF	58,263.000	458
	6110	2072		REF PAV MRK TY I (Y)(8")(SLD)(100 MIL) DOLLARS and CENTS	LF	471.000	459
	6110	2078		REF PAV MRK TY I (Y)(24")(SLD)(100 MIL) DOLLARS and CENTS	LF	1,120.000	460
	6110	2082		REF PAV MRK TY II (W)(4")(BRK) DOLLARS and CENTS	LF	42,333.000	461
	6110	2083		REF PAV MRK TY II (W)(4")(DOT) DOLLARS and CENTS	LF	648.000	462
	6110	2084		REF PAV MRK TY II (W)(4")(SLD) DOLLARS and CENTS	LF	46,038.000	463
	6110	2091		REF PAV MRK TY II (W)(8") (LNDP) DOLLARS and CENTS	LF	606.000	464
	6110	2092		REF PAV MRK TY II (W)(8") (SLD) DOLLARS and CENTS	LF	13,297.000	465

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	6110	2093		REF PAV MRK TY II (W)(12") (LNDP) DOLLARS and CENTS	LF	1,652.000	466
	6110	2094		REF PAV MRK TY II (W)(12") (SLD) DOLLARS and CENTS	LF	1,952.000	467
	6110	2096		REF PAV MRK TY II (W)(24") (SLD) DOLLARS and CENTS	LF	7,750.000	468
	6110	2097		REF PAV MRK TY II (Y)(4") (BRK) DOLLARS and CENTS	LF	130.000	469
	6110	2098		REF PAV MRK TY II (Y)(4") (SLD) DOLLARS and CENTS	LF	58,263.000	470
	6110	2106		REF PAV MRK TY II (Y)(8") (SLD) DOLLARS and CENTS	LF	471.000	471
	6110	2107		REF PAV MRK TY II (Y)(24") (SLD) DOLLARS and CENTS	LF	1,120.000	472
	6266	2001		VIVDS PROCESSOR SYSTEM DOLLARS and CENTS	EA	4.000	473
	6266	2002		VIVDS CAMERA ASSEMBLY DOLLARS and CENTS	EA	36.000	474
	6266	2003		VIVDS SET-UP SYSTEM DOLLARS and CENTS	EA	4.000	475
	6266	2005		VIVDS COMMUNICATION CABLE (COAXIAL) DOLLARS and CENTS	LF	8,230.000	476

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	6266	2007		VIVDS TEMPORARY DOLLARS and CENTS	EA	4.000	477
	6362	2001		DUAL OC-3 ATM MPEG-2 ENCODER DOLLARS and CENTS	EA	3.000	478
	6363	2001		ETHERNET FIBER DRIVER DOLLARS and CENTS	EA	3.000	479
	6364	2001		CCTV FIELD EQUIPMENT DOLLARS and CENTS	EA	3.000	480
	6365	2001		CAMERA POLE STRUCTURE DOLLARS and CENTS	EA	4.000	481
	6366	2001		CCTV EQUIPMENT CABINET DOLLARS and CENTS	EA	3.000	482
	6367	2001		FIBER OPTIC CBL S/M (144 STRAND)(TY A) DOLLARS and CENTS	LF	19,525.000	483
	6367	2002		FIBER OPTIC CBL S/M (6 STRAND)(TY E) DOLLARS and CENTS	LF	79,625.000	484
	6367	2003		REMOVE EXIST FIBER OPTIC CABLE (RMC) DOLLARS and CENTS	LF	14,395.000	485
	6368	2001		FIELD TERMINAL SERVER DOLLARS and CENTS	EA	15.000	486
	6369	2001		DMS CABINET FOUNDATION DOLLARS and CENTS	EA	11.000	487

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	6370	2001		FIBER FIELD TERMINAL SERVER DOLLARS and CENTS	EA	4.000	488
	6371	2001		FIBER HUB FOUNDATION DOLLARS and CENTS	EA	4.000	489
	6371	2002		FIBER HUB (ATM) DOLLARS and CENTS	EA	3.000	490
	6372	2001		FIELD ETHERNET SWITCH DOLLARS and CENTS	EA	17.000	491
	6373	2001		WIRELESS RADIO TMS DECODER SYSTEM DOLLARS and CENTS	EA	1.000	492
	6373	2002		WIRELESS RADIO TMS RADAR SITE DOLLARS and CENTS	EA	3.000	493
	6373	2003		WRLS RAD TMS COMB RPTR/TRANS/RAD SITE DOLLARS and CENTS	EA	2.000	494
	6373	2004		WIRELESS RADIO TMS RECEIVER SITE DOLLARS and CENTS	EA	1.000	495
	6373	2005		WRLS RAD TMS COMB TRANS/RADAR SITE DOLLARS and CENTS	EA	1.000	496
	6374	2001		CONVERT EXIST FIB OPT DMS SYS TO ATM DOLLARS and CENTS	EA	8.000	497

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	6374	2002		CONVERT EXIST LCS TO ATM DOLLARS and CENTS	EA	4.000	498
	6377	2001		FIELD VOIP GATEWAY DOLLARS and CENTS	EA	17.000	499
	6381	2001		LCS CABINET FOUNDATION DOLLARS and CENTS	EA	5.000	500
	6382	2001		PREPARATION OF EXISTING CONDUIT DOLLARS and CENTS	EA	2,815.000	501
	6383	2001		REMOVE EXIST ACOUSTIC VEH SENSOR SYS DOLLARS and CENTS	EA	5.000	502
	6383	2002		REMOVE EXIST CCTV FIELD EQUIPMENT DOLLARS and CENTS	EA	3.000	503
	6383	2003		REMOVE EXIST COMMUNICATION CABINET DOLLARS and CENTS	EA	2.000	504
	6383	2004		RELOCATE EXIST CCTV FIELD EQUIPMENT DOLLARS and CENTS	EA	1.000	505
	6383	2005		RELOCATE EXIST FIBER HUB DOLLARS and CENTS	EA	1.000	506
	6383	2006		REMOVE EXIST FIB OPT DMS (TY 2) SYS DOLLARS and CENTS	EA	5.000	507
	6383	2007		REMOVE EXIST LCS SYSTEM DOLLARS and CENTS	EA	5.000	508

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	6383	2008		REMOVE EXIST FIB OPT DMS (TY 3) SYS DOLLARS and CENTS	EA	6.000	509
	6383	2009		REMOVE EXIST FIBER HUB DOLLARS and CENTS	EA	4.000	510
	6383	2010		RELOCATE EXIST FIB OPT DMS (TY 3) SYS DOLLARS and CENTS	EA	6.000	511
	6383	2011		RELOCATE EXIST FIB OPT DMS (TY 2) SYS DOLLARS and CENTS	EA	5.000	512
	6383	2012		RELOCATE EXIST LCS SYSTEM DOLLARS and CENTS	EA	5.000	513
	6384	2001		SINGLE MODE FIB OPT VID/DATA TRANS(ATM) DOLLARS and CENTS	EA	3.000	514
	6385	2001		CONDT MULTDCT PVC(4") CONC ENCL(2- WAY) DOLLARS and CENTS	LF	5,560.000	515
	6385	2002		CONDT MULTDCT PVC(4") (RDWY) (2-WAY) DOLLARS and CENTS	LF	8,455.000	516
	6385	2003		CONDT MULTDCT FIB(4") (BRDG) (2-WAY) DOLLARS and CENTS	LF	1,200.000	517
	6385	2004		CONDT MULTDCT PVC(4") (BORED)(2-WAY) DOLLARS and CENTS	LF	2,700.000	518

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	6388	2001		RADAR VEHICLE SENSING DEVICE DOLLARS and CENTS	EA	16.000	519
	6389	2001		FINAL ACCEPTANCE PLAN DOLLARS and CENTS	LS	1.000	520
	6392	2001		DECOR ILL ASSM (TY SA) 20B-1 (.25 KW)S DOLLARS and CENTS	EA	3.000	521
	6392	2002		DECOR ILL ASSM (TY SA) 20T-1 (.25 KW)S DOLLARS and CENTS	EA	1.000	522
	6392	2003		DECOR ILL ASSM (TY SA) 24B-1 (.25 KW)S DOLLARS and CENTS	EA	1.000	523
	6392	2004		DECOR ILL ASSM (TY SA) 24T-1 (.25 KW)S DOLLARS and CENTS	EA	1.000	524
	6392	2005		DECOR ILL ASSM (TY SP) 27S-1 (.25 KW)S DOLLARS and CENTS	EA	4.000	525
	6392	2006		DECOR ILL ASSM (TY SA) 30B-1 (.25 KW)S DOLLARS and CENTS	EA	5.000	526
	6392	2008		DECOR ILL ASSM (TY SA) 30T-1 (.25 KW)S DOLLARS and CENTS	EA	60.000	527
	6392	2009		DECOR ILL ASSM (TY SA)30T-1-1(.25 KW)S DOLLARS and CENTS	EA	1.000	528
	6392	2011		DECOR ILL ASSM (TY SA) 40T-1 (.25 KW)S DOLLARS and CENTS	EA	2.000	529

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	6392	2013		DECOR ILL ASSM (TY SA)47S-1-1(.4 KW)S DOLLARS and CENTS	EA	39.000	530
	6392	2014		DECOR ILL ASSM (TY SP)47S-1-1(.4 KW)S DOLLARS and CENTS	EA	1.000	531
	6392	2015		DECOR ILL ASSM (TY SA) 50T-1 (.4 KW)S DOLLARS and CENTS	EA	7.000	532
	6392	2016		DECOR ILL ASSM (TY SA) 50B-1 (.4 KW)S DOLLARS and CENTS	EA	3.000	533
	6392	2017		DECOR ILL ASSM U/P (.15 KW)S DOLLARS and CENTS	EA	39.000	534

*****GENERAL NOTES*****

===== **Basis of Estimate** =====

Item	Description	Rate/Area	Quant-Unit
730	Spot Mowing	-----	200 ACRE
734	Litter Removal	2 CYC/Mo	100 CYC
738	Cleaning/Sweeping(Center Median)	24 CYC/Yr	84 CYC
738	Cleaning/Sweeping(Outside Main Lane)	24 CYC/Yr	72 CYC
738	Cleaning/Sweeping(Frontage Road)	12 CYC/Yr	48 CYC

- The Following Is For Contractor's Information Only - Non Pay

203	Sprink (Emb)	40 GAL/CY
211	Roll (Emb)	1 HR/300 CY
212	Roll (Emb)	1 HR/300 CY
213	Roll (Med-B)(SubGr)	1 HR/1000 SY
213	Roll (Med-B)(Tpsl)	1 HR/10000 SY
213	Roll (Med-B)(Surf Trmt)	1 HR/2000 SY

===== **Asphalt Concrete Pavement** =====

Type	Location	Depth	Rate/Area	Area-SY	Quant-Tons
Ty C	Main Rdwy, Fr Rd, Streets, Turnarounds & Ramps	2"	220 LBS/SY	303,909	<u>33,430</u>
				Ty C Totals =	33,430
Ty C (Surf)	Main Rdwy, Fr Rd, Streets, Turnarounds & Ramps	2"	220 LBS/SY	432,536	<u>47,579</u>
				Ty C (Surf) Totals =	47,579
Ty A	Fr Rd, Streets, Turnarounds	12"	1320 LBS/SY	71,392	47,119
	Main Rdwy, & Ramps	15"	1650 LBS/SY	221,489	<u>182,728</u>
				Ty A Totals =	229,847

===== **Surface Treatment Data** =====

Description One Course Surface Treatment
Area 439,300 sy

-----See Bid Item-----

asphalt--rate(gal/sy) 0.3 /1 = 132,677 gal
aggrate--type/gr ty B /gr 4
aggrate--rate(cy/sy) 1/100 = 4,393 cy

Description Two Course Surface Treatment (Harry Wurzbach Overpass)
Area 6,950 sy

-----See Bid Item-----

Asphalt--
 first application rate(gal/sy) 0.30 /1 = 2,085 gal
 second application rate(gal/sy) 0.30 /1 = 2,085 gal
aggrate--type/gr ty B /gr 4
aggrate--
 first application rate(cy/sy) 1/100 = 70 cy
 second application rate(cy/sy) 1/100 = 70 cy

The following State, District, Local and/or Utility Standards have been modified: C411, C203, & Low Profile Concrete Barrier (Portable and Precast) LPCB (1)-92.

All pavement markings shall be in accordance with the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

The Contractor's attention is directed to the fact that existing work will be conducted within the project limits. Any work that deviates from the contract documents must accommodate the existing construction. Any changes in the work must be approved by the Engineer.

Call the Texas One Call System at 1-800-245-4545 to locate utilities prior to construction.

Utility lines with Asbestos

Existing natural gas steel wrapped and/or asbestos cement (AC) water lines that will no longer be in service are usually abandoned in place (AIP). However, if any of these lines have to be removed for whatever reason (in the way of other construction, to make tie-ins, etc.) removal shall comply with all federal, state and local laws, ordinances and regulations regarding the

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management of asbestos containing materials. At a minimum, the following procedure shall be followed:

1. Contact the Engineer.
2. Remove only the amount of pipe that's needed to perform the proposed work with removal being at the nearest joint.
3. Cover and secure the ends of the pipe with a double layer of 6 mil plastic. If the pipe is damaged, the entire pipe shall be covered with plastic.
4. Move the pipe to an Engineer's approved secured temporary storage site within the project limits.
5. The Engineer will determine the owner (utility company) of the pipe to coordinate removal from the project. The contractor will load the pipe onto the removal vehicles but will NOT be responsible for removing the pipe from the project.
6. Removal of the utility pipe from the trench will be subsidiary to the work that created the need for the removal (excavation for structures, roadway excavation, a new line, tie-ins of new to existing lines, etc.). The work performed in handling the pipe after it has been removed from the trench (covering with plastic, hauling to the temporary site on the project and later loading on the vehicles provided by the utility company or the state) will be paid for through the Force Account procedure.

Contact the Engineer or the City of San Antonio at 210-615-5975(TxDOT) or 210-207-7765 (City) when construction operations are within 400 feet of a signalized intersection to determine/verify the location of loop detectors, conduit, ground-boxes, etc. Any signal equipment damaged by the construction operations shall be repaired or replaced. The method of repair or replacement shall be pre-approved and inspected by the Engineer. Depending on the type and extent of the damage, the Engineer reserves the right to perform the repair or replacement work and the Contractor will be billed for the cost of this work.

All existing raised pavement markings shall be removed as the work progresses as approved by the Engineer. This work will not be paid for separately, but shall be considered subsidiary to the various bid items. Materials removed shall become the property of the Contractor for proper disposal.

In instances where fixed features require, the cross section slopes may be varied to the extent determined/approved by the Engineer.

If waste areas or material source areas result from this project, the Contractor is reminded to follow the requirements of the Texas Aggregate Quarry and Pit Safety Act.

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Any materials removed and not reused on the project and determined to be salvageable by the Engineer, shall be retained by the State and shall be stored within the project limits at an approved secure location or delivered undamaged to the salvage/storage yard as directed by the Engineer. Materials that are not determined to be salvageable shall become the property of the Contractor for proper management in accordance with local, state and/or federal requirements at their expense. Traffic signs must be defaced so that they will not reappear in public as signs.

In preparing holes for posts and/or foundations, care shall be taken to not rupture existing drainage structures, electrical conduits, public utilities, etc.

Any sign panels that are to be adjusted and/or removed and replaced, shall be done in the same workday unless otherwise approved by the Engineer.

Sign types for which details are not shown in the plans shall conform to the "Texas MUTCD".

Notify the Engineer and/or the City of San Antonio Traffic Signal Design Engineer (210-733-4573) at least two weeks prior to a proposed traffic pattern change(s) that will require a revision to traffic signals. This is required to provide the State/City time to determine the new signal timing and phasing settings that need to be implemented with the traffic change.

Remove existing street name signs from existing stop signs and re-install them above the new stop signs. Removing and re-installing existing street signs will not be paid for directly, but shall be considered subsidiary to the Item, "Small Roadside Sign Assemblies".

--Item 5--

Reference all existing striping and pavement markings in a manner which will allow these markings to be re-established. Extra referencing shall be placed (if needed) to ensure that the Project's markings (lane lines, edge lines, ramp gores, etc.) are in line with signs, TMS arrows, etc. located on overhead sign supports.

ACP placed at curb inlets, traffic inlets and slotted drains shall be neatly tapered to the inlet depression.

If a bridge deck is milled, seal coated and/or overlaid, it shall be cleaned of excess material. This material shall be removed and not just broomed to the sides of the bridge, or under the guardrail approach, etc.

Cover or protect all sealed expansion joints and rails on bridges and all railroad tracks encountered as approved by the Engineer. Clean all of these features if they weren't properly protected.

The above work will not be paid for directly, but will be considered subsidiary work.

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Prior to contract letting, bidders may obtain a free computer diskette or a computerized transfer of files (from the Engineer's office) that contains the earthwork information. If copies of the actual cross-sections in addition to, or instead of, the diskette are requested, they will be available at the Engineer's office for borrowing by copying companies for the purpose of making copies for the bidder at the bidder's expense.

When working near aerial electrical lines and/or utility poles, provide adequate safety measures as needed to comply with Federal, State and local regulations. For electrical lines and poles shown in the plans, if the lines need to be de-energized and/or if poles need to be braced, contact the electrical company to coordinate the de-energizing and bracing. Work pertaining to de-energizing lines, bracing poles and any other protective measures will not be paid for at the expense of TxDOT.

Prevention of Migratory Bird Nesting

It is anticipated that migratory birds, a protected group of species, may try to nest on any bridge or culvert, in any vegetation, or gravel substrate, at any time of the year. The preferred nesting season for migratory birds is from February 15 through October 1 of any year. When practicable, measures to avoid migratory bird species, including ROW clearing activities, should be executed outside of the preferred nesting season. Otherwise, nests containing migratory birds must be avoided and work performed elsewhere within the project limits, until the young birds have fledged.

Structures

Bridge and culvert construction operations can not begin until swallow nesting prevention is implemented, until after October 1 if the Engineer determines that swallow nesting is actively occurring, or until the Engineer determines swallow nests have been abandoned. If the State has installed nesting deterrent on the bridges and culverts prior to approval of the contract, maintain the existing nesting deterrent in order to prevent swallow nesting until October 1 or completion of the bridge and culvert work, whichever occurs earlier. If new nests are built and occupied after the beginning of the bridge and culvert work, do not perform work that can interfere with or discourage swallows from returning to their nests. Prevention of swallow nesting can be performed by one of the following methods:

1. By February 15 of any year, begin the removal of any existing completed mud nests and all other mud placed by swallows for the construction of nests on any portion of the bridge and culverts. The Engineer will inspect the bridges and culverts for nest building activity. If swallows begin nest building, scrape or wash down all nest sites on the structure. Perform these activities daily unless the Engineer determines the need to do this work more frequently. Remove nests and mud through October 1 of any year or until bridge and culvert construction operations are completed.

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2. By February 15 of any year, place a nesting deterrent (which prevents access to any portion of the bridge and culvert by swallows) on the entire bridge (except deck and railing) and on culverts.

No extension of contract time or payment of compensation will be granted for a delay or suspension of work caused by nesting swallows. This work is considered subsidiary to the various bid items.

--Item 7—

The total disturbed area for this project is 125.4 acres. The disturbed area in the project, all project locations in the Contract and Contractor project specific locations (PSL's), within 1 mile of the project limits, for the Contract will further establish the authorization requirements for storm water discharges. The department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. Obtain any required authorization from the TCEQ for any PSL's for construction support activities on or off the ROW. When the total area disturbed in the Contract and PSL's within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSL's on the ROW to the Engineer (to the appropriate MS4 operator when the project is on an off-state system route).

IN ADDITION TO THE REQUIREMENTS OF ITEM 7, AVOID IMPACT TO THE THREE AREAS IDENTIFIED AS "DO NOT DISTURB".

"DO NOT DISTURB AREA" NO. 1 IS THE POND AREA WITH HYDRIC VEGETATION NORTH OF SALADO CREEK. INSTALL CONSTRUCTION FENCING ON THE PERIMETER OF THIS AREA AS DELINEATED BY THE ENGINEER. DO NOT DISTURB THIS AREA DURING CONSTRUCTION OR WHEN MOVING EQUIPMENT OR MACHINERY IN AND OUT OF THE TEMPORARY CONSTRUCTION EASEMENT. INGRESS AND EGRESS FOR THE TEMPORARY CONSTRUCTION EASEMENT SHOULD BE FROM THE WEST SIDE.

"DO NOT DISTURB AREA" NO. 2 IS THE PILOT CHANNEL OF BEITEL CREEK.
"DO NOT DISTURB AREA" NO. 3 IS THE TRIBUTARY TO SALADO CREEK AT HARRY WURZBACH. BOTH AREAS NO. 2 AND 3 ARE CONCRETE LINED CHANNELS AND ARE JURISDICTIONAL WATERS OF THE US. NO WORK IS AUTHORIZED IN THESE AREAS. IF ANY DEBRIS OR UNAUTHORIZED FILL SHOULD ACCIDENTALLY FALL WITHIN THESE AREAS, CONTACT THE ONSITE ENGINEER AND CLEAN UP THE DEBRIS IMMEDIATELY. IF ACCIDENTAL FILL TOTALLING OVER 0.10 ACRES SHOULD OCCUR, THE ONSITE ENGINEER WILL INFORM THE US CORPS OF ENGINEERS OF THE ACCIDENTAL OCCURRENCE AND PROCEED ACCORDING TO GUIDANCE FROM THE CORPS.

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The work start date and the beginning of working day charges for this contract will be October 1, 2006.

Working days will be computed and charged in accordance with Article 8.3.A.6: Other.

Working days will be charged Monday through Sunday, excluding national holidays, regardless of weather conditions or material availability. Work on national holidays will not be permitted without written permission of the Engineer. If work is performed on any of these holidays requiring an Inspector to be present a working day will be charged. The Contractor will be allowed four (4) "floating" non-work days per calendar month. The "floating" non-work days must be agreed upon in writing by the Contractor and the Engineer at the beginning of each month. Once agreed upon, these "floating" days cannot be charged unless the Contractor obtains written approval from the Engineer. If work is performed on a floating" non-work day requiring an Inspector to be present a working day will be charged.

Nighttime work will be required, and is defined in Article 8.3.C: Nighttime Work. Night and/or weekend work is required. Nighttime work will not be allowed during the designated "floating" non-work days unless written permission is obtained from the Engineer. If Nighttime work is performed on a "floating" non-work day requiring an Inspector to be present a working day will be charged.

Primavera Project Planner computer software is required for the progress schedule. The determination schedule includes a 90-day delay start with a Begin Construction date of August 1, 2006.

Night and/or weekend work is required. See the Sequence of Work, Traffic Control Plan, time restrictions for lane closures, etc.

The number of working days allowed to complete this project and interim milestones, if any, was calculated using a conceptual time determination schedule that assumes generic resources, production rates and sequences of construction. The time determination schedule also assumes average weather conditions based on historic data for the San Antonio District. The Engineer will supply bidders upon written request one electronic copy of the time determination schedule compatible with Primavera Project Planner software.

The determination schedule is provided for informational use only and is not intended for bidding or construction purposes. If the bidder utilizes the schedule for bidding or construction purposes, the bidder accepts the schedule and assumes the responsibility for verifying all aspects of the schedule. The department will not adjust the number of working days for the project and milestones, if any, due to differences in opinion regarding any assumptions made in the preparation of the schedule or for errors, omissions or discrepancies found in the time determination schedule.

- (1) Milestone 1 is based on closing the existing IH-410 frontage road east turnaround at Harry Wurzbach in order to allow construction of Culvert Structure No. 3. The time charges for Milestone 1 begin on the day signs or devices are erected for the closing of the east turnaround at Harry Wurzbach. The time charges for Milestone 1 end on the first working day after proposed paving, drainage, and signing are complete and the proposed east turnaround at Harry Wurzbach from Sta 13+00 "Y" to Sta 20+68 "Y" is open to traffic. This work begins in Phase 1 Stage 1A and ends in Phase 1 Stage 1.

The road-user liquidated damages for Milestone 1 shall be \$ 6,800 per day.

The Contractor shall have **43** working days to complete Milestone 1.

The maximum number of working days for computing incentive credit for Milestone 1 shall be 8 days.

- (2) Milestone 2 is based on closing the intersection of Ira Lee with the IH-410 eastbound frontage road to allow construction of the EBFR bridge over Salado Creek and its approaches. The time charges for Milestone 2 begin on the day signs or devices are erected for the closing of Ira Lee. The time charges for Milestone 2 end on the first working day after proposed paving, retaining walls, bridge, drainage, temporary signing and striping are complete and the proposed IH-410 eastbound frontage road intersection at Ira Lee is open to traffic, and the IH-410 eastbound frontage road from Sta 307+00 "B2" to Sta 337+00 "B2" is open to one lane of traffic as shown in the plans for Phase 1 Stage 2. This work begins in Phase 1 Stage 1 and ends in Phase 1 Stage 2.

The road user liquidated damages for Milestone 2 shall be \$ 5,000 per day.

The Contractor shall have **66** working days to complete Milestone 2.

The maximum number of working days for computing incentive credit for Milestone 2 shall be 10 days.

- (3) Milestone 3 is based on construction of the WBFR Lower Access Road. The time charges for Milestone 3 begin on the day signs or devices are erected on the Lower Access Road between Station 10+00 to Sta. 27+00 "J". The time charges for Milestone 3 end on the first working day after proposed paving, bridge, sidewalk, retaining walls, drainage, and temporary striping are complete and the Lower Access Road is open to final configuration traffic. This work begins in Phase 1 Stage 1 and ends in Phase 1 Stage 2.

The road user liquidated damages for Milestone 3 shall be \$ 5,000 per day.

The Contractor shall have **103** working days to complete Milestone 3.

The maximum number of working days for computing incentive credit for Milestone 3 shall be 10 days.

- (4) Milestone 4 is based on closing the existing IH-410 eastbound entrance ramp from Nacogdoches Road in order to allow operation of the temporary IH-410 eastbound exit ramp to Harry Wurzbach. The time charges for Milestone 4 begin on the day signs or devices are erected for the closing of the existing Nacogdoches entrance to IH-410 East. The time charges for Milestone 4 end on the first working day after proposed paving, retaining walls, drainage illumination and temporary striping are complete and the Nacogdoches entrance to IH-410 East from Sta 10+00 "D" to Sta 55+78 (DET 2-21) is open to traffic. This work begins and ends in Phase 2 Stage 2.

The road user liquidated damages for Milestone 4 shall be \$ 14,400 per day.

The Contractor shall have 11 working days to complete Milestone 4, and will not be permitted to use a floating non-work day during the duration of this milestone.

The maximum number of working days for computing incentive credit for Milestone 4 shall be 7 days.

- (5) Milestone 5 is based on closing the existing IH-410 eastbound entrance ramp from Harry Wurzbach in order to allow operation of the temporary IH-410 eastbound exit ramp to Starcrest/Perrin Beitel. The time charges for Milestone 5 begin on the day signs or devices are erected for the closing of the existing Harry Wurzbach entrance to IH-410 East. The time charges for Milestone 5 end on the first working day after proposed paving, retaining walls, drainage, and temporary signing and striping are complete and the temporary Starcrest/Perrin Beitel exit from Sta 43+00 (DET 2-13) to Sta 29+00 "M" is open to traffic as shown in the plans for Phase 2 Stage 5. This work begins in Phase 2 Stage 3 and ends in Phase 2 Stage 5.

The road user liquidated damages for Milestone 5 shall be \$ 14,400 per day.

The Contractor shall have **30** working days to complete Milestone 5, and will be permitted to use a maximum of 2 floating non-work days during the duration of this milestone.

The maximum number of working days for computing incentive credit for Milestone 5 shall be 7 days.

- (6) Milestone 6 is a milestone within Milestone 5. Milestone 6 is based on closing the existing IH-410 eastbound entrance ramps from Harry Wurzbach and Starcrest

concurrently, in order to allow operation of the proposed IH-410 eastbound exit ramp to Starcrest/Perrin Beitel. The time charges for Milestone 6 begin on the day signs or devices are erected for the closing of the existing Starcrest entrance to IH-410 East. The time charges for Milestone 6 end on the first working day after proposed paving, signing and striping is complete and the proposed Starcrest entrance to IH-410 East "Ramp P" is open to traffic. This work begins and ends in Phase 2 Stage 5.

The road user liquidated damages for Milestone 6 shall be \$ 21,600 per day.

The Contractor shall have **10** working days to complete Milestone 6, and will not be permitted to use a floating non-work day during the duration of this milestone.

The maximum number of working days for computing incentive credit for Milestone 6 shall be 3 days.

- (7) Milestone 7 is based on closing the existing IH-410 westbound entrance ramp from Perrin Beitel in order to allow construction of the proposed IH-410 westbound entrance ramp from Perrin Beitel. The time charges for Milestone 7 begin on the day signs or devices are erected for the closing of the existing Perrin Beitel entrance to IH-410 West. The time charges for Milestone 7 end on the first working day after proposed paving, retaining walls, bridges, drainage, and temporary signing and striping are complete and the temporary Perrin Beitel entrance to IH-410 West from Sta 30+00 (DET 4-3) to Sta 46+88 (DET 4-3) is open to traffic as shown in the plans for Phase 4 Stage 2. This work begins in Phase 4 Stage 1 and ends in Phase 4 Stage 2.

The road user liquidated damages for Milestone 7 shall be \$ 14,400 per day.

The Contractor shall have **115** working days to complete Milestone 7.

The maximum number of working days for computing incentive credit for Milestone 7 shall be 10 days.

- (8) Milestone 8 is based on closing the existing IH-410 westbound exit ramp to Starcrest in order to allow construction of the proposed IH-410 westbound exit ramp to Starcrest. The time charges for Milestone 8 begin on the day signs or devices are erected for the closing of the Starcrest exit from IH-410 West. The time charges for Milestone 8 end on the first working day after proposed paving, retaining walls, drainage, and striping are complete and the temporary Starcrest exit and auxiliary lane from Sta 40+00 (DET 5-4) to Sta 62+55 (DET 5-4) is open to traffic. This work begins in Phase 4 Stage 2 and ends in Phase 5 Stage 1.

The road user liquidated damages for Milestone 8 shall be \$ 14,400 per day.

The Contractor shall have **24** working days to complete Milestone 8, and will not be permitted to use a floating non-work day during the duration of this milestone.

The maximum number of working days for computing incentive credit for Milestone 8 shall be 5 days.

- (9) Milestone 9 is based on closing the existing IH-410 westbound entrance ramp from Harry Wurzbach to allow construction of the proposed IH-410 westbound mainlane widening from Sta 60927+00 "AA" to Sta 60937+00 "AA". The time charges for Milestone 9 begin on the day signs or devices are erected for the closing of the existing Harry Wurzbach entrance to IH-410 West. The time charges for Milestone 9 end on the first working day after proposed paving and striping are complete and the proposed Harry Wurzbach entrance to IH-410 West "Ramp E" is open to traffic. This work begins and ends in Phase 6 Stage 1.

The road user liquidated damages for Milestone 9 shall be \$ 14,400 per day.

The Contractor shall have **16** working days to complete Milestone 9, and will not be permitted to use a floating non-work day during the duration of this milestone.

The maximum number of working days for computing incentive credit for Milestone 9 shall be 6 days.

- (10) Milestone 10 is based on substantial completion of the project. The time charges for Milestone 10 begin on the day any signs or devices are installed or reset for the purpose of switching traffic to the configuration shown in the plans for Phase 2 Stage 1. The time charges for Milestone 10 end on the first working day after final proposed overlay pavement, striping, signing and illumination are complete. This work begins in Phase 2 Stage 1 and ends in Phase 6 Stage 1.

The road user liquidated damages for Milestone 10 shall be \$ 15,000 per day.

The Contractor shall have **802** working days to complete Milestone 10.

The maximum number of working days for computing incentive credit for Milestone 10 shall be 100 days.

Locate all manholes and valves within the construction area of the project. Each manhole and valve will be identified by its owner (SAWS, CPS, etc.) and referenced with station and offset. No roadwork may begin until this list has been submitted to the Engineer. Gas valves should be accessible at all times, therefore; temp. CTB may not be placed over these valves.

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If the Traffic Control Plan/Sequence of Work requires traffic to be moved to a new pavement section prior to the placement of the final mat of ACP, construct all manholes and/or valves to final pavement elevations just prior to the final mat of ACP. If, between the final elevation adjustment and the final mat of ACP, the manholes and/or valves are going to be exposed to traffic, place temporary asphalt around the manhole and/or valve to provide a +/- 50:1 taper. The cost of elevation adjustment and asphalt tapers will not be paid for directly, but will be part of the price bid for other manhole and/or valve work.

--Item 9--

When directed/approved by the Engineer, provide two uniformed, off-duty law enforcement officers with two officially marked vehicles (if patrol cruisers are available from the enforcement agency) during work that requires a lane to be closed. These officers in patrol cruisers (if provided) shall be located as directed/approved by the Engineer to monitor and/or direct traffic during the lane closure. The method used to direct traffic at signalized intersections shall be as directed/approved by the Engineer. Additional officers and cruisers may be required when directed/approved by the Engineer.

--Item 100--

Do not begin any clearing operations until the trees and areas of vegetation that should not be removed or disturbed by construction activities have been established. To ensure that these areas are not disturbed, place protection fencing as shown in the plans or as directed/approved by the Engineer.

All right of way clearing operations will be coordinated with the SW3P and as directed/approved by the Engineer.

Trim and remove brush and trees to construct the project or to provide a horizontal clearance of approximately 2 feet inside the right of way line and a vertical clearance of at least 12 feet. No vertical flailing equipment will be allowed and the method used shall be approved by the Engineer.

To avoid the spread of oak wilt disease, all species of oak trees that are damaged or cut (branches, roots and/or stumps), treat with a commercial tree wound dressing (pruning spray). To prevent possible infection from tree to tree, disinfect all pruning tools with a solution of 70% isopropyl alcohol before moving to the next tree. Unless otherwise approved by the Engineer, tree limbs and trees shall be removed from the project no later than the next working day in which they were removed. The Engineer can stop all construction operations if the above dressing and/or cut requirements are not followed.

--Item 110--

Where excavation (channel) extends beyond the right of way fence, remove and replace the fence to a comparable condition.

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All areas that receive CMT shall be seeded or sodded, fertilized and watered in accordance with the appropriate bid items, and/or as directed/approved by the Engineer.

--Item 162--

Use of an organic or non-asphaltic biodegradable material that is manufactured as a tacking agent for straw and/or hay mulch applications is required. Use of an asphaltic material as the tacking agent must have prior approval from the Engineer, and if used, shall be MS-2.

Furnish and place Bermuda grass sod.

--Item 164 & 166--

For drill seeding permanent warm season grasses: the seed drill shall be capable of properly storing and metering the release of small seeds (such as Bermuda grass) separately from fluffy type seeds (such as Bluestem). Drills manufactured for planting standard grain crops will not be acceptable.

--Item 168--

Watering rates for sod: 3 gals./S.Y./cycle with 3 cycles per week for the first 4 weeks then 1 cycle per week for the next 8 weeks. Increasing the gals./S.Y./cycle to decrease the number of cycles/week is not allowed.

Watering rates for seeding: 1.5 gals./S.Y./cycle with 6 cycles per week for the first 4 weeks then 3 cycles per week for the next 8 weeks. Increasing the gals./S.Y./cycle to decrease the number of cycles/week is not allowed.

These rates are to estimate the amount of watering that might be needed to supplement natural rainfall to keep the soil moist until germination and establishment of seeds and grasses can occur. Adjust these rates as directed/or approved by the Engineer to take into account actual field conditions such as rain, soil temperature, soil texture, air temperature, sunny vs. cloudy days, etc. Increasing the gals./S.Y. cycle to decrease the number of cycles/week is not allowed.

--Item 300--

The asphalt binder used in the manufacture the Type C Surface hot mix asphaltic concrete, shall be PG 76-22.

The asphalt binder used in the manufacture of the non-surface layers of the hot mix asphaltic concrete, shall be PG 64-22.

--Item 302--

Previously tested aggregates found to contain excessive quantities of dust (more than 0.5 percent passing the No. 4 sieve) during precoating, stockpiling or hauling operations, may be rejected by the Engineer. Test Method Tex-200-F, Part I will be used for testing.

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The State will utilize the Ignition Oven Method (Tex 236-F) for aggregate gradation, with the option of utilizing belt or vacuum extraction gradation in the event the ignition oven malfunctions.

--Item 316--

If emulsions are used, a minimum 24 hour curing period shall elapse before placing any subsequent asphalt courses. Because of this curing period, obtain approval from the Engineer before using emulsions.

When using latex asphalt, measures shall be taken to avoid drifting of asphalt onto traffic and adjacent properties.

Set a string line for all surface treatment operations unless otherwise approved by the Engineer.

Asphalt season will be year round as long as sections 316.4.D.1 to 316.4.D.3 are met.

If the aggregates to be precoated are found to have stripping characteristics, the Engineer may require the addition of a lime slurry. If required, lime meeting the requirements of Item 263 shall be added to the aggregate at the rate of 1% lime by weight of aggregate and shall be added in slurry form at the cold feed. If approved by the Engineer, the lime slurry may be added at the stockpile, but not more than 24 hours in advance of use. The cost of the lime shall be considered subsidiary to this Item.

Ensure that the asphalt used for precoating the aggregate and the asphalt used for the surface treatment will not result in a reaction that may adversely affect the bonding of the aggregate and asphalt during the surface treatment operation.

The addition of bag house fines is not permitted in the production of precoated material.

Mixes that do not maintain flow qualities where the material can not be satisfactorily spread by approved mechanical spreading devices will not be acceptable.

Stockpiles of aggregate precoated with AC may generate excessive heat build-up resulting in damage to the asphalt and/or aggregates. Stockpiles showing evidence of heat damage (as determined by the Engineer) may be rejected.

Aggregates used for the final surface shall have a Flakiness Index not to exceed 15 and shall be subjected to 5 cycles of the Soundness Test in accordance with Test Method Tex-411-A. The percent loss shall not be greater than 30 when magnesium sulfate is used. This test will not apply to blends with crushed trap rock, crushed rhyolite, crushed limestone rock asphalt or lightweight aggregate.

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All concrete curbs and/or concrete islands that get coated with asphalt shall be cleaned as directed/approved by the Engineer.

--Item 320--

All longitudinal ACP joints adjacent to a travel lane shall be constructed with a joint marker device which will create a 3:1 to 6:1 taper. For placement of 2 inches or more, the device shall provide a maximum ½ inch vertical edge. Outside edges (next to the grass) shall also have a taper or shall be backfilled the same day.

The ACP operation shall provide a material transfer device capable of transferring mix from the haul truck to the paver. If a material transfer vehicle is used, monitor the loading to not damage to the existing pavement structure. Material transfer devices can include a pick up machine, such as a Lincoln 660 or similar.

--Item 341--

See Item 585 for ride quality information.

R.A.P. (Department or Contractor owned) is allowed for ACP, but not for the surface mat.

The asphalt plant shall be equipped with truck scales as defined in Item 520. Three weight tickets bearing the date, the truck number, the gross, net & tare weights shall be given to the truck driver then given to the State inspector at the spreading and finishing machine. Trucks may be required to weigh on public scales or portable platform scales to verify the weight of the ticket.

The minimum Surface Aggregate Classification required shall be class "A".

The requirements for the travel-lanes shall also apply for the shoulders.

Table 8, of the Hamburg Wheel Test Requirements is changed for PG 64 or lower. Minimum number of passes at 0.5" Rut Dept, Tested at 122 degrees F shall be 5,000.

Submit a copy of the Tex 233-F production charts to the Engineer on a weekly basis. At the end of the ACP work, all originals shall be provided to the Engineer.

Crushing of the aggregate for hot mix and immediate use for production of the mix is not allowed. The aggregate shall be stockpiled until enough material is available for five days of production unless prior approval is provided by the Engineer. In order to provide adequate time for design and verification of the mix, a pre-placement meeting shall be held at least one month prior to the placement of the hot mix.

The main purpose of hot mix cores taken by the State are for payment calculations. If (for quality control purposes) the Contractor wants core information sooner, take additional cores.

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The use of diesel and/or solvents as asphalt release agents in production, transportation, and/or construction is not allowed. The list of approved asphalt release agents may be obtained from the District Laboratory.

No more than one hot mix lot will be open for any specific type of hot mix, unless authorized by the Engineer. After a lot is open and the Contractor gets the Engineer's approval to change plants or producers, the previous lot will be closed and a new lot will be opened. The numbering for the lots produced at the new plant/producer will start with lot 1. If allowed by the Engineer to switch back to the original or previous plant or producer, the next lot from that plant or producer will resume numbering sequentially from the last lot produced by that plant or producer.

Schedule lay-down operational production/placement where uneven travel lanes are minimized and eliminated weekly.

--Item 354--

Retain planed material.

Take precaution to avoid damage to existing bridge decks and armor joints. Any damage to the bridge decks and/or armor joints shall be repaired as approved/directed by the Engineer.

--Item 400--

Cement stabilized backfill shall consist of flexible base with two sacks of Portland cement per cubic yard or flowable backfill meeting the requirements of Item 401.

--Item 401--

The Flowable Backfill used for backfilling pipes will not require a shrinkage compensator.

Strength of the Flowable Backfill will be verified by the District Laboratory. Field testing will not be required, unless it is deemed necessary by the Engineer.

--Item 420--

Bent concrete is a plan quantity item.

Mass concrete will be measured as a plan quantity item.

--Item 421 & 520--

After the concrete producer contacts the District Laboratory or the Engineer's office (when outside the San Antonio area) to request an inspector at the batch plant, if an inspector is not available, TxDOT will notify the producer. At that time, if the producer has a TxDOT approved automated batch ticket and the concrete is not for bridge drill shafts, columns, caps, abutments,

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decks and/or top slab of a direct traffic culvert, the producer will be allowed to batch without a TxDOT inspector being present.

The concrete producer is required to use an automated ticket that contains the same information as TxDOT's ticket. The producer's ticket shall be a computer printout submitted to TxDOT for approval prior to use. Concrete for bridge drill shafts, columns, caps, abutments, decks and/or top slabs of direct traffic culverts shall be batched in the presence of a TxDOT inspector using the producer's concrete batch ticket.

--Item 422—

Perform a Surface Test Type A, as described in Item 585 along longitudinal construction joints in the bridge deck. The test will be taken at a maximum of 4' either side of the joint at location s selected by the Engineer. Make corrections to the deck in accordance with Article 585.3.D.1 as approved by the Engineer. There will be no bonus or penalty based on initial or final ride quality. This work will be considered subsidiary to Item 422.

--Item 423--

The backfill material for pre cast retaining walls shall be approved by the Engineer before placement unless otherwise directed/approved by the Engineer. Large stockpile(s) shall be built in lifts not to exceed 2 feet and a minimum working face of not less than 10 feet and a not more than 20 feet.

For MSE walls, provide a system from one of the following approved suppliers:

Reinforced Earth Walls
The Reinforced Earth Company
1331 Airport Freeway, Suite 302
Euless, Texas 76040-4150
(817) 283-5503

Retained Earth Walls
Foster Geotechnical
901 N. Hwy. 77
Hillsboro, Texas, 76645
(254) 580-9100

Strengthened Earth Walls
Hanson Concrete Products
3500 Maple Ave
Dallas, Texas, 75219
(214) 525-5877

Reinforced Soil Embankment Walls

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Texas Welded Wire, Inc
645 W Hurst Blvd
Hurst, Texas, 7605
(817) 282-4560

Tricon Retained Soil Walls
Tricon Precast, Inc
15055 Henry Rd
Houston, Texas, 77060
(713) 931-9832

Tensar Retaining Wall System
Tensar Earth Technologies, Inc
5775-B Glenridge Drive
Atlanta, Georgia, 30328
(404) 250-1290

Strengthened Soil Walls
Shaw Technologies, Inc
P.O. Box 271448
Flower Mound, Texas 75027
(972) 490-1924

VP Wall System
Valley Prestress Products, Inc.
P.O. Box 1367
Mission, Texas 78573
(956) 584-5701

Underdrains and their connection to proposed drainage systems shown in the plans are subsidiary to this item. Submit shop drawings for retaining wall underdrain systems.

WHEN SHOWN IN THE PLANS, PLACE GRANULAR BACKFILL AND CONCRETE RIPRAP CAP BETWEEN THE BACK OF TRAFFIC RAIL/BARRIER AND FACE OF RETAINING WALL. PAYMENT IS SUBSIDIARY TO THE RETAINING WALL. USE GRANULAR FILL AND CONCRETE RIPRAP APPROVED BY THE ENGINEER.

--Item 427--

Provide special surface finish "Concrete Paint" to surface area I.

--Item 428--

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Provide a class I surface treatment to the following elements: Upper surface of the roadway slab (including direct traffic culverts), bridge sidewalks and medians, the inside face of curbs and concrete rails, and all other areas shown in the plans.

--Item 432--

In all riprap slopes, 3 inch diameter weep holes shall be provided at 10 foot maximum spacing and backed with loose graded gravel or crushed stone and galvanized hardware cloth.

In areas where guard fence posts are to be placed in riprap, the riprap shall have an 18 inch +/- blocked out area (round or square).

--Item 442--

Use temperature zone 1 for CVN testing.

--Item 449--

The pipe joint compound used to coat the threads of anchor bolts prior to installation of nuts when erecting a high mast pole, shall be an electrically conducting protective thread lubricant compound (Crouse-Hinds TL-2, Oz/Gedney STL, Thomas & Betts Kopr-Shield).

--Item 454--

All sealed expansion joints shall receive Protection System II in accordance with Item 446.

For Header-Type Expansion Joints, the following systems are approved:

SSI-XJS
4021 Benbrook Hwy.
Ft. Worth, Texas 76116
817-731-7890

DEGUSSA
WABOCRETE II
MARK HUFF
3011 HEATHERPARK DRIVE
KINGWOOD, TEXAS 77345
(713) 392-4833

--Item 462--

The fill material between pre-cast boxes shall consist of flexible base with two sacks of Portland cement per cubic yard or flowable backfill meeting the requirements of Item 401. This backfill is considered subsidiary to the pertinent Pre-cast Box pay item.

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The following structures shall be pre cast:

Bridge Class Structure (BCS) No. 1; Culverts 1, 2, and 3; and, all storm drain box structures.

--Item 496—

The structure(s) to be removed have surface coatings which may contain hazardous materials. Provide for the safety and health of employees and abide by all OSHA Standards and Regulations. All costs incurred for proper management shall be subsidiary to this Item.

Notify the Engineer 11 working days prior to beginning removal operations at the Salado Creek Bridges, so that the Engineer can coordinate inspection for asbestos containing materials.

--Item 500--

"Materials on Hand" payments will not be considered in determining percentages used to compute mobilization payments.

--Item 502--

State Standard Sheet(s) "Traffic Control Plan (TCP)" requires that certain signs remain in place until the standard pavement markings are placed. The standard markings should be in place no later than 14 days after surface treatment operations are completed.

When advanced warning flashing arrow panel(s) is/are specified, one standby unit in good condition shall be at the job site.

Use of shadow vehicles with Truck Mounted Attenuators (TMA) as called for in the State Standard Sheet(s) "Traffic Control Plan" (TCP) is not optional.

Treat pavement drop-offs as shown in the TCP and/or as approved/directed by the Engineer.

After notified in writing by the Engineer, the time frame to provide properly maintained signs and barricades before they are considered to be in non-compliance, is 48 hours regardless of the days of the week involved.

When placing traffic signal loop detectors across the roadway, at least one lane shall remain open at all times. There are existing traffic signals in operation at the intersection of Nacogdoches and EBFR / WBFR; Harry Wurzbach and EBFR / WBFR; Starcrest and EBFR / WBFR; Perrin-Beitel and EBFR / WBFR. The existing traffic signals shall remain in operation at all times except when necessary for specific installation operations.

Whenever the signals need to be turned off (when directed/approved by the Engineer), hire off-duty law enforcement officers, as covered by Item 9, to control the traffic until the signals are back in satisfactory condition.

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Moving an existing sign to a temporary location is subsidiary to this Item. Installations with permanent supports at permanent locations will be paid for under the applicable bid item (s).

Temporary mailboxes shall be mounted on an approved plastic drum in accordance with Compliant Work Zone Traffic Control Devices, Section K. Mounting the mailbox on the drum and moving the drum as needed for the various construction phases will not be paid for directly, but will be considered subsidiary to this Item.

--Item 504--

Furnish one field office and laboratory Type E. The field office and laboratory shall have at least 1000 square feet and be partitioned into at least 5 workrooms. Submit floor plan to Engineer for approval.

The field office shall have a storage area for office equipment as directed/approved by the Engineer. The storage area shall be a minimum of 200 cubic feet and shall be reasonably secure from forced entry and removal.

The field office parking area shall be of adequate shape and size to accommodate at least 10 vehicles. When directed by the Engineer (depending on the location), the field office and the parking area shall be enclosed with a fence and have security lighting.

If asphaltic material is obtained from other than a commercial source presently inspected by TxDOT, furnish a Type D structure for the asphalt mix control laboratory for the Engineer's exclusive use. This structure shall have a minimum height of 8 feet and provide a minimum of 400 square feet of gross floor area for permanently located asphalt plants or 200 square feet for a temporary plant. The floor area will be partitioned into a minimum of two rooms, with a minimum of two windows per room. The floor shall have an impervious cover and sufficient strength to support the testing equipment. Portable structures shall be support blocked for stability and shall be tied down.

The Type D structure shall be air conditioned and furnished with a minimum of one desk, three chairs, one file cabinet, a telephone line and one built-in equipment storage cabinet. The storage cabinet shall be a minimum of 3 feet (W) by 2 feet deep by 3 feet (H) and be reasonably secure from forced entry and removal.

The Type D structure shall be provided with a 240 volt electrical service and a minimum of 2 outlets per wall. Space heaters for heating the structure are not allowed. Asphalt content will be determined utilizing the Ignition Method, so the electrical wiring of the structure shall be adequate for the needs of the testing equipment.

Provide office furniture consisting of desks, chairs, filing cabinets, etc. as directed/approved by the Engineer. Clean the field office and laboratory as needed, but not less than once a week.

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This will include, but not be limited to, sweeping and mopping floors, cleaning the toilet and lavatory, and emptying waste baskets.

Provide 1 phone line, 1 phone, and pay all phone related charges to provide this service to the State's field office. Provide the Engineer a copy of the monthly phone bill which will be used to monitor phone usage.

In addition to the minimum requirements of DMS-10101, the following requirements apply to this project:

Provide 2 desktop computers, 1 printer, and a High Speed (Cable/DSL) Internet Service Provider (ISP). The complete system including all system cards and peripherals must be FCC Class B device certified.

The rear mounted I/O ports shall meet the specification requirements for "dial-up modem".

In addition to 8 1/2" x 11", the printer shall be capable of printing 11" x 17".

For the operating system and software, provide Primavera 3.1 and Micro Station, version J or V as determined by the Engineer.

Unless otherwise directed/approved by the Engineer, all computer hardware and software shall be installed and in operating order in the State's field office prior to the commencement of any work, and shall remain in operating order for the duration of the project.

Make a paper copier and supplies available to TxDOT personnel.

In addition to 8 1/2" x 11", the copier shall be capable of copying 11" x 17" paper size.

--ITEM 506--

The Contractor must be aware of an Environmentally Sensitive Area bounded by the Existing Eastbound Mainlane Edge of Pavement and the ROW line that runs south of the Eastbound Frontage Road from Sta. 70986+07.5 to 70989+50. This will require archeological monitoring during construction during the removal of pavement along the eastbound access road and the trenching required for storm sewer, utilities and other subsurface construction activities that extend below the depth of existing base material.

NOTIFY THE ENGINEER, Barrlynn West of the San Antonio District (210) 615-5840 and Al McGraw of TxDOT-ENV (512) 416-2633 two weeks before beginning any excavation/trenching activities in this area to allow for coordination and preparation of archeological monitoring. ALSO NOTIFY THE ENGINEER and Project Inspector immediately if an accidental archeological discovery is made during construction.

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A TxDOT Archeologist or archeologist under contract to TxDOT will monitor the activities in this area that have the potential of disturbing archeological deposits. This includes the construction and installation of Line G-9, Line G9-11, Line G9-12, TMS, SAWS 12" waterline, and CPS gas pending revisions. Based on monitoring and in consultation with the Texas Historical Commission, TxDOT may be required to extend the boundary of the Environmentally Sensitive Area. During monitoring, the Archeologist will furnish a weekly oral or electronic report to the Project Inspector and TxDOT-ENV.

The Archeologist will conduct on-site monitoring of excavation/trenching activities in this Area and suspend these activities in the immediate area of discovery if an archeological find warrants further investigation. Following a report and recommendation by the Archeologist, temporary suspension may be determined by the ENGINEER and Project Inspector or by TxDOT-ENV. The Project Inspector shall inform the Contractor of any required suspension of activity.

A maximum of 72 hours will be allowed, per occurrence, to document and recover the finding. The contractor should be prepared to work elsewhere or around the immediate discovery area.

--ITEM 508--

QUANTITIES INCLUDE TEMPORARY 2" OVERLAY AT WIDENINGS TO MATCH EXISTING PAVEMENT SURFACE UNTIL THE ENTIRE PROJECT IS READY TO RECEIVE THE FINAL SURFACE MAT.

--Item 529--

Class "C" concrete will be required for machine extruded curb.

Curb inlets and inlet extensions are based on an exposed curb height of 7 inches. The roadway curb height and shape will be transitioned to the inlet's curb with a 40: 1 taper.

--Item 531--

) The color on the curb ramp truncated domes will be terra cotta. Stamped concrete is not allowed. Therefore, truncated dome pavers meeting the requirements shown on the Standard sheets are required.

The curb ramp locations shown in the plans have taken into account the geometric features of the intersection (radius, intersecting angle, etc.), traffic signals (if any) and the pavement markings. If anything changes during construction, the location of curb ramps must be adjusted to ensure they meet all TAS requirements.

--Item 540--

MBGF posts shall be round with domed tops, and not painted.

Guard fence posts placed in proposed and/or existing areas of riprap, sidewalks or any other concrete shall have an 18 inch +/- (square or round) block out in the concrete. After the posts are

installed, the blocked out area shall be topped off with 4 inches of low strength concrete grout mortar consisting of about 1 sack of cement per cubic yard of mix.

If 10 or less timber posts are needed, posts may be purchased locally and will be accepted with visual inspection by the Engineer.

--Item 545--

Payment for object marker assemblies OM-3B is subsidiary to the crash cushion attenuator system.

The following table shall be used for selection of crash cushion attenuator systems at the specified locations. The Contractor may use either system listed for each location. For permanent installations, the contractor will not be allowed to alternate between systems at differing locations. (i.e., only one type of system will be permitted to be used on the project for all locations).

TEMPORARY TRAFFIC CONTROL

PHASE 1, STAGE 1

LOCATION		SYSTEM	
"G" Station	Roadway	TRACC (Type)	QUADGUARD (Type, # Bays, Width)
60927+80 LT	WBML	FASTRACC	CZ, 9, N

PHASE 1, STAGE 2

LOCATION		SYSTEM	
"G" Station	Roadway	TRACC (Type)	QUADGUARD (Type, # Bays, Width)
60935+33 RT	EBML	FASTRACC	CZ, 9, N
60960+03 LT	WBML	FASTRACC	CZ, 9, N
70970+23 RT	EBML	FASTRACC	CZ, 9, N
71015+43 LT	WBML	FASTRACC	CZ, 9, N

LOCATION		SYSTEM	
"G" Station	Roadway	VIA (SFPM) NO. OF BARRELS	QUADGUARD (Type, # Bays, Width)
60913+00 LT	WBML	17	CZ, 9, N
60962+10 RT	EBML	17	CZ, 9, N

60965+85 LT	WBML	17	A, 9, W
70991+51 RT	EBML	17	A, 9, W
71027+00 RT	EBML	17	CZ, 9, N
81035+93 LT	WBML	8	A, 3, W
81056+90 LT	WBML	17	CZ, 9, N

PHASE 2, STAGE 1

LOCATION		SYSTEM	
"G" Station	Roadway	TRACC (Type)	QUADGUARD (Type, # Bays, Width)
60907+00 RT	WBML	FASTRACC	CZ, 9, N
60922+69 RT	EB RAMP	SHORTRACC	CZ, 3, N
60927+47 LT	WBML	FASTRACC	CZ, 9, N
70971+20 RT	EB RAMP	SHORTRACC	CZ, 3, N
70987+98 LT	WBML	FASTRACC	CZ, 9, N
81031+34 LT	WB RAMP	SHORTRACC	CZ, 3, N

LOCATION		SYSTEM	
"G" Station	Roadway	VIA (SFPM) NO. OF BARRELS	QUADGUARD (Type, # Bays, Width)
60890+02 RT	EBML	17	CZ, 9, N
60904+00 LT	WBML	17	CZ, 9, N
60921+10 LT	WBML	17	CZ, 9, N
60941+43 RT	EBML	17	CZ, 9, N
70990+77 RT	EBML	17	A, 9, W
71017+47 LT	WBML	17	A, 9, W
81030+96 RT	EBML	17	A, 9, W

PHASE 2, STAGE 2

LOCATION		SYSTEM	
"G" Station	Roadway	VIA (SFPM) NO. OF BARRELS	QUADGUARD (Type, # Bays, Width)
60926+80 RT	EBML	17	CZ, 9, N

PHASE 2, STAGE 3

LOCATION		SYSTEM	
"G" Station	Roadway	VIA (SFPM) NO. OF BARRELS	QUADGUARD (Type, # Bays, Width)
60954+98 RT	EB RAMP	17	CZ, 9, N

PHASE 2, STAGE 4

LOCATION		SYSTEM	
"G" Station	Roadway	VIA (SFPM) NO. OF BARRELS	QUADGUARD (Type, # Bays, Width)
60966+41 RT	EBML	17	A, 9, W

PHASE 2, STAGE 5

LOCATION		SYSTEM	
"G" Station	Roadway	VIA (SFPM) NO. OF BARRELS	QUADGUARD (Type, # Bays, Width)
70985+12 RT	EBML	17	CZ, 9, N

PHASE 3, STAGE 1

LOCATION		SYSTEM	
"G" Station	Roadway	VIA (SFPM) NO. OF BARRELS	QUADGUARD (Type, # Bays, Width)
60889+54 RT	EBML	17	CZ, 9, N

PHASE 4, STAGE 1

LOCATION		SYSTEM	
"G" Station	Roadway	VIA (SFPM) NO. OF BARRELS	QUADGUARD (Type, # Bays, Width)
71017+32 LT	WBML	17	A, 9, W

PHASE 5, STAGE 1

Project Number:

Sheet

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LOCATION		SYSTEM	
"G" Station	Roadway	VIA (SFPM) NO. OF BARRELS	QUADGUARD (Type, # Bays, Width)
60924+85 LT	WBFR	8	CZ, 3, N
70969+59 LT	WBML	17	A, 9, W
71017+74 LT	WBML	17	CZ, 9, N
81057+51 LT	WBML	17	CZ, 9, N

PHASE 5, STAGE 2

LOCATION		SYSTEM	
"G" Station	Roadway	VIA (SFPM) NO. OF BARRELS	QUADGUARD (Type, # Bays, Width)
70995+19 RT	WBML	17	A, 9, W

PHASE 6, STAGE 1

LOCATION		SYSTEM	
"G" Station	Roadway	VIA (SFPM) NO. OF BARRELS	QUADGUARD (Type, # Bays, Width)
60895+00 RT	EBML	17	CZ, 9, N
71030+01 LT	WBML	17	CZ, 9, N

PERMANENT

LOCATION		SYSTEM	
"AA" Station	Roadway	TRACC (Type)	QUADGUARD (Type, # Bays, Width)
60890+99 RT	EBML	FASTRACC	A, 9, N
60892+94 LT	WBML	FASTRACC	A, 9, N
60917+95 RT	EBML	FASTRACC	A, 9, N
60939+60 RT	EBML	FASTRACC	A, 9, N
60943+77 RT	EBFR	SHORTRACC	A, 3, N
60943+75 LT	WBFR	SHORTRACC	A, 3, N
70970+49 RT	EBML	FASTRACC	A, 9, N

70984+76 LT	WBFR	SHORTRACC	A, 3, N
70989+30 LT	WBML	FASTRACC	A, 9, N
70989+84 RT	EBML	FASTRACC	A, 9, N
71002+43 RT	EB RAMP	SHORTRACC	A, 3, N
71016+12 LT	WBML	FASTRACC	A, 9, N
81034+59 LT	WBFR	SHORTRACC	A, 3, N
81034+40 RT	EBML	FASTRACC	A, 9, N

--Item 585--

Use Use Surface Test Type B pay adjustment schedule 1 to evaluate ride quality of travel lanes.

--Item 610--

FABRICATE ROADWAY ILLUMINATION ASSEMBLIES IN ACCORDANCE WITH SHOP DRAWINGS APPROVED BY THE DEPARTMENT. SUBMIT SHOP DRAWINGS FOR EACH PROJECT, OR USE PRE-APPROVED STANDARD SHOP DRAWINGS.

FOR PROJECT SPECIFIC SHOP DRAWINGS, FURNISH SEVEN SETS OF DRAWINGS OF THE COMPLETE ASSEMBLY IN ACCORDANCE WITH ITEM 441, "STEEL STRUCTURES". DELIVER SHOP DRAWINGS TO THE ENGINEER AT THE PROJECT ADDRESS.

TO BE ELIBILE TO USE PRE-APPROVED STANDARD SHOP DRAWINGS, THE SHOP DRAWING MUST BE SUBMITTED AND APPROVED BY THE DEPARTMENT PRIOR TO USE ON THE PROJECT. DEVIATION FROM THE PRE-APPROVED STANDARD SHOP DRAWING WILL REQUIRE RESUBMISSION OF THE SHOP DRAWINGS. THE ENGINEER MAY APPROVE, IN WRITING, THE USE OF UPDATED STANDARD DRAWINGS IN CASES WHERE THE STANDARD DRAWINGS HAVE BEEN UPDATED AND THE UPDATED VERSION HAS BEEN APPROVED BY THE DEPARTMENT.

FOR PRE-APPROVAL AND UPDATES TO PREVIOUSLY APPROVED STANDARD SHOP DRAWINGS, FURNISH SEVEN SETS OF DRAWINGS OF THE COMPLETE ASSEMBLY IN ACCORDANCE WITH ITEM 441, "STEEL STRUCTURES" TO THE DIRECTOR OF TRAFFIC OPERATIONS DIVISION, TEXAS DEPARTMENT OF TRANSPORTATION, 125 EAST 11TH STREET, AUSTIN, TEXAS 78701-2483.

COPIES OF THE STANDARD SHOP DRAWINGS ARE ON FILE WITH TRAFFIC OPERATIONS DIVISION, BRIDGE DIVISION, AND THE MATERIALS SECTION OF CONSTRUCTION DIVISION. ADDITIONAL SHOP DRAWINGS FOR ROADWAY ILLUMINATION ASSEMBLIES BUILT IN ACCORDANCE WITH THESE DRAWINGS ARE NOT REQUIRED. PRE-APPROVED SHOP DRAWING MANUFACTURERS AND ASSEMBLY MODEL NUMBERS CAN BE FOUND AT

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<http://www.dot.state.tx.us/business/materialproducerlist.htm>.

CATEGORY IS ROADWAY ILLUMINATION AND ELECTRICAL SUPPLIES

Ballast/capacitors removed from the light assembly, shall remain the property of the State. Assume all ballast/capacitors contain Polychlorinated Biphenyl (PCB), unless a notation appears on the outside of the unit that specifies it does not contain PCB's or it has an imprinted manufacture date of 1979 or later. All ballast/capacitors with PCB's shall be placed in 55-gallon open top drum that complies with Department of Transportation (DOT) specifications. Six (6) inches of sawdust or other absorbent material shall be placed in the bottom of the drum. Furnish and place a DOT approved PCB warning label on the outside of the drum. A drum shall not be filled to more than $\frac{3}{4}$ capacity.

Avoid rupturing the ballast/capacitor(s). If a ballast/capacitor is ruptured, proper procedures and personal protective equipment is required for the clean-up operations. Specialist trained and equipped staff shall handle the clean-up operations.

The lamps in light fixtures may contain hazardous levels of mercury, halide, and sodium vapors. Observe and comply with all federal, state and local laws, ordinances and regulations regarding the management of these lamps. Prevent the breakage of the lamps. At a minimum, all lamps removed from the light fixture(s) shall be packaged in a container that minimizes the breakage of the lamps. Broken lamps shall be collected in a sealed plastic bag (i.e. Ziploc). Broken and unbroken lamps shall be stored in separate containers. Furnish a suitable container and attach a label stating "Universal Waste Lamps" on the container. Write the date the first lamp was placed in the container on the "Universal Waste Lamp" label. Within one (1) week after the first lamp is placed in a container, notify the Engineer.

The lamps and PCB containing ballast/capacitors, placed in properly labeled containers, will remain the property of the State. Place the containers in an area where it is protected from damage and the elements. Notify the Engineer when the container(s) is/are ready for transport. The Engineer will make arrangements to collect, transport, and dispose/recycle the containers. The ballast/capacitor and lamp's removal and storage is subsidiary to this item.

--Item 618--

It might be necessary to cut existing concrete for placement of conduit. The existing concrete shall be saw cut, removed from the steel reinforcement (bars or fabric) and the steel bent to accommodate the conduit. After the conduit has been placed, the steel shall be bent back to its original position and the trench back-filled with CL "A" concrete. This work is subsidiary to this Item.

The conduit for illumination on City of San Antonio streets shall be installed to a depth of 36 inches.

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DO NOT USE NON-CERTIFIED PERSONS TO PERFORM ELECTRICAL WORK. SEE ITEM 7.15 "ELECTRICAL REQUIREMENTS" FOR ADDITIONAL DETAILS.

ELECTRICAL CERTIFICATION MAY BE OBTAINED BY CONTACTING THE TEXAS ENGINEERING EXTENSION SERVICE (TEEX) AT (979) 845-6563 AND ASKING FOR INFORMATION ON THE TxDOT ELECTRICAL SYSTEM COURSE.

DO NOT USE CAST IRON JUNCTION BOXES IN CONCRETE TRAFFIC BARRIERS AND SINGLE SLOPE TRAFFIC BARRIERS. USE POLYMER CONCRETE JUNCTION BOXES INSTEAD OF THE CAST IRON JUNCTION BOXES SHOWN ON STANDARD SHEETS CTBI (3), CTBI (4), AND SSCB (4). MOUNT THE JUNCTION BOXES FLUSH (+ 0", - 1/2") WITH CONCRETE SURFACE OF CONCRETE BARRIER.

USE MATERIALS FROM PREQUALIFIED PRODUCERS AS SHOWN ON THE CONSTRUCTION DIVISION (CST) OF THE TEXAS DEPARTMENT OF TRANSPORTATION (TXDOT) MATERIAL PRODUCERS LIST. USE THE FOLLOWING WEBSITE TO VIEW THIS LIST: <http://www.dot.state.tx.us/business/materialproducerlist.htm>

THE POLYMER CONCRETE BARRIER BOX WILL NOT BE PAID FOR SEPARATELY, BUT WILL BE CONSIDERED SUBSIDIARY TO ITEM 618, "CONDUIT".

--Item 620--

PROVIDE BREAKAWAY ELECTRICAL CONNECTORS FOR BREAKAWAY POLES. USE BUSSMAN HEBW, LITTLEFUSE LEB, FERRAZ-SHAWMUT FEB, OR EQUAL ON UNGROUNDED CONDUCTORS. FOR GROUNDED CONDUCTORS, USE BUSSMAN HET, LITTLEFUSE LET, FERRAZ-SHAWMUT FEBN, OR EQUAL. THESE BREAKAWAY CONNECTORS HAVE A WHITE COLORED MARKING AND A PERMANENTLY INSTALLED SOLID NEUTRAL. SEE THE LATEST RID (2) STANDARD FOR ADDITIONAL DETAILS.

--Item 624--

Concrete aprons shall be placed around all ground boxes installed in sodded areas as directed/approved by the Engineer.

The cover shall be legibly imprinted with the words "Danger High Voltage" as required by the State Standard Sheet(s) "Electrical Details". In addition, the cover shall include "Traffic Signal", "TMS", "Illumination", or whatever other system is being housed in the ground box. The ground box locations shown on the plans are approximate and can be moved to better fit field conditions when directed/approved by the Engineer. If possible, the ground boxes should not be placed in sidewalks or driveways.

County: Bexar**Control:** 0521-04-187,etc**Highway:** IH 410**--Item 628--**

Make all arrangements for electrical service, and for compliance with local standards and practices for proper installations.

--Item 644--

The wedge anchor system shown on State Standard Sheet SMD (TWT)-02 and the expanded foam foundation covered by note no. 11 on the SMD (SLIP-2)-02 are not allowed. The "Roll Pin" shown on SMD (SLIP-1)-02 is required.

Care shall be taken in relocating existing VIA transit signs as shown in the plans. In the event that damage occurs to an existing VIA sign during the relocation, The Contractor shall contact VIA to arrange for replacement of the sign.

--Item 647--

Prepare a traffic sign inventory prior to the commencement of any sign removal work. The inventory shall show the sign type, size, condition, and location. The inventory shall be approved by the Engineer.

--Item 650—

Field check all sign structure elevations, details and dimensions shown in the plans prior to fabrication. Verify all locations of overhead sign supports.

The cost to construct the concrete footings for concrete column sign bridges, including furnishing all equipment, materials, labor, tools, incidentals and any temporary shoring necessary will not be paid for directly, but shall be considered incidental to the unit price bid for item 650, for each concrete sign bridge, complete in place.

Mass Concrete, as specified in the referenced Specification Item 420 will be required for the OSB footings and columns. Payment for Mass Concrete shall be considered subsidiary to the Item 650.

--Item 656—

Provide the foundation for the controller assembly using the anchor bolts and template supplied by the Engineer. Demonstrate to the Engineer that the field wiring is properly installed, then State or City forces will install the controller assembly, connect the field wiring, set the signal timing, and turn on the controller.

--Item 662—

When traffic shifts shown in the traffic control plans cannot be accomplished in a single weekend, install traffic buttons conforming to Item 672, except for measurement and payment, to transition between interim lane locations until the work zone pavement marking installation is completed. Payment for traffic buttons for this purpose shall not be made directly, but shall be subsidiary to this item.

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QUANTITIES INCLUDE TEMPORARY ROAD MARKER TABS FOR INTERIM STRIPING DURING OVERLAY PAVING OPERATIONS TO BE PLACED AS DIRECTED.

--Item 666 & 6110--

If TY II material is used (vs. an acrylic or epoxy sealer) as the sealer for the TY I markings, it shall be placed a minimum of 14 calendar days (to provide adequate curing) in advance of the TY I markings.

Construct Exit Number Gore Markings in accordance with standard drawing "Exit Number Gore Markings for Aerial View Detail PM(7)-06". Exit Number Gore Markings are paid as item 666-2096 and 666-2173 with estimated quantity of 5 each for both items.

--Item 672--

The bituminous adhesive shall be heated with equipment approved by the Engineer. The equipment shall be capable of heating and maintaining the adhesive at a temperature in accordance with the manufacture's recommended actions. If any adhesive is burned due to overheating, it shall be replaced. The adhesive will be packaged in cardboard containers weighing less than 100 pounds. Adhesive dispensing equipment shall be truck or trailer mounted. All adhesive material shall be placed directly from the heated dispenser to the pavement. Portable or non-heated containers will not be allowed.

The adhesive application shall be of sufficient thickness so that when the markers are pressed into the adhesive, 1/8" or more adhesive will remain under 100% of the marker. The adhesive should extend not less than 1/2" but not more than 1 1/2" beyond the perimeter of the marker.

--Item 677--

The mechanical method used for the elimination of existing thermoplastic pavement markings require prior approval from the Engineer.

--Item 680--

Except for the controller, which will be provided and operated by the State or the City, work shall consist of furnishing and installing all required materials and equipment necessary for the complete and operating traffic signal installation at the following intersections:

1. Nacogdoches Road & IH 410 Frontage Roads;
2. Harry Wurzbach & IH 410 Frontage Road/Dalewood;
3. Starcrest & IH 410 Frontage Roads;
4. Perrin Beitel & IH 410 Frontage Roads

The locations shown on the plans for signal pole foundations, controller foundations, conduit and other items may be adjusted to better fit field conditions as approved/directed by the Engineer.

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High pressure sodium lamps shall meet ANSI C78 requirements and shall be the type that extinguishes at the end of usable lamp life and remains extinguished without cycling. 400 watt lamps shall contain less than 4.0 MG of mercury. 250 watt lamps shall contain less than 3.0 MG of mercury. Lamps shall be lead free. Lamps shall pass the Federal Toxic Characteristic Leachate Procedure (TCLP). Lamp examples: OSRAM-Sylvania LU400/ECO Plus.

--Item 682--

All signal heads shall be from the same manufacturer.

All signal faces shall be covered until placed in operation.

All pedestrian signal faces shall be single section incandescent Type. Die cast polycarbonate will be an acceptable material in lieu of die cast aluminum. All mounting attachments shall be constructed of steel pipe and shall be mounted as shown on the plans. The pedestrian signal shall display the symbolized message as shown on the plans.

For all proposed mast arm pole assemblies, mounting bracket assembly Option "B" shall be used as shown on the State Standard Sheet(s) "Single Mast Arm Assemblies".

--Item 684--

For each cable terminating in the controller cabinet, an extra 10 ft of cable shall be provided. All cables shall be continuous without splices from terminal point to terminal point or as directed/approved by the Engineer. All proposed signal cable shall be #14 AWG solid copper. The number of conductors required shall be as shown on the plans.

--Item 686 & 687--

All signal poles shall be from the same manufacturer.

--Item 688--

The sealant used must be approved by the Engineer.

The pedestrian push button shall be raised or flush and be a minimum of 2 inches in the smallest dimension. The force to activate the control shall be no greater than 5 lb/f. The button placement has to be coordinated with the ground surface pad to access the button.

The pedestrian push button shall be wired with a 9-Conductor # 14 A.W.G. XHHW wire.

--Item 730--

Mowing will be required throughout the duration of the project and as directed by the Engineer.

--Item 734--

A litter pickup cycle shall be inclusive of the whole project from north ROW to south ROW and from west project limit to east project limit, including the traveled roadway.

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--Item 738--

Perform sweeping cycles every two weeks whenever barrier is placed within two feet of the lane edge for frontage roads, main lanes, and ramps.

A sweeping cycle shall be a moving operation performed at night. The moving operation shall be considered subsidiary to this item and must meet the requirements of the Traffic Control Plan Standards.

--Item 5010--

Provide 6 transportable cellular telephones for use by the Engineer’s staff. The cell phone plan selected must be approved by the Engineer prior to service being provided.

--Item 6007--

Perform a traffic signal and traffic sign inventories prior to the commencement of any work. The inventory will list the quantity, condition, sign type and size of the equipment which is to be salvaged and returned to the City. This inventory shall include, but not limited to, the following equipment and materials:

- | | |
|---|--------------------------------|
| Pedestrian Signal Heads | Metal Splice Boxes |
| Traffic Signal Sections | Service Pedestals |
| Service Box | Pipe Post |
| Signal Mounting Hardware | Standard and Transformer Bases |
| Steel Signal Poles and Mast Arms | Backplates |
| Pedestrian Push Buttons and Signs | Traffic Signal Lamps |
| Traffic Signal Controller and Cabinet | VIVDS Cameras |
| (All equipment and accessories located within the controller cabinet) | |

Both the signal and sign inventory shall be conducted by the Contractor with the Engineer present and jointly agreed to. All traffic signal and traffic sign equipment and materials to be salvaged shall be returned to the State traffic traffic operations center located at 4615 NW Loop 410, San Antonio, TX. The Traffic Operations Engineer shall be contacted at 210-731-5233 to schedule returns. Non-salvage items such as wood poles and cable shall be properly managed in accordance with the local, State and/or Federal requirements.

TMS GENERAL NOTES

“TMS” is abbreviation for Traffic Management System.

The contractor’s attention is directed to the “Wireless Radio Traffic Management System Site layouts” and the “Temporary DMS(TY-2) Locations Traffic Management System layouts”. These layouts show temporary CCTV cameras and radar detectors being installed and operated

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by wireless equipment, and Dynamic Message Signs being removed from existing Overhead Sign Bridges and installed on temporary "T" mounts. All equipment shown on these layouts must be installed and made operational with the TransGuide system BEFORE any existing Traffic Management equipment is taken out of service.

Coordinate the installation of permanent TMS equipment, conduit, manholes, ground boxes, etc. with the roadway construction phasing so as to prohibit any open cuts across new construction.

All references to the TRANSGUIDE mainframe are references to the TRANSGUIDE computer network.

Provide a submittal compliance matrix with all TMS submittals.

Perform all TMS Prototype approval, Design approval, and Demonstration tests within the State of Texas.

Not previously used TMS equipment:

Test any TMS Equipment (including but not limited to CCTV field equipment, Fiber Optic Dynamic Message Sign System, Lane Control System), which has not previously been proven to be fully operational and fully compatible with the existing TRANSGUIDE software and hardware in the following manner:

Conduct tests for each type of TMS equipment, as directed by the Engineer, to determine compatibility of the equipment with the existing TRANSGUIDE software and hardware. Prior to field installation, test one complete unit with all components to ensure that it is fully compatible with the existing TRANSGUIDE system. Mount the equipment to a trailer and connect in the field to an existing Fiber Hub. Make all hardware connections and configuration (in the operations center and in the field) and provide all incidentals (cable, connectors, etc.) to make the unit operational. Test all aspects of the system to show full functionality of the equipment and to show full compatibility with the TRANSGUIDE software and hardware. Failure to perform to the requirements of any test will be considered as a defect, and the equipment will be subject to rejection by the Engineer. Rejected equipment may be offered again for retest provided all noncompliance's have been corrected and retested by the Contractor and evidence thereof submitted to the Engineer. Testing is considered subsidiary to the particular bid item, with no direct payment made.

Partial Payments:

The contractor will receive partial payments for the following TMS items unless otherwise approved by the Engineer:

Radar Vehicle Sensing Device, Dual OC-3 ATM MPEG2 Encoder, Dual OC-3 ATM MPEG2 Decoder, Ethernet Fiber Driver, Fiber Field Terminal Server, Fiber Hub (ATM), Field Ethernet

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Switch, Field Terminal Server, Field VoIP Gateway, Wireless Radio Traffic Management System Sites, CCTV Field Equipment, and Single Mode Fiber Optic Video/Data Transceiver.

Partial Payments Consist Of The Following:

Materials On Hand: the Contractor's paid amount is based on the invoices for the material received and stored in his/her yard.

Field Installation: When the Contractor has completed the support structure, (mounted the Dynamic Message sign, Lane Control Signal Heads and/or CCTV camera) and installs the controller, the department will pay 80% of the bid item.

Stand-Alone Test: when the equipment has passed the stand-alone test, the department will pay 95% of the bid item.

When the TMS equipment has passed the test portion of the final acceptance test, the Department will pay 100% of the bid item.

The above percentages do not include the deduction for standard Retainage.

Submittals:

Include in all TMS submittals the respective bid item (specification number and descriptive code). Indicate compliance on a paragraph by paragraph basis. Ensure that the statements claiming compliance reference the appropriate documentation and the referenced documentation supporting this claim is included with the submittal. Provide referenced documentation that contains the same numbering system as referenced in the submittal. For example, submittal item XXXX-XXXX, Section 2.3, Paragraph 3, Meets Requirements (See Attachment "B"). The supporting documentation for Item XXXX-XXXX, Section 2.3, Paragraph 3, would be titled as Attachment "B". Provide submittals with the same numbering system as stated in the specification. Failure to submit accordingly will result in rejection by the Engineer.

A TMS submittal will be considered as incomplete and therefore rejected, if it contains items listed as "being furnished by others". It is the responsibility of the Contractor to make sure the submittal addresses all items of the specification.

Provide the following TMS submittals (to be received by the department) within the designated time. The time frame is in calendar days.

Item Description	Submitted By Contractor W/I Days After Authorization To Begin Work	Returned By State W/I Days
------------------	--	----------------------------------

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Equipment & Interconnect Wiring Schematic	30	30
Fiber Optic Cable (Single Mode)	30	30
CCTV Field Equipment	30	30
Dual OC-3 ATM MPEG2 Encoder	30	30
Dual OC-3 ATM MPEG2 Decoder	30	30
Ethernet Fiber Driver	30	30
Fiber Field Terminal Server	30	30
Fiber Hub (ATM)	30	30
Field Ethernet Switch	30	30
Field Terminal Server	30	30
Field VoIP Gateway	30	30
Wireless Radio Traffic Management System Sites	30	30
Single Mode Fiber Optic Video/Data Transceiver Equipment	30	30
Communication Cable	90	15
Multi-Duct Conduit System	90	15
Final Acceptance Plan	90	30

Submit those items designated with the (*), if any, together as a Package.

Submit the Final Acceptance Plan in electronic form.

The Contractor may submit items sooner if needed for construction, but no later than the dates stated above.

Provide, to the Engineer, as-built plans in MicroStation format (.dgn files) of the TMS portion of this project when the project is complete. TxDOT will provide the .dgn files of the TMS plan sheets. Update these files with all TMS items as ACTUALLY CONSTRUCTED in the field. Cost to provide as-built plans as described above is subsidiary to the various bid items with no direct payment.

Videotape all TMS equipment which requires training on VHS (1/2") tapes and provide the tapes to the Department for later use. Customize all training specifically for the TRANSGUIDE system; generic training will not be accepted on this project. All tapes become the property of the Department. Materials and labor are subsidiary to the various Bid Items with no direct payment.

TMS equipment and conduit locations are approximate; the precise location is to be determined in the field, therefore the Contractor should not scale equipment off of plan sheets. Plan sheets are to be used for visual location (vicinity). Equipment locations may have to be adjusted due to conflicts with utilities or other structures, as approved by the Engineer. Do not obstruct the natural flow of water with Traffic Management equipment. In low water areas, place Traffic Management equipment on high side of ditch.

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Replace or repair any existing to remain Traffic Management Equipment, conduit, cables, etc. damaged during construction, subsidiary to the various bid items with no direct payment. Replace all pavement, sidewalk, curb, rip-rap or any item damaged during construction, subsidiary to the various bid items with no direct payment.

Stencil structure numbers on all new TMS structures for permanent identification as directed by the Engineer.

Ensure that all TMS equipment furnished and installed is completely compatible with the existing hardware and software located within the TRANSGUIDE operations center (i.e. TRANSGUIDE central software). TRANSGUIDE is unique and complicated. The Contractor should contact the Traffic Management Engineer for details on the system network architecture.

All new TMS equipment and any existing TMS equipment that is relocated and converted to ATM will be incorporated into the existing Network Management System, subsidiary to the various bid items.

Security against theft and vandalism of all Traffic Management equipment is the full responsibility of the Contractor until the date of final acceptance of the project by the Engineer.

Maintenance of all Traffic Management equipment furnished and installed on this project is the full responsibility of the Contractor until date of final acceptance of this project by the Engineer. All required documentation must be turned in before TxDOT will accept project for maintenance.

Submit a layout of equipment and interconnect wiring schematic for the TRANSGUIDE Control Center and Fiber Hubs for approval by the Engineer prior to ordering materials. Consider all interconnect wiring within the TRANSGUIDE Control Center and all interconnect wiring for all equipment in the plans and described within the specifications as subsidiary to the various Bid Items with no direct payment.

Consider the adjusting and/or removal of sign panels on OSB structures to mount TMS Dynamic Message Signs as subsidiary to the various Bid Items with no direct payment, as directed by the Engineer.

Perform all TMS electrical work and provide all TMS electrical materials in accordance with the National Electrical Code.

The location of utilities (including TMS), either underground or overhead, if shown within the right of way are approximate and must be verified by the Contractor before beginning construction operations. TRANSGUIDE will provide the approximate location of TMS equipment, however, it is the responsibility of the Contractor to determine the depth of the Traffic Management conduit.

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In accordance with the Underground Facility Damage Prevention Act (One Call Bill) the phone number for a utility locator is 1-800-545-6005. It is the Contractor's responsibility to make arrangements for utility locators as needed.

TxDOT (Traffic Management)	(210)731-5131
TxDOT (Sign Lighting)	(210)615-5995
TxDOT (Traffic Signal)	(210)615-5975

In preparing holes for TMS posts and/or foundations, use care so as not to rupture existing drainage structures, sprinkler systems, electrical conduits and public utilities.

Place small signs on ramps and frontage roads at a lateral clearance of 8 feet to 12 feet from the edge of pavement or as directed by the Engineer.

When installing TMS cabinet foundations where rip-rap presently exists, use care in breaking out existing rip-rap. Do not break out area greater than is required for placement of the foundations. Replace broken out rip-rap with class "B" concrete to the exact slope, pattern and thickness of the existing rip-rap in accordance with item 432, subsidiary to the various bid items with no direct payment.

Work on TMS equipment that integrates into the operational system only between the hours of 12:00 am (midnight) and 4:00 am when the work requires an interface with the TRANSGUIDE operational system. Notify the TransGuide operations manager (731-5242) 48 hrs prior to this work. The contractor is responsible for all cross connects in the TRANSGUIDE computer room and Fiber Hubs.

Notify the TransGuide operations manager (731-5242) one week in advance of any new fiber to existing fiber splicing operations, and of any fiber optic cable cuts as shown in plans.

Traffic Signal Modems and Fiber Field Terminal Servers:

State forces shall furnish and contractor shall install modems in the TransGuide Operation Center for each Traffic signal controller shown on the plans as being connected to the TMS system. Contractor shall furnish and install Fiber Field Terminal Servers in traffic signal cabinets where TMS plans show traffic signal controller being connected to TMS system. Contractor shall connect all field wiring and make traffic signal controllers fully operational with the TransGuide system, subsidiary to the various bid items.

--Item 421 & 427--

Finish all TMS concrete structures with a Grade I Class B, Type I finish or as approved by the engineer.

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Install 50 feet of trunkline fiber optic cable (single mode) inside all manholes or as shown on plans, racked to the side of the manhole. Provide rack and hooks to support the cable, subsidiary to the various bid items with no direct payment. Partial construction of manholes will not be permitted unless adequate protection is provided by the contractor.

Protect all TMS equipment with metal beam guard fence, terminal anchor sections and single guard rail terminals. Install metal beam guard fence with terminal anchor sections and single guardrail terminal immediately after the creation of the TMS obstruction. Failure to do so will result in stoppage of all other work on the project until the installation of guard fence is complete.

Do not install metal beam guard fence for TMS equipment until the exact location of the TMS equipment to be protected has been determined. Obtain prior approval from the engineer before the metal beam guard fence is installed and prior to ordering materials. Due to field conditions the quantity may be reduced. The engineer's approval does not relieve the contractor of his/her responsibility for correctness. Any adjustments to TMS equipment or metal beam guard fence with TAS and SGT's will be at no cost to the department.

--Item 618--

Make all TMS underground conduit bends of 45 degrees or more in PVC systems, including bends into ground boxes, with rigid metal conduit, subsidiary to the various bid items with no direct payment. Ensure that grounding is in accordance with the ED sheets.

Steel case all TMS PVC bores, subsidiary to the item "conduit" with no direct payment for labor or materials.

Install a permanent pull cord all new TMS conduit and innderducts which do not contain cables. Provide pull cords that have a minimum tensile strength of 1250 lbs. and are flat with footage markings for determining length installed. Provide pull cords that are water-resistant and resistant to environmental conditions within conduit. Pull cords installed will be considered incidental to the various bid items with no direct payment made for labor and materials.

Install a single 1/C #14 AWG insulated wire (tracer wire) in TMS conduit that does not contain copper cables or contains fiber optic cable only and no copper cables, for the purpose of locating that conduit after installation, subsidiary to the item "conduit".

TMS layout sheets may show multiple TMS cabinets at a particular location, however the conduit & cable which interconnects the equipment is not shown and is not included in the quantities unless stated otherwise on plan sheets. These conduit & cable runs which interconnect Fiber hubs and other TMS cabinets foundations to each other are subsidiary to the various bid items with no direct payment, except for the 25 pr #22 communication cable which connects "auxiliary" cabinets to "main" cabinet, which IS included in quantities.

County: Bexar**Control:** 0521-04-187,etc**Highway:** IH 410

When installing TMS conduit in areas where riprap presently exists, use care and do not break out more riprap that is necessary for placement of conduit. Replace riprap with concrete to the exact slope, pattern and thickness of the existing riprap, subsidiary to the various bid items with no direct payment

Install TMS concrete encased conduit (except for Multi-duct conduit system) with a minimum of 2 inches of encasement. (See Multi-duct conduit system details for concrete encasement requirements). Provide a template at 5 foot intervals to ensure that the conduit remains in its original position as approved by the engineer. Templates are considered subsidiary to the item "conduit" with no direct payment.

TMS bore lengths shown on plan sheets are approximate. Length of bore is measured starting 3 feet from each edge of pavement, curb and gutter, or any unforeseen existing utility, and balance of conduit run is measured as trenched conduit.

--Item 620--

Wire nuts for TMS installations are not be permitted.

In locations where TMS service conductors are routed through ground boxes with other cables, install a section of flexible PVC conduit in the ground box. Route the service conductors through this conduit to keep it separated from other cables. Isolate all other cables in the ground box in the same manner. Furnishing and installing the flexible PVC conduit is subsidiary to the various bid items with no direct payment.

To ensure immediate identification, consistently color code and permanently identify all TMS power conductors, twisted wire pair cables, shielded cables, control cables, and fiber optic cables in all manholes, ground boxes, and at all termination points and splices. Submit a chart or list identifying all cables and conductors in a logical and sequential manner.

Install all TMS conductors and cables continuous and without splices from terminal point to terminal point unless otherwise shown on the plans.

The TMS plans show the conduits numbered and specified cables in specific conduits. The purpose of these notes is to instruct the contractor on how to group the cables in the conduits and not to specify the exact conduit to carry the cables. Except for the main trunklines (4- 3" PVC or 4" PVC Multiduct [2-way] or [4-way, etc], the numbering system is arbitrary and may be set by the contractor.

Provide an electrical conductor insulated ground in accordance with the National Electrical Code for any TMS conduit containing electrical conductors (insulated).

Test all TMS circuits to be clear of faults, grounds or open circuits.

County: Bexar

Control: 0521-04-187,etc

Highway: IH 410

--Item 624--

Place concrete aprons around all TMS ground boxes installed in sodded areas or as directed/approved by the Engineer.

Complete construction of TMS ground boxes within 48 hours after beginning construction for that ground box.

Provide TMS ground boxes as shown on state standard sheet ED (3)-03. Construct the cover of polymer concrete. Legibly imprint the cover with the letters "FTM" - "Danger High Voltage" in minimum 1 inch letters.

--Item 628--

Construct the TMS electrical services as shown on the TMS Electrical Service Data sheets.

--Item 6009—ITS SYSTEM SUPPORT EQUIPMENT--

Furnish the following TMS equipment to TRANSGUIDE maintenance, meeting the specifications in this contract:

- One (1) Radar Vehicle Sensing Device with all mounting hardware
- One (1) CCTV Field Equipment

--Item 6010—COMMUNICATION CABLE

Splices of communication cable are not allowed on this project. Test all pairs to ensure they are good before installation.

If any existing TMS communication cable that is shown to remain is damaged, it will be replaced in its entirety (terminal point to terminal point – no splices allowed) at no cost to the department. Replace and make fully operational any cable damaged within 48 hours after damage is detected.

Provide cable of size and gauge as shown on plans.

Rack TMS communication cables to side of any manhole it passes thru. Provide 1 1/2 turns of cable in each ground box or manhole it passes thru.

Ground the communication cable shield for the CCTV camera in the CCTV equipment cabinet.

--Item 6362—DUAL OC-3 ATM MPEG-2 ENCODER

Provide dual ATM Singlemode interface single video encoders for this project.

--Item 6364-- CCTV FIELD EQUIPMENT

Ensure that all underground coaxial cable is RG-11 (double shielded).

County: Bexar**Control:** 0521-04-187,etc**Highway:** IH 410

Furnish and install CCTV communication/power cables recommended or supplied by the manufacturer of CCTV. If no recommendation for communication/power cables is made by manufacturer of CCTV, the following cable to conduit assignment will be followed:

Conduit #1: Install coaxial drop cable and CCTV control cable.

Conduit #2: Install CCTV power cable.

If the CCTV power cable carries 24 VDC, then the power cable may be installed in the same conduit with the coaxial drop cable. If the CCTV control cables carry 115 VAC, then the control cables must be installed with the 115 VAC power cable in conduit #2.

In cases where the CCTV equipment and conduit are to be mounted on an existing and proposed structure, review the structure and submit the mounting details to the engineer for approval.

--Item 6365-- CAMERA POLE STRUCTURE

The camera pole may be twelve (12) sided.

--Item 6367-- FIBER OPTIC CABLE (SINGLE MODE)

This project requires the placement of fiber optic cable. In situations where the new fiber optic cable placed by the contractor is spliced to existing TxDOT fiber optic cable, it is the responsibility of the contractor to ensure that the new fiber optic cable is compatible with the existing TxDOT fiber optic cable. Splicing fiber optic cable of different manufacturers may result in signal degradation as measured through splice loss and DB loss per mile. The contractor must supply documentation of the compatibility of the fiber types with the fiber optic cable submittals. If testing of the new fiber optic cable after installation shows evidence of signal degradation outside of tolerable specifications due to the use of different fiber types, the contractor is responsible for replacing the newly installed fiber optic cable with material that results in signal quality within specifications. A TxDOT representative will be present while the contractor is splicing fibers from two different manufacturers.

The contractor is responsible for testing any existing Fiber Optic cable strands that will be used for the communication links back to TransGuide or to an Aggregation Point (any existing fiber back to TransGuide or an Aggregation Point to which new fiber will be spliced) for new or relocated TMS equipment, identifying which fibers can be used and ensuring that the Fiber Optic cable meets requirements stated in Fiber Optic Cable specification for dB loss.

Any existing TMS fiber optic cable damaged during construction will be replaced within 48 hours after detection of damage. The Contractor will be required to test the fiber and provide such tests to the Engineer for determining suitability for splicing. If no splice is permitted, the Contractor will replace the entire run (approx. 15,000 ft or actual length) at no direct cost to the Department. All fiber provided, tested and spliced will be in accordance with special specification "Fiber Optic Cable (Single Mode)".

County: Bexar**Control:** 0521-04-187,etc**Highway:** IH 410

Install 50 feet of slack of “trunkline” fiber optic cable in each manhole that fiber passes thru, racked to side of manholes using support hooks. Rack and hooks are subsidiary to the item manhole with no direct payment.

Use ST connectors where fiber optic cables terminate in TMS equipment.

All fiber optic cable splices and connectors are subsidiary to the item "Fiber Optical Cable (Single Mode)", with no direct payment.

--ITEM 6383—REMOVE AND RELOCATE EXISTING TRAFFIC MANAGEMENT EQUIPMENT

Contractor is made aware that along with other TMS equipment being relocated, there are 6 ea DMS TY-3 signs being relocated for which the existing DMS poles and signs will be re-used. The contractor must examine the existing drill shaft foundations and pole base plates and provide new drill shaft foundations that have the same bolt pattern as existing foundations.

Verify the location of other sign panels on the overhead sign bridges in the field prior to installation of the DMS.

Provide all conduit and cables from Dynamic Message Signs to DMS controllers and from all LCS heads to LCS controllers, subsidiary to this item with no direct payment. Submit to the Engineer for approval the mounting details of the Dynamic Message Signs and conduit that are to be installed on existing or proposed structures.

Galvanize all structural steel, bolts, nuts and washers after fabrication.

Provide structural steel that conforms to A.S.T.M. Specification A-36. Provide clamp bolts that have square heads and hexagon nuts and confirm with A.S.T.M. Specification A-307 and with dimensions in accordance with ANSI B 18.2.1.

Provide aluminum post clamps made of cast aluminum alloy 356-T6. Provide aluminum bolts made of alloy 2024-T4.

Perform all work in accordance with the National Electrical Code.

Provide new pleated air filters in relocated DMS cabinets, relocated LCS cabinets, and relocated Fiber Hubs. Fiberglass air filters are not acceptable.

Conduct all Lane Control System (LCS) testing at night with full closure or as approved by the Engineer.

County: Bexar**Control:** 0521-04-187,etc**Highway:** IH 410

Numbers assigned on the plans for Fiber Hubs are strictly for identification within the construction plans and are not to be used for programming the TMS equipment. Contact TransGuide automation for equipment numbers.

No portable notebook computers are required for the TMS portion of this project.

--Item 6385—MULTI-DUCT CONDUIT SYSTEM--

Lengths of Multi-duct conduit system (trenched, bored, trenched in roadway hung on bridge) are measured by length of system, not total of lengths of conduits installed. For example, a 20 ft length of conduit system is measured as 20 feet, regardless of whether it is a 2-way system, 4-way system or any other number of conduits system.

Install a pull rope in each Innerduct and plug any unused Innerduct. Provide plugs with eye's for attaching the pull rope.

Submit to the engineer for approval attachment details for Fiberglass Multi-duct system hung on bridges. Use Omni duct (Opti-com Mfg.) or equivalent hanging system or as approved by the engineer. Use manufacturer's recommended spacing of hangers and expansion joints.

--Item 6389-- FINAL ACCEPTANCE PLAN

The 60 day test will begin only when all TMS equipment installation, cabling, wiring, testing, field work, TRANSGUIDE operations center work, etc. for the entire project is completed and acceptable to TxDOT. Partial testing is not allowed.

--Item 6390--SOFTWARE SYSTEM INTERFACE

Provide data stream and protocol for items "Fiber Optic Dynamic Message Sign System", CCTV Field Equipment", and "Radar Vehicle Sensing Device" as specified in special specification "Software System Interface". Do not submit any other data stream or protocol.

Do not install computer or gateway hardware between the field controllers and the computer network.

Engineer will not accept any other solutions other than those specified within the special specification "Software System Interface".

CONTROL : 0521-04-187, ETC
PROJECT : STP 2006(457)MM, ETC
HIGHWAY : IH 410
COUNTY : BEXAR

TEXAS DEPARTMENT OF TRANSPORTATION

GOVERNING SPECIFICATIONS AND SPECIAL PROVISIONS

ALL SPECIFICATIONS AND SPECIAL PROVISIONS APPLICABLE TO THIS PROJECT ARE IDENTIFIED AS FOLLOWS:

STANDARD SPECIFICATIONS: ADOPTED BY THE TEXAS DEPARTMENT OF
----- TRANSPORTATION JUNE 1, 2004.
STANDARD SPECIFICATIONS ARE INCORPORATED
INTO THE CONTRACT BY REFERENCE.

- ITEMS 1 TO 9 INCL., GENERAL REQUIREMENTS AND COVENANTS
- ITEM 100 PREPARING RIGHT OF WAY (103)
- ITEM 110 EXCAVATION (132)
- ITEM 132 EMBANKMENT (100) (204) (210) (216) (400)
- ITEM 161 COMPOST (160)
- ITEM 162 SODDING FOR EROSION CONTROL (166) (168)
- ITEM 164 SEEDING FOR EROSION CONTROL (162) (166) (168)
- ITEM 168 VEGETATIVE WATERING
- ITEM 316 SURFACE TREATMENTS (210) (300) (302) (520)
- ITEM 341 DENSE-GRADED HOT-MIX ASPHALT (QC/QA) (210) (300) (301) (320)
(520) (585)
- ITEM 354 PLANING AND TEXTURING PAVEMENT
- ITEM 400 EXCAVATION AND BACKFILL FOR STRUCTURES (132) (401) (420)
(421)
- ITEM 401 FLOWABLE BACKFILL (421)
- ITEM 402 TRENCH EXCAVATION PROTECTION
- ITEM 403 TEMPORARY SPECIAL SHORING (423)
- ITEM 416 DRILLED SHAFT FOUNDATIONS (420) (421) (440) (448)
- ITEM 420 CONCRETE STRUCTURES (400) (404) (421) (426) (427) (438) (440)
(441) (448)
- ITEM 422 REINFORCED CONCRETE SLAB (420) (421) (424) (426) (430) (440)
(585)
- ITEM 423 RETAINING WALLS (110) (132) (400) (420) (421) (424) (440) (445)
(458) (556)
- ITEM 425 PRECAST PRESTRESSED CONCRETE STRUCTURAL MEMBERS (420)
(421) (424) (426) (427) (434) (440) (442)
- ITEM 427 SURFACE FINISHES FOR CONCRETE (420)
- ITEM 428 CONCRETE SURFACE TREATMENT (427)
- ITEM 429 CONCRETE STRUCTURE REPAIR (420) (421) (431) (440)
- ITEM 430 EXTENDING CONCRETE STRUCTURES (420) (421) (440) (448)

ITEM 432 RIPRAP (247) (420) (421) (427) (431) (440)
 ITEM 442 METAL FOR STRUCTURES (441) (445) (446) (447) (448) (449)
 ITEM 446 CLEANING AND PAINTING STEEL
 ITEM 450 RAILING (420) (421) (424) (440) (441) (442) (445) (446) (448)
 (540)
 ITEM 454 BRIDGE EXPANSION JOINTS (429) (442)
 ITEM 460 CORRUGATED METAL PIPE (400) (445) (476)
 ITEM 462 CONCRETE BOX CULVERTS AND STORM DRAINS (400) (420) (421)
 (424) (440) (464) (476)
 ITEM 464 REINFORCED CONCRETE PIPE (400) (476)
 ITEM 465 MANHOLES AND INLETS (400) (420) (421) (440) (471)
 ITEM 466 HEADWALLS AND WINGWALLS (400) (420) (421) (430) (440) (464)
 ITEM 467 SAFETY END TREATMENT (400) (420) (421) (430) (432) (440) (445)
 (460) (464)
 ITEM 471 FRAMES, GRATES, RINGS, AND COVERS (441) (445) (448)
 ITEM 476 JACKING, BORING, OR TUNNELING PIPE OR BOX (460) (462) (464)
 ITEM 481 PVC PIPE FOR DRAINS (400)
 ITEM 496 REMOVING STRUCTURES (430)
 ITEM 499 ADJUSTING STEEL SHOES (429) (441) (442) (446) (448)
 ITEM 500 MOBILIZATION (5010)
 ITEM 502 BARRICADES, SIGNS, AND TRAFFIC HANDLING
 ITEM 504 FIELD OFFICE AND LABORATORY
 ITEM 506 TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL
 CONTROLS (432) (556)
 ITEM 508 CONSTRUCTING DETOURS
 ITEM 512 PORTABLE CONCRETE TRAFFIC BARRIER (420) (421) (424) (440)
 (442)
 ITEM 514 PERMANENT CONCRETE TRAFFIC BARRIER (400) (416) (420) (421)
 (424) (440) (442) (448)
 ITEM 528 COLOR TEXTURED CONCRETE AND LANDSCAPE PAVERS (132) (247)
 (420) (421) (440)
 ITEM 529 CONCRETE CURB, GUTTER, AND COMBINED CURB AND GUTTER (360)
 (420) (421) (440)
 ITEM 530 INTERSECTIONS, DRIVEWAYS, AND TURNOUTS (247) (260) (263)
 (275) (276) (292) (316) (330) (334) (340) (360) (421) (440)
 ITEM 531 SIDEWALKS (104) (360) (420) (421) (440) (530)
 ITEM 540 METAL BEAM GUARD FENCE (421) (445) (529) (542) (544)
 ITEM 542 REMOVING METAL BEAM GUARD FENCE
 ITEM 544 GUARDRAIL END TREATMENTS
 ITEM 545 CRASH CUSHION ATTENUATORS (421)
 ITEM 610 ROADWAY ILLUMINATION ASSEMBLIES (421) (441) (442) (445) (446)
 (449) (616) (620)
 ITEM 617 TEMPORARY ROADWAY ILLUMINATION (416) (610) (613) (614) (618)
 (620) (621) (622) (624) (627) (628)
 ITEM 618 CONDUIT (400) (445) (476) (622)
 ITEM 620 ELECTRICAL CONDUCTORS
 ITEM 624 GROUND BOXES (421) (440)
 ITEM 628 ELECTRICAL SERVICES (441) (445) (449) (618) (620) (627) (656)
 ITEM 636 ALUMINUM SIGNS (643)
 ITEM 644 SMALL ROADSIDE SIGN SUPPORTS AND ASSEMBLIES (421) (440)
 (441) (442) (445) (634) (636) (643) (656)
 ITEM 647 LARGE ROADSIDE SIGN SUPPORTS AND ASSEMBLIES (421) (440)
 (441) (442) (445) (643)
 ITEM 650 OVERHEAD SIGN SUPPORTS (416) (420) (421) (441) (442) (445)

(449) (618)

ITEM 658 DELINEATOR AND OBJECT MARKER ASSEMBLIES (445)

ITEM 662 WORK ZONE PAVEMENT MARKINGS (666) (668) (672) (677)

ITEM 666 REFLECTORIZED PAVEMENT MARKINGS (316) (318) (662) (677) (678)

ITEM 672 RAISED PAVEMENT MARKERS (677) (678)

ITEM 678 PAVEMENT SURFACE PREPARATION FOR MARKINGS (677)

ITEM 680 INSTALLATION OF HIGHWAY TRAFFIC SIGNALS (610) (625) (627)
(634) (636) (656)

ITEM 681 TEMPORARY TRAFFIC SIGNALS (628) (680)

ITEM 682 VEHICLE AND PEDESTRIAN SIGNAL HEADS

ITEM 684 TRAFFIC SIGNAL CABLES

ITEM 686 TRAFFIC SIGNAL POLE ASSEMBLIES (STEEL) (416) (421) (441)
(442) (445) (449)

ITEM 687 PEDESTAL POLE ASSEMBLIES (445) (449) (656)

ITEM 730 ROADSIDE MOWING

ITEM 734 LITTER REMOVAL

ITEM 738 CLEANING AND SWEEPING HIGHWAYS

SPECIAL PROVISIONS: SPECIAL PROVISIONS WILL GOVERN AND TAKE
 ----- PRECEDENCE OVER THE SPECIFICATIONS ENUMERATED
 HEREON WHEREVER IN CONFLICT THEREWITH.

REQUIRED CONTRACT PROVISIONS, FEDERAL-AID CONSTRUCTION CONTRACTS
 (FORM FHWA 1273, DECEMBER, 1993)

WAGE RATES

SPECIAL PROVISION "SCHEDULE OF LIQUIDATED DAMAGES" (000---275)

SPECIAL PROVISION "IMPORTANT NOTICE TO CONTRACTORS" (000---499)

SPECIAL PROVISION "PARTNERING" (000---002)

SPECIAL PROVISION "NOTICE TO ALL BIDDERS" (000---003)

SPECIAL PROVISION "NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO
 ENSURE EQUAL EMPLOYMENT OPPORTUNITY" (000---004)

SPECIAL PROVISION "DISADVANTAGED BUSINESS ENTERPRISE IN FEDERAL-
 AID CONSTRUCTION" (000---461)

SPECIAL PROVISION "STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY
 CONSTRUCTION CONTRACT SPECIFICATIONS" (000---006)

SPECIAL PROVISION "OPTIONAL TRAINING" (000---008)

SPECIAL PROVISION "CERTIFICATION OF NONDISCRIMINATION IN EMPLOYMENT"
 (000---009)

SPECIAL PROVISION "DEPARTMENT DIVISION MAILING AND PHYSICAL ADDRESS"
 (000---011)

SPECIAL PROVISION "IMPORTANT NOTICE TO CONTRACTORS" (000---527)

SPECIAL PROVISION "IMPORTANT NOTICE TO CONTRACTORS" (000---528)

SPECIAL PROVISION "IMPORTANT NOTICE TO CONTRACTORS" (000---529)

SPECIAL PROVISION "ELECTRONIC EQUIPMENT DATING FORMAT" (000---004)

SPECIAL PROVISION TO ITEM 3 (003---020)

SPECIAL PROVISION TO ITEM 5 (005---001)

SPECIAL PROVISION TO ITEM 6 (006---018)

SPECIAL PROVISIONS TO ITEM 8 (008---001) (008---004) (008---007)
 (008---037)

SPECIAL PROVISION TO ITEM 9 (009---009)

SPECIAL PROVISION TO ITEM 100 (100---001)

SPECIAL PROVISION TO ITEM 416 (416---001)

SPECIAL PROVISION TO ITEM 420 (420---003)
 SPECIAL PROVISION TO ITEM 434 (434---003)
 SPECIAL PROVISION TO ITEM 440 (440---001)
 SPECIAL PROVISION TO ITEM 441 (441---002)
 SPECIAL PROVISION TO ITEM 442 (442---005)
 SPECIAL PROVISION TO ITEM 447 (447---002)
 SPECIAL PROVISION TO ITEM 620 (620---001)

SPECIAL SPECIFICATIONS:

ITEM 4167 SOUND WALLS
 ITEM 5010 TRANSPORTABLE CELLULAR TELEPHONES
 ITEM 5018 INCENTIVE FOR USING NON-ROAD DIESEL EQUIPMENT POWERED BY
 EPA TIER 1, 2, OR 3 DIESEL ENGINES IN NONATTAINMENT AND
 AFFECTED COUNTIES
 ITEM 5301 SANITARY SEWERS
 ITEM 5302 WATER MAINS AND SERVICE LINES
 ITEM 5327 NATURAL GAS PIPELINE
 ITEM 6006 SPREAD SPECTRUM RADIOS FOR TRAFFIC SIGNALS
 ITEM 6007 REMOVING TRAFFIC SIGNALS
 ITEM 6008 SHIFTING OR REMOVING EXISTING OVERHEAD SIGNS
 ITEM 6009 ITS SYSTEM SUPPORT EQUIPMENT
 ITEM 6010 COMMUNICATION CABLE
 ITEM 6011 TESTING, TRAINING, DOCUMENTATION, FINAL ACCEPTANCE AND
 WARRANTY
 ITEM 6013 ELECTRONIC COMPONENTS
 ITEM 6026 NATIONAL TRANSPORTATION COMMUNICATIONS FOR ITS PROTOCOL
 FOR DYNAMIC MESSAGE SIGNS
 ITEM 6038 PORTABLE CHANGEABLE MESSAGE SIGN
 ITEM 6110 REFLECTORIZED PAVEMENT MARKINGS WITH RETROREFLECTIVE
 REQUIRMENTS
 ITEM 6266 VIDEO IMAGING VEHICLE DETECTION SYSTEM
 ITEM 6362 DUAL OC-3 ATM MPEG-2 ENCODER
 ITEM 6363 ETHERNET FIBER DRIVER
 ITEM 6364 CCTV FIELD EQUIPMENT
 ITEM 6365 CAMERA POLE STRUCTURE
 ITEM 6366 CCTV EQUIPMENT CABINET
 ITEM 6367 FIBER OPTIC CABLE (SINGLE MODE)
 ITEM 6368 FIELD TERMINAL SERVER
 ITEM 6369 FIBER OPTIC DYNAMIC MESSAGE SIGN SYSTEM (6011)(6013)
 (6026)(6390)
 ITEM 6370 FIBER FIELD TERMINAL SERVER
 ITEM 6371 FIBER HUB (ATM)
 ITEM 6372 FIELD ETHERNET SWITCH
 ITEM 6373 WIRELESS RADIO TRAFFIC MANAGEMENT SITES
 ITEM 6374 CONVERT EXISTING TRAFFIC MANAGEMENT EQUIPMENT TO ATM
 ITEM 6377 FIELD VOIP GATEWAY
 ITEM 6381 LANE CONTROL SYSTEM
 ITEM 6382 PREPARATION OF EXISTING CONDUIT
 ITEM 6383 REMOVE AND RELOCATE EXISTING TRAFFIC MANAGEMENT EQUIPMENT
 ITEM 6384 SINGLE MODE FIBER OPTIC VIDEO/DATA TRANSCEIVER EQUIPMENT
 (ATM)

ITEM 6385 MULTI-DUCT CONDUIT SYSTEM
ITEM 6388 RADAR VEHICLE SENSING DEVICE
ITEM 6389 FINAL ACCEPTANCE PLAN
ITEM 6390 SOFTWARE SYSTEM INTERFACE
ITEM 6392 DECORATIVE ILLUMINATION ASSEMBLIES

GENERAL: THE ABOVE-LISTED SPECIFICATION ITEMS ARE THOSE UNDER WHICH
----- PAYMENT IS TO BE MADE. THESE, TOGETHER WITH SUCH OTHER
PERTINENT ITEMS, IF ANY, AS MAY BE REFERRED TO IN THE ABOVE-
LISTED SPECIFICATION ITEMS, AND INCLUDING THE SPECIAL
PROVISIONS LISTED ABOVE, CONSTITUTE THE COMPLETE SPECIFI-
CATIONS FOR THIS PROJECT.

SPECIAL PROVISION

000---004

Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246)

1. **General.** In addition to the affirmative action requirements of the Special Provision titled "Standard Federal Equal Employment Opportunity Construction Contract Specifications" as set forth elsewhere in this proposal, the Bidder's attention is directed to the specific requirements for utilization of minorities and females as set forth below.

2. **Goals.**

- a. Goals for minority and female participation are hereby established in accordance with 41 CFR 60-4.
- b. The goals for minority and female participation expressed in percentage terms for the Contractor's aggregate work force in each trade on all construction work in the covered area, are as follows:

Goals for minority participation in each trade (percent)	Goals for female participation in each trade (percent)
---	---

See Table 1

6.9

- c. These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and non-federally involved construction. The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Standard Federal Equal Employment Opportunity Construction Contract Specifications Special Provision and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority and female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

Table 1

County	Goals for Minority Participation	County	Goals for Minority Participation
Anderson	22.5	Concho	20.0
Andrews	18.9	Cooke	17.2
Angelina	22.5	Coryell	16.4
Aransas	44.2	Cottle	11.0
Archer	11.0	Crane	18.9
Armstrong	11.0	Crockett	20.0
Atascosa	49.4	Crosby	19.5
Austin	27.4	Culberson	49.0
Bailey	19.5	Dallam	11.0
Bandera	49.4	Dallas	18.2
Bastrop	24.2	Dawson	19.5
Baylor	11.0	Deaf Smith	11.0
Bee	44.2	Delta	17.2
Bell	16.4	Denton	18.2
Bexar	47.8	DeWitt	27.4
Blanco	24.2	Dickens	19.5
Borden	19.5	Dimmit	49.4
Bosque	18.6	Donley	11.0
Bowie	19.7	Duval	44.2
Brazoria	27.3	Eastland	10.9
Brazos	23.7	Ector	15.1
Brewster	49.0	Edwards	49.4
Briscoe	11.0	Ellis	18.2
Brooks	44.2	El Paso	57.8
Brown	10.9	Erath	17.2
Burleson	27.4	Falls	18.6
Burnet	24.2	Fannin	17.2
Caldwell	24.2	Fayette	27.4
Calhoun	27.4	Fisher	10.9
Callahan	11.6	Floyd	19.5
Cameron	71.0	Foard	11.0
Camp	20.2	Fort Bend	27.3
Carson	11.0	Franklin	17.2
Cass	20.2	Freestone	18.6
Castro	11.0	Frio	49.4
Chambers	27.4	Gaines	19.5
Cherokee	22.5	Galveston	28.9
Childress	11.0	Garza	19.5
Clay	12.4	Gillespie	49.4
Cochran	19.5	Glasscock	18.9
Coke	20.0	Goliad	27.4
Coleman	10.9	Gonzales	49.4
Collin	18.2	Gray	11.0
Collingsworth	11.0	Grayson	9.4
Colorado	27.4	Gregg	22.8
Comal	47.8	Grimes	27.4
Comanche	10.9	Guadalupe	47.8

County	Goals for Minority Participation	County	Goals for Minority Participation
Hale	19.5	Lavaca	27.4
Hall	11.0	Lee	24.2
Hamilton	18.6	Leon	27.4
Hansford	11.0	Liberty	27.3
Hardeman	11.0	Limestone	18.6
Hardin	22.6	Lipscomb	11.0
Harris	27.3	Live Oak	44.2
Harrison	22.8	Llano	24.2
Hartley	11.0	Loving	18.9
Haskell	10.9	Lubbock	19.6
Hays	24.1	Lynn	19.5
Hemphill	11.0	Madison	27.4
Henderson	22.5	Marion	22.5
Hidalgo	72.8	Martin	18.9
Hill	18.6	Mason	20.0
Hockley	19.5	Matagorda	27.4
Hood	18.2	Maverick	49.4
Hopkins	17.2	McCulloch	20.0
Houston	22.5	McLennan	20.7
Howard	18.9	McMullen	49.4
Hudspeth	49.0	Medina	49.4
Hunt	17.2	Menard	20.0
Hutchinson	11.0	Midland	19.1
Irion	20.0	Milam	18.6
Jack	17.2	Mills	18.6
Jackson	27.4	Mitchell	10.9
Jasper	22.6	Montague	17.2
Jeff Davis	49.0	Montgomery	27.3
Jefferson	22.6	Moore	11.0
Jim Hogg	49.4	Morris	20.2
Jim Wells	44.2	Motley	19.5
Johnson	18.2	Nacogdoches	22.5
Jones	11.6	Navarro	17.2
Karnes	49.4	Newton	22.6
Kaufman	18.2	Nolan	10.9
Kendall	49.4	Nueces	41.7
Kenedy	44.2	Ochiltree	11.0
Kent	10.9	Oldham	11.0
Kerr	49.4	Orange	22.6
Kimble	20.0	Palo Pinto	17.2
King	19.5	Panola	22.5
Kinney	49.4	Parker	18.2
Kleberg	44.2	Parmer	11.0
Knox	10.9	Pecos	18.9
Lamar	20.2	Polk	27.4
Lamb	19.5	Potter	9.3
Lampasas	18.6	Presidio	49.0
LaSalle	49.4	Rains	17.2

County	Goals for Minority Participation	County	Goals for Minority Participation
Randall	9.3	Webb	87.3
Reagan	20.0	Wharton	27.4
Real	49.4	Wheeler	11.0
Red River	20.2	Wichita	12.4
Reeves	18.9	Wilbarger	11.0
Refugio	44.2	Willacy	72.9
Roberts	11.0	Williamson	24.1
Robertson	27.4	Wilson	49.4
Rockwall	18.2	Winkler	18.9
Runnels	20.0	Wise	18.2
Rusk	22.5	Wood	22.5
Sabine	22.6	Yoakum	19.5
San Augustine	22.5	Young	11.0
San Jacinto	27.4	Zapata	49.4
San Patricio	41.7	Zavala	49.4
San Saba	20.0		
Schleicher	20.0		
Scurry	10.9		
Shackelford	10.9		
Shelby	22.5		
Sherman	11.0		
Smith	23.5		
Somervell	17.2		
Starr	72.9		
Stephens	10.9		
Sterling	20.0		
Stonewall	10.9		
Sutton	20.0		
Swisher	11.0		
Tarrant	18.2		
Taylor	11.6		
Terrell	20.0		
Terry	19.5		
Throckmorton	10.9		
Titus	20.2		
Tom Green	19.2		
Travis	24.1		
Trinity	27.4		
Tyler	22.6		
Upshur	22.5		
Upton	18.9		
Uvalde	49.4		
Val Verde	49.4		
Van Zandt	17.2		
Victoria	27.4		
Walker	27.4		
Waller	27.3		
Ward	18.9		
Washington	27.4		

SPECIAL SPECIFICATION

5327

Natural Gas Pipeline

- 1. Description.** Obtain all natural gas pipeline materials from a designated CPS Energy (CPS ENERGY) Center (a municipal agency of the City of San Antonio), transporting and unloading the CPS ENERGY furnished materials at the project site; and for furnishing all other materials, tools, supplies, labor and equipment necessary for a complete natural gas pipeline in conformance with the details shown on the plans, this Item and as directed by the Engineer. The term “Engineer” is defined as “the TxDOT and/or the CPS ENERGY Engineers and their representatives”.

Be responsible for the construction of complete facilities, conforming in all respects with the details shown on the plans and as covered by this Item including the design standards, Exhibit GAS-3 and/or Exhibit GAS-4 that are a part of and located at the end of this Item.

No gas service may be cut/turned-off after 2:30 PM each day. All gas services cut/turned-off during the day shall be restored before 4:00 PM that same day. All work shall be coordinated with the Engineer.

All natural gas pipeline work shall conform with Title 49 of the Code of Federal Regulations (CFR), Part 192, “Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards”, and to the design standards and details shown on the plans and/or included in this Item.

Perform the natural gas pipeline work required to abide by the regulations of 49 CFR Part 40, “Procedures for Transportation Workplace Drug Testing Programs”, and 49 CFR Part 199, “Control of Drug Use in Natural Gas, Liquefied Natural Gas, and Hazardous Liquid Pipeline Operations”, to test employees for the presence of prohibited drugs as prescribed and to provide an employee assistance program. Provide the Engineer with an affidavit prior to beginning the work which states that they have complied with all applicable laws, statutes and regulations pertaining to ensuring a drug and alcohol free workplace including but not limited to the requirements of 49 CFR as amended by RSPA. Submit a copy of their anti-drug and alcohol plan for drug and alcohol testing prior to beginning the work and allow the Engineer's representative, periodic on-site access to records documenting compliance with these regulations. Indemnify the State and CPS ENERGY against any fines, penalties, damages, costs or attorney fees based on violation of this requirement.

Provide the Engineer, the name and contact person for the agency or consortium used to ensure compliance with this requirement.

The Contractor that is going to perform the natural gas pipeline work is required to have performed other utility gas pipeline work within the previous 3 years of similar technical

scope and magnitude as the work to be performed for this project. Provide evidence of this previous experience requirement or obtain approval through other means deemed acceptable as determined by the Engineer. Contact CPS ENERGY prior to letting to determine if previous experience meets this requirement.

Locate all existing gas facilities as needed for the construction and installation of new gas facilities. Upon request, the Engineer will provide copies of the appropriate CPS ENERGY gas maps to facilitate locating activities for the existing facilities at the project site; however, the Engineer and CPS ENERGY do not guarantee the accuracy of such gas facilities map information. Use conventional pipe locating equipment and techniques in conjunction with information from the maps to determine the actual location of existing gas facilities and be liable for any damages to existing gas facilities and any other utilities that are incurred by construction activities.

While this Item and the details shown on the plans are intended to be full and complete, the Contractor is considered bound by customary good construction practice whether referred to specifically or not.

2. **Materials.** CPS Energy will provide all natural gas pipe (steel and/or plastic), couplings, valves, valve boxes, stop cocks, anodeless risers, miscellaneous fittings, pipe tracer wire, and any other natural gas pipeline materials necessary to complete the work. These materials will be provided by CPS ENERGY at no cost to the Contractor. Notify the Engineer 10 days prior to scheduling the pick-up of these materials. All other materials, tools, supplies, equipment, etc., necessary to complete the work shall be furnished by the Contractor.

When the materials stored at the CPS ENERGY Centers are issued, they become the Contractor's responsibility. A transfer-of-inventory will be signed as a written record of the materials provided. The Contractor, the State and CPS ENERGY will jointly inspect and inventory the materials for quantity and quality at the time of loading at the CPS ENERGY Center and will sign the inventory list. After this transfer, the Contractor will be responsible for CPS ENERGY's delivered costs for any materials that have to be replaced due to lost or damaged beyond use during the project. "Damaged Beyond Use" will be determined by the Engineer.

Load the materials at one or more CPS ENERGY Center(s) in San Antonio, transport and unload at the work area. All materials are to be unloaded (not dropped) with proper equipment to prevent damage.

Deliver the materials along the right of way in such a manner as to not cause interference to driveways, streets, other construction operations, sidewalks, etc. Prevent dirt or debris from entering into the pipe, couplings, fittings, etc.

Upon completion of the gas work, promptly return excess materials furnished by CPS ENERGY to the designated CPS ENERGY Center(s).

3. **Construction Methods.**

- (1) **Excavation.** Excavation (trenching) required to complete the pipeline installation will have sufficient width to allow installation of piping and valves at depths specified

on the plans and/or the design standards shown at the end of this Item. Blasting to perform the excavation is not allowed. In cases where shrubbery and trees that are labeled to remain are encountered in any location where in the opinion of the Engineer the use of ditching/trenching equipment may result in unnecessary damage, the Engineer may require the trench to be excavated by hand.

Dust Suppression. Whenever trenching activities create significant amounts of dust or other undesirable emissions into the atmosphere, take action to reduce these emissions, as determined by the engineer.

- (2) **Boring.** At the locations shown on the plans, the pipe installation is accomplished with a boring operation using the following methods.

The use of guided or directional boring equipment is acceptable if the Contractor demonstrates such equipment is capable of installing the pipe along a controlled and relatively constant horizontal and vertical alignment. Insure that the pipe is not damaged as it is pulled or otherwise inserted into the bored hole. The bored hole must be at least 1 nominal pipe size larger than the pipe to be installed (i.e. a 4 in. pipe requires at least a 6 in. bored hole). When the bored hole is known to have significant deflections, the bored hole must then be at least 2 nominal pipe sizes larger than the gas pipe.

When boring equipment is used to install plastic pipe, a fusible link will be used between the pull head and the pipe at all times to prevent damage during the pull-back operation. The fusible link shall be at least 2 ft. in length and be a section of pipe that is 1 nominal pipe size smaller than the pipe being installed.

The Engineer will inspect the fusible link and the leading edge of the installed pipe for any significant gouges or scrapes in the outside wall of the pipe or excessive change in length of the fusible link. If damages to the fusible link or pipe are found, remove and replace all of the damaged pipe, and reimburse CPS ENERGY for the cost of the damaged pipe (including CPS ENERGY inventory and handling expenses).

When boring equipment is used to install steel pipe, the Engineer is to inspect the installed pipe for any significant gouges or scrapes in the protective coating on the outside wall of the pipe. If damages to the coating are found, repair all of the damaged coating at no additional cost.

Whenever service lines are planned for installation along a section of gas main that is being installed with guided or directional boring equipment, excavate at least 1 service tap location to provide an intermediate inspection hole prior to pulling the pipe into the bored hole. The intermediate inspection hole is to be located near the middle of the directional bored section. If several service line connections are planned along the route, the Engineer must approve the location of the service tap that is excavated for the intermediate inspection hole before the pipe insertion process.

Mains and service lines that are installed by guided or directional boring equipment must not be installed at depths greater than 7 ft. unless one of the following conditions applies:

- (a) The plans specifically require installation depths in excess of 7 ft.
 - (b) Installation depths in excess of 7 ft. are necessary to achieve acceptable clearance between the pipe and another utility or structure while maintaining the minimum burial depth requirements for the pipe.
 - (c) The Engineer's prior approval for such installation when the conditions described above are not applicable.
 - (d) When guided or directional boring equipment is used to install gas distribution facilities, additional compensation due to extra depth of cover will not apply.
 - (e) The method of gas service replacement by insertion involves sliding a new polyethylene pipe of smaller diameter into the existing pipe. This is an acceptable method of installation provided the ends of the existing steel pipe are reamed and fitted with bushings for the pipe to be inserted without damage, and a shrink sleeve is applied to keep components in place and prevent damage thereafter. In order to reduce stress on the service line being inserted from the main, the horizontal distance between the end point of the new service alignment and the point of insertion should be at least, twice the perpendicular distance between the lines (see the Insertion Detail, exhibit GAS-3). Tracer wires will be inserted through the existing service along with the new pipe. An electrical continuity test will be conducted on each installed tracer wire to verify that the wire has not been "shorted" against the existing steel service during the installation procedure.
- (3) **Temporary Bridges.** When the trench is excavated where it is necessary to have a passageway across/lower the trench, provide safe, temporary bridges or provide other safe means of crossing the trench as approved by the Engineer.

No streets, alleys or driveways are to be blocked at night, except with the Engineer's prior approval. Trenches/holes left open during non-working periods (overnight, a weekend, etc.) shall be properly protected and with barricades and warning lights.

- (4) **Protection of Pipe Ends.** Keep the pipeline installation clean. At the end of each day's work and at any other times that the ends of the installed pipe are left unattended, the pipe ends must be securely closed to prevent the entrance of water, animals, trash or any other obstructions, and not opened until work is resumed.

If there is reasonable cause to believe that there is an obstruction in a portion of the lines, remove all foreign matter if it is in the lines. The work necessary to assure that foreign matter is not present and/or to remove the foreign matter if it is present is at the Contractor's expense.

- (5) **Welding.** All welding is in accordance with API Standard 1104, 18th Edition, dated September, 1994 (or the latest edition), as outlined herein, as shown on the plans, and/or as directed/approved by the Engineer.

- (a) Welds are to be made with the "shielded metal-arc" process. All welding equipment and materials such as welding rods will be furnished by the Contractor. Brand of welding rods proposed must be approved by the Engineer prior to use.

- (b) Where determined by the Engineer to be necessary, back-welding or inside-welding of all tube turns, ells, etc., in the pipeline is to be performed as part of the required work.
 - (c) All welds to be made with not less than 3 beads. The second or “Hot Pass Bead”, should be run on the full circumference of the pipe as soon as practical where the Hot Pass or second bead is run before the Stringer Bead has cooled.
 - (d) Prior to being allowed to weld, each welder must qualify in accordance with Section 3.0 of API Standard 1104 and must pass the tests listed in paragraph 3.4 of this Standard. Conduct, or make arrangements for, qualification tests for welders. The qualifying tests will be conducted in the presence of the Engineer.
 - (e) Each welder will be assigned a specific number and it will be the welder's responsibility to affix his/her number with a crayon next to each weld for future identification. Steel die stamping is not to be used.
 - (f) Welding inspection, is in accordance with Section 5.1 of API Standard 1104. Test all welds with soap suds while the line is subjected to an internal air pressure of 90 PSI prior to field coating the joints.
 - (g) Pin holes, leaks, cold laps, rivers, undercutting or any other defects occurring in any weld, are to be repaired by cutting out the entire weld and completely rewelding. Whenever it becomes necessary to remove a weld from the completed line, replacement is made by welding into the line a pup joint having a minimum length of 10 ft.
- (6) **Coating of Pipe.** Coating materials for coating field joints and for repairing damaged or defective coating will be furnished by CPS ENERGY.
- (a) If the pipe furnished by CPS ENERGY is coated and wrapped pipe, the Contractor will be responsible for coating all field joints and repairing damaged and defective coating on the pipe regardless of the nature, extent or cause of damage or defect. However, if the pipe provided had a damaged or defective coating of such magnitude as to require an extra charge to properly coat, first refer this matter to the Engineer and not proceed until authorization to do so has been obtained, in which event the provisions of Item 9, “Measurement and Payment”, will be used to pay for this work.
 - (b) For coating field joints of pipes coated with TGF-3 coal tar enamel, the coating on the pipe must be cut back a distance of 8 to 12 in. from the joint. The edge of the enamel and felt wrapping is to be feathered at these points to assure a firm bond between the original coating and the field coating. After the joints are welded and tested, and the welds cleaned and brushed, the bare ends of the pipe are to be thoroughly cleaned, then immediately given a hand-brushed coat of primer to dry surfaces. Exercise care to prevent primer from being applied too heavily, especially at the base of the welds; any runs or sags which have dried or dead primer must be scraped off and the pipe reprimed. After the tape primer has dried to a tacky consistency, apply cold wrap tape with a 30% overlap, taking care not to

create any voids between the pipe and tape coating. No primer or coating will be applied to wet or damp pipe.

- (c) All repairs to damaged coating which exceeds 2 sq. in. will be made by breaking out the old coating, scraping the pipe to bare metal, feathering the edges to assure a firm bond and repriming. After the primer has dried to a tacky consistency, apply cold wrap tape taking care not to create any voids between the pipe and the tape coating. For repairs less than 2 sq. in., the pipe does not have to be scraped to bare metal and primed; however, the good enamel around the damaged portion is to be feathered before the cold wrap is applied.
- (d) Repairs to Fusion Bonded Epoxy and/or Powercrete coated pipe may include the following additional repair procedures.

For pinhole and small area repair, the pipe surface and small area holidays where repairs by the patching stick method are approved by the Engineer and is a recommended procedure by the coating manufacturer, the original coated surface must be thoroughly cleaned and lightly abraded with sandpaper. Patching stick material is to be compatible with the F.B.E. epoxy coating system and is to be material normally supplied by the manufacturer of the F.B.E. coating system. It is to be applied by heating the clean pipe surface until the patching stick begins to melt when it is rubbed over the heated area. Continue heating the coated surface while applying the patching stick like a brazing rod. Build a small puddle of melted compound to obtain a minimum thickness of 0.025 in. Continue heating until the compound flows out smoothly. In all instances the manufacturer's recommendations for the use of the patching stick are to be followed.

An alternate method, for repairs to small area holidays, is liquid epoxy. The material for patching is to be 100% solids catalytically cured epoxy coating normally supplied by the manufacturer of the F.B.E. coating system. The original coated surface must be thoroughly cleaned and lightly abraded with sandpaper. All dust is to be wiped off before applying the patch coating. This type of repair coating is to be applied by spatula, brush, roller or spray to attain a uniform minimum thickness of 0.025 in. and is to overlap the surrounding undamaged coating by at least 1 in. The patch coating is not to be applied when pipe temperatures are below 50°F unless provisions are made for complete heat curing, using methods and temperatures in accordance with procedures recommended by the patch coating manufacturer.

At the option of the Engineer, completely cured coating repairs are to be inspected with the Contractor's holiday detector. A patch-coated area is to be allowed to cure prior to handling as per manufacturer's specifications. Supply necessary equipment to complete repairs to manufacturer's guidelines.

For large area repair, where repairs are approved by the Engineer, the following procedures are to be followed. The pipe is to be cleaned to remove all dirt, scale, rust, damaged or disbonded coating and other foreign material. Areas repaired before surface oxidation or rusting occurs may be prepared by hand sanding, power tool grinding, or surface oxidation or other approved and suitable means. Areas

repaired after surface oxidation or rusting occurs are to be cleaned using abrasive blasting prior to coating repairs. The edges of the original coating are to be “feathered out” around the area to be coated and all dust wiped off before applying the patch coating.

The material for patch coating must be 100% catalytically cured epoxy coating supplied by the manufacturer of the F.B.E. coating system. This type of repair coating is to be applied by spatula, brush, roller or spray to attain a uniform minimum thickness of 0.025 in. or as recommended by the manufacturer. The patch compound is to overlap the surrounding undamaged coating by at least 1 in. A patch-coated area is to be allowed to cure prior to handling as per manufacturer's specifications. At the option of the Engineer, completely cured coating repairs are to be inspected with the Contractor's holiday detector. Supply necessary equipment to complete repairs to manufacturer's guidelines.

For coating field joints on fusion bonded epoxy coated pipe, heat shrink sleeves may be employed when approved by the Engineer. Heat shrink sleeves are to be the heat shrinkable wraparound sleeves with either a specially formulated mastic sealant or a solvent free, 2 component liquid epoxy primer designed to prevent corrosion of joints on buried pipelines. Apply sleeves in compliance with manufacturer's recommendations. In addition, for field joints within bores, heat shrink sleeves may also be employed when approved by the Engineer, provided the sleeves are manufactured for this application. Sleeves for this application are to consist of a combination of the following components:

a specially designed wraparound heat shrinkable sleeve, a high shear strength thermoplastic hot melt adhesive, a solvent free, 2 component epoxy, a specially designed wear cone, and optional clamping belts. Supply necessary equipment to install sleeves in accordance to manufacturer's recommendations. This may include, but not be limited to, high intensity gas torches and abrasive blast equipment for pipe surface preparation.

After the field joints have been coated and immediately before the pipe is lowered into the ditch, the entire coating will be tested to locate breaks or pinholes and other flaws in the coating with an approved holiday detector in good working condition capable of producing the testing voltage in pulsating cycles at very low amperage. The voltage used is not to exceed 14,000 volts for pipe coatings of 0.094 in. For fusion bonded epoxy coated pipe, the coating is to be checked for holidays using a dry-type holiday detector. The holiday detector is to be set at 150 volts per mil thickness of coating. All defective places will be plainly marked immediately. Furnish the holiday detector, and check the coating for holidays in the presence of the Engineer.

- (e) Compression type couplings, valves, welded fittings, etc., will receive a cold applied mastic after the pipe is in the trench and has been tested for leaks. A plastic wrap supplied by CPS ENERGY will be installed over the mastic to protect the coating during backfilling.
- (f) Handling coated pipe is to be accomplished only with suitable equipment to prevent damage to the coating. The coated pipe is to be placed on skids alongside

the trench until it is to be welded and lowered into the trench. The skids are to be of sufficient width or padded with sand bags or resilient pads to prevent the skid edges from cutting the coating and wrapping. The skids are to be arranged to permit the coated pipe to bear on the full width of the skid.

- (g) Coated and wrapped pipe is to be carefully handled with wide rubber, leather, composition, or canvas slings or belts containing no protruding rivets or belts that may damage the coating. Wire rope, tongs, chains, hooks, and bare cables must not come into contact with the coating. Coated pipe is not to be handled when the temperature is low enough to cause cracking of the enamel.
- (7) **Plastic Gas Pipe.** Handle the pipe only with suitable equipment to prevent damage to the pipe such as fracture, kinking, deep gouges or cuts. The pipe is not to be subjected to abuse by dropping, throwing or dragging except over smooth non-scratching terrain or surface.

Install an insulated copper tracer wire furnished by CPS ENERGY with all pipe for the purpose of locating the pipe after backfilling. This wire is to be installed with 2 to 6 in. of separation from the pipe.

Fuse pipe joints in accordance with requirements of 49 CFR Part 192, "Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards", Paragraphs of 192. 281, 192. 283, 192. 285, 192. 287.

Prior to starting production fusing, each employee that will be making fusion joints must qualify according to 49 CFR Part 192, Paragraph 285. Conduct, or make arrangements for the qualification tests. The qualifying tests are to be conducted in the presence of the Engineer.

Furnish all specialty tools and equipment required to handle, install, butt fuse and squeeze-off the pipe. Insure all specialty tools and equipment are specifically designed for use on plastic piping systems and are in good working condition. The Engineer may inspect all specialty tools and equipment and may disallow the use of any specialty tools or equipment that are not specifically designed for use on high density polyethylene (plastic) piping systems or are deemed to not be in good working condition. CPS ENERGY routinely uses the Steve Vick & Mark II Coil Tractor for handling large diameter coiled pipe, McElroy equipment for making butt fusions on plastic pipe and Mustang Squeeze-off tools for stopping the flow of gas in existing plastic piping systems. Provide copies of the manufacturer's literature for all comparable equipment from other manufacturers and at the discretion of the Engineer, comparable equipment from other manufacturers may be approved.

All pipe joints are to be soap bubble tested with the line having between 90 and 120 PSIG internal pressure. The test is to be made in the presence of the Engineer.

- (8) **Cathodic Protection.** Install packaged anodes, insulating joints and insulating flange sets as provided for by this Item and/or as shown on the plans. Welding machines are not to be used to test insulation or otherwise be grounded across insulating devices. Insulation will be checked by the Engineer and declared acceptable only after testing establishes satisfactory performance.

- (9) Installation and Backfill.** All stumps and roots found in the trench are to be cut and removed where they will not come in contact with the pipe. All loose rocks, stones, blocks, heavy clods, tree limbs, etc., which may damage or prevent proper installation of the pipe are to be removed before the pipe is installed. The pipe will not be lowered into the trench until it has been inspected and approved by the Engineer.

The trench is to be excavated a minimum of 4 in. deeper than the proposed pipe depth so that a commercial sand approved by the Engineer can be placed in the trench before the pipe is installed. The sand placed in the trench to cushion the pipe is to be leveled and tamped so that the weight of the pipe is evenly distributed on the sand cushion.

Unless the plans or the Engineer requires flowable backfill, backfilling must be conducted in a manner where the trench will be neatly and uniformly backfilled and compacted. Exercise care to prevent hand shovels and tampers from damaging the pipe. Provide 6 in. of sand backfill around and over the pipe to form a protective cushion between the pipe and the materials and equipment used for backfilling. After the pipe has a 6 in. minimum cover of sand, the remaining backfill may contain rocks and gravel, except that large rocks in excess of 4 in. in diameter, width or length, shall not be used.

When crossing drainage ditches and minor streams, furnish and install all materials necessary for bank reinforcement. The backfill is to be properly maintained until the work has been completed and accepted. No reimbursement will be made for repairing of backfill due to floods and/or other conditions occurring before final acceptance.

Control the excavation and backfilling operation to have a minimum amount of open trench commensurate with good construction practices. Any surplus material not used for backfilling is to be disposed of properly. Attain the minimum specified cover for the gas piping.

- (10) Final Piping Connections, Tie-Ins and Purging.** Make all connections of new gas lines to existing gas lines. This includes all necessary preparations for tie-ins and purging for all sections of gas lines installed. Weld short stop fittings and other necessary fittings on existing steel gas lines that will be used by CPS ENERGY to control the flow of gas into the new gas lines. CPS ENERGY will control the flow of gas on all operative gas facilities while the Contractor is making final piping connections and/or tie-ins.

CPS ENERGY will purge the new gas mains, and the Contractor will purge all new and/or existing service lines that have been tied to the new gas mains or otherwise adjusted.

Furnish all necessary equipment and instrumentation that is required to insure that the final tie-in welds and/or fusions between new and existing gas facilities are performed in a safe manner. Such equipment and instrumentation may include pneumatic air movers, combustible gas indicators (CGI's), oxygen monitors, self-contained breathing apparatus and fire retardant clothing for construction personnel, and fire extinguishers.

- (11) Clean-Up.** As soon as backfill is completed on a section of pipeline, clean the right of way, remove and transport all surplus CPS ENERGY issued materials to the

designated CPS ENERGY Center(s). Dispose of all refuse such as brush, broken skids, rock, etc. The earth on both sides of the trench which has been disturbed during the construction of the gas line is to be leveled, and the entire area left in a condition satisfactory to the Engineer.

4. Tests.

- (1) **Radiographic Inspection.** (CPS Energy usually hires a third party contractor to provide this. And I do not know that we have ever used this. Probably could delete this completely)Applies when radiographic inspection is specified by this Item or by the plans.
 - (a) **Standards and Codes.** The latest edition of the following documents apply when required:
 - (i) Department of Transportation, 49 CFR Part 192, “Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards”.
 - (ii) Recommended Practice No. SNT-TC-1A, Supplement A “Radiographic Testing Method”.
 - (iii) ANSI B31. 8, “Gas Transmission and Distribution Piping Systems”.
 - (iv) ASME Code Section V, “Nondestructive Examination”.
 - (v) United States Nuclear Regulatory Commission, Title 10, Chapter 1, CFR - Energy and other federal, state and local regulations for protection against radiation hazards.
 - (b) **Radiographic Procedure.** Perform all radiographic inspections in accordance with Section 8.2 of API Standard 1104. The Contractor is to provide a copy of the written procedure to the Engineer for acceptance.
 - (c) **Personnel Qualifications.** Radiographic certification will be through a qualification and certification program that incorporates the requirements of Recommended Practice No. SNT-TC-1A, Supplement A in accordance with Section 8.7 of API Standard 1104.
 - (d) **Equipment and Material.** Furnish all equipment and materials necessary for the performance of the radiographic inspection. The materials and equipment include all film and supplies for the processing, film identification, recording, filing and storage. Provide all barriers, warning systems, film badges, documentation and records necessary for the protection and personnel monitoring of every person near a radiation source.
 - (e) **Production Radiography Procedures.** Notify the Engineer if any welds fail to meet the radiographic inspection. All welds or welded joints that are repaired or replaced are to be radiographed again.

- (f) **Film Identification Procedure.** Film identification is in accordance with Section 8. 6 of API Standard 1104. The method of identification will be as approved by the Engineer prior to the start of radiographic inspection.
 - (g) **Radiographic Reports and File.** Furnish the Engineer a report for each calendar day the unit is on the project. All radiographs made are to be delivered to the Engineer and become the property of CPS ENERGY.
- (2) **Pressure Testing.** Demonstrate to the satisfaction of the Engineer, by performing a pressure test, that the mains and/or services installed do not leak and will operate safely at the desired maximum allowable operating pressure. Pressure tests will be performed to verify satisfactory workmanship and the strength of materials. To the extent practical, the test is to be conducted to the entire pipeline to minimize the number of untested tie-in connections. All joints used to tie-in a test segment of pipeline after the test are to be soap bubble tested at not less than its operating pressure. Repair any leaks or failures which are revealed by the test.

Furnish all supervision, labor, materials and equipment to perform the pressure test, including but not limited to, pumps, compressors, pigs, test instrumentation and water. Pressure test requirements will be as indicated on the plans. The requirements indicate the minimum and maximum test pressure, test fluid and test duration, as appropriate. Conduct the test in accordance with the applicable requirements of 49 CFR Part 192 and take all necessary safety precautions to protect construction personnel and the general public during the test. Obtain all permits necessary to conduct the test except for the Railroad Commission of Texas test water discharge permit that is required for a hydrostatic pressure test.

- (a) **Standard Air Test.** Gas mains and services to be operated at pressures of 60 PSIG or less. This test will be indicated in Exhibit SKT-2 without a test duration period. The test pressure is to be a minimum of 90 PSIG and a maximum of 120 PSIG. The test duration is to be sufficient to ensure discovery of all leaks. At the minimum, each weld, butt fusion and any other fitting and connection is to be soap bubble tested at the specified test pressure. The test pressure is to be measured with a dial type gauge and monitored during the course of the test to detect leakage. Upon completion of the test, furnish the Engineer with a written statement to indicate successful completion of the test. Pending acceptance of the test by the Engineer, the Engineer must also sign the statement.
- (b) **High Pressure Test.**
 - (i) When the plans specify a test pressure greater than 90 PSIG or if a specific test duration period is specified, the following applies.

Prior to initiating any work required for a High Pressure Test, hold a pre-test meeting with the Engineer to discuss all aspects of plans for conducting the High Pressure Test. The key points of discussion for hydrostatic pressure tests will include the following: 1) optimum direction and injection rate for filling the pipe section with water while minimizing air entrapment; 2) optimum direction and discharge location for safely and completely draining the pipe section; 3) the type, quantity and condition of pipeline pigs; 4) installation and

use of temporary pig launchers and/or receivers; 5) capacities of water pumping equipment; 6) pressurization procedures; 7) written test documentation; 8) limitations on refilling and/or discharging test water during the pressure test without invalidating the test and causing the test to be restarted; 9) test water stabilization period after filling the pipe section; 10) appropriate procedures for dewatering the pipe section to minimize the amount of water that remains in the pipe; 11) any other aspects of High Pressure Test.

The test medium may be either air or water as shown on the plans. A hydrostatic test is to be conducted in general conformance with API Recommended Practice (RP) 1110. Conduct air tests in conformance with API RP 1110 with regard to safety and instrumentation.

- (ii) All filling and pressurization procedures are subject to the approval of the Engineer. When a hydrostatic test is performed, fill the pipeline in a manner that no air is entrapped, making use of pipeline pigs as necessary. Furnish all pipeline pigging equipment, including appropriate styles and types of pipeline pigs and temporary pig traps and launchers. The Engineer will inspect all pigging equipment, and the equipment is to be acceptable to the Engineer prior to use. Allow a suitable time for temperature stabilization of the test fluid. The stabilization period is to be a minimum of 24 hours after the filling operation is complete for a hydrostatic test or, for an air test, 8 hours after the pipeline is pressurized to the minimum test pressure. The stabilization period may be reduced by the Engineer for short sections such as offsets, etc.
 - (iii) Note each significant step or event during the filling, pressurization and testing operation and comments are to be added for any incidents which may affect the results of the test. Where the specified test duration is 2 hours or less deadweight pressure, pipe temperature and ambient temperature measurements are to be recorded at 15 min. intervals. For tests whose duration is greater than 2 hours, these measurements are to be recorded at 30 min. intervals.
 - (iv) Upon completion of the test, obtain the approval of the Engineer prior to depressurizing the pipeline. Depressurize, de-water, clean and dry the pipeline to the satisfaction of the Engineer. Dispose water in the manner required by (if any) permits.
- (c) **Test Records.** Submit to the Engineer all documentation associated with all the tests, including a completed Form I, "Hydrostatic Test Record and Certification" of Appendix I, API RP 1110, (or substantially similar documentation), testing logs and all recorder charts. All documentation is to be labeled to identify the pipeline section that was tested, signed, and dated by the Contractor. Provide written confirmation to indicate successful completion of the test for the Engineer's approval.
- (3) **Pipeline Availability (Test Period).** The gas main installation including the backfill will not receive final acceptance until all gas main construction has been completed and the main has been in satisfactory operation. This date will be established by the Engineer in writing. If it is determined by the Engineer that adjustments, repairs,

replacements or other correction measures are needed, promptly perform the correction or replacement and retesting work necessary at contractor's expense including all work damaged by the correction or replacement of the defective work. Upon completion of the gas work, all subsequent test periods will be at the discretion of TxDOT.

5. Measurement. Measurement of completed and accepted work as described herein is as follows:

- (1) New service stubs for 1 in. through 4 in. diameter pipes placed in an open trench will be measured as each location shown on the plans and as directed by the Engineer. A service stub connected to the gas main located along the same side of the street as the property being serviced is referred to as a short side service stub. A service stub connected to the gas main located along the opposite side of the street from the property being serviced is referred to as a long side service stub. The following conditions apply for service stubs:
 - (a) Service stubs installed from an existing gas main to 1 ft. inside property line for short side or long side service.
 - (b) Service stubs installed from a new gas main to 1 ft. inside property line for short side or long side service.
- (2) Re-running and lowering service lines for 1 in. through 4 in. diameter pipes will be measured as each location shown on the plans and as directed by the Engineer. The conditions for service lines shown in Sections 5.(1)(a) and (b) will apply for re-running and lowering service lines.
- (3) Extending, connecting and pump testing an existing service line for 1 in. through 4 in. diameter pipe to a new gas main will be measured as each location shown on the plans and as directed by the Engineer.
- (4) Shortening, connecting and pump testing an existing service line for 1 in. through 4 in. diameter pipe to a new gas main will be measured as each location shown on the plans and as directed by the Engineer.
- (5) When there is a need for a new welded steel service tee or a steel gate valve to be welded, the new welded steel service tee or the steel gate valve will be measured for the welding required to install each fitting for a 1-1/4 in. steel tee or a 2 in. or 4 in. steel gate valve. In most instances, the existing service tee and/or valve will be utilized when re-running a service line off an existing steel gas main.
- (6) Uncovering and capping service lines at the gas main will be measured as each location shown on the plans and as directed by the Engineer.
- (7) Installing a gas main of the size and type shown on the plans in an open trench will be measured by the foot along the top of the trench.
- (8) Installing a steel pipe casing for a service line or a gas main of the size shown on the plans in an open trench will be measured by the foot along the top of the trench. The size of the steel pipe casing will be larger than the size of the service line or gas main,

such as, using 2 in. casing for a 3/4 in. pipe, 3 in. casing for 1 in. or 1-1/4 in. pipe, 4 in. casing for a 2 in. pipe, etc. This does not include the pipe installed in the casing.

- (9) Boring for a service line or a steel pipe casing of the size specified on the plans will be measured by the foot of pipe installed in the bore. The size of the steel pipe casing will be larger than the size of the service line or gas main to be installed.
- (10) Installing a service line or gas main of the type and size shown on the plans into a previously installed casing will be measured by the foot of pipe installed in the casing. The size of the pipe will be a 3/4 in. pipe into a 2 in. casing, a 1 in. or 1-1/4 in. pipe into a 3 in. casing, a 2 in. pipe into a 4 in. casing, a 4 in. pipe into a 6 in. casing, a 6 in. pipe into a 8 in. casing, a 8 in. pipe into a 12 in. casing, a 12 in. pipe into a 16 in. casing or a 16 in. pipe into a 20 in. casing.
- (11) Flowable backfill will be measured in accordance with Item 401, "Flowable Backfill", for the locations shown on the plans and locations directed by the Engineer.
- (12) Trench excavation protection will be measured in accordance with Item 402, "Trench Excavation Protection", for the locations shown on the plans and locations directed by the Engineer.
- (13) Excavation and backfill (except flowable backfill) and the work for cutting and restoring pavement will be measured in accordance with Item 400, "Excavation and Backfill for Structures". The sand used as part of the backfill will be considered subsidiary to this Item. All testing of the gas main installations will not be measured for payment but is to be considered subsidiary to the various natural gas pipeline pay items.

6. Payment. The work performed and materials furnished for the installation of the natural gas pipeline in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for the Items of work hereinafter described. These prices will be full compensation for hauling all CPS ENERGY furnished materials, preparation, excavation and backfill, for shaping and fine-grading the trench, for placing and connecting pipes, for coating the steel pipe, for installing all necessary fittings, for building and painting risers, for meter set-ups, furnishing materials not provided by CPS ENERGY, for all testing, disposition of surplus material and for all manipulations, labor, tools, equipment and incidentals.

- (1) Payment for new service stubs for 1 in. through 4 in. diameter pipe placed in an open trench will be at the unit price bid for "Natural Gas Pipeline (New Short or Long Service)(Existing Main to Property Line)" and "Natural Gas Pipeline (New Short or Long Service) (New Main to Property Line)", complete in place.
- (2) Payment for re-running and lowering service lines for 1 in. through 4 in. diameter pipe placed in an open trench will be at the unit price bid for "Natural Gas Pipeline (Short or Long Service)(Existing Main to Property Line)", "Natural Gas Pipeline (Short or Long Service)(Existing Main to Meter)" "Natural Gas Pipeline (Short or Long Service)(New Main to Property Line)" and "Natural Gas Pipeline (Short or

Long Service)(New Main to Meter)", complete in place. Removal of existing service lines will be subsidiary to this Item.

- (3) Payment for extending and connecting a service line for 1 in. through 4 in. diameter pipe to a new gas main will be at the unit price bid for "Natural Gas Pipeline (Service)(Extend to New Main)", complete in place.
- (4) Payment for shortening and connecting a service line for 1 in. through 4 in. diameter pipe to a new gas main will be at the unit price bid for "Natural Gas Pipeline (Service)(Shorten to New Main)", complete in place.
- (5) Payment for the welding required to install each fitting for a 1-1/4 in. steel tee or a 2 in. or 4 in. steel gate valve will be at the unit price bid for "Natural Gas Pipeline (Service)(Welded Fitting)(Tee)" or "Natural Gas Pipeline (Service)(Welded Fitting)(Valve)", complete in place.
- (6) Payment for uncovering and capping an existing service line at the gas main will be at the unit price bid for "Natural Gas Pipeline (Capping Service at Main)", complete in place.
- (7) Payment for installing a new gas main will be at the unit price bid for "Natural Gas Pipeline (Main)" of the type and size specified on the plans, complete in place. This includes the placement of a tracer wire in the trench when plastic pipe is specified.
- (8) Payment for installing steel pipe casing in an open trench for a service line or gas main will be at the unit price bid for "Natural Gas Pipeline (Casing)" of the type and size specified on the plans, complete in place. This work includes the installation of casing vent pipes, insulators and end seals.
- (9) Payment for boring the installation of a service line or a casing for a service line or a gas main will be at the unit price bid for "Natural Gas Pipeline (Boring)" of the type and size specified on the plans, complete in place.
- (10) Payment for inserting a service line or a gas main inside a casing will be at the unit price bid for "Natural Gas Pipeline (Insert)" of the type and size specified on the plans, complete in place.
- (11) Payment for flowable backfill used to backfill the trench will be at the unit price bid for "Flowable Backfill" under Item 401, "Flowable Backfill".
- (12) Payment for trench excavation protection will be at the unit price bid for "(Trench Excavation Protection)" under Item 402, "Trench Excavation Protection."
- (13) Payment for excavation and cutting and restoring pavement will be at the unit price bid under Item 400, "Excavation and Backfill for Structures."

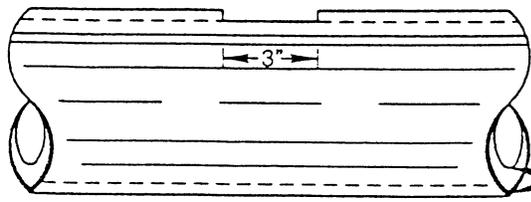
CITY PUBLIC SERVICE
EXHIBIT GAS-3
DESIGN STANDARDS FOR
STEEL GAS PIPING

**DESIGN STANDARDS FOR
STEEL GAS PIPING**

Drawing Number	Drawing Description	Latest Revision	Page#
DS-31	Copper Wire Connection to Pipe Using Cadweld		2
DS-32	Instruction Sheet Type TB-3 Welder		3
DS-33	Packaged Anodes		4
DS-36	Valve, Steel (Weld X Flange)	2/5/91	5
DS-37	Valve, Steel (Weld X Weld)	2/5/91	6
DS-38	Test Riser, 2 In	9/2/92	7
DS-39	Test Riser, 1 In	9/1/70	8
DS-40	Coupling, Bonded	9/1/70	9
DS-41	Insulate Flange	9/1/70	10
DS-42	Cathodic Protection Test Point	9/1/70	11
DS-43	Cathodic Protection Test Lead Connection to Main	9/1/70	12
DS-44	Cathodic Protection Terminal Board	11/28/94	13
DS-45	Insulating Joint - 8" & 12" Pipe	6/5/80	14
DS-46	Plugging Equipment Fittings	10/83	15
DS-47	Plugging Equipment Installation	10/83	16
DS-48	Installation Instructions Type II Short Stop Fitting	10/83	17
DS-49	Tee Service Welded Transition Steel to Plastic (PE)		18
	Service Insertion Overview		19
DS-50	Service Riser and Regulator For 5, 10, 30 & 35 Lt. Meters		20

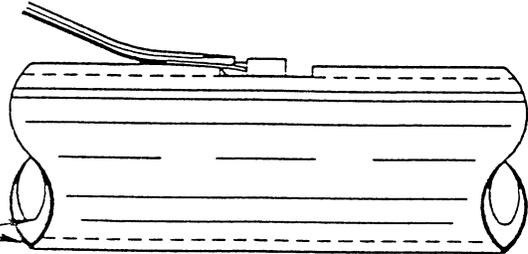
Copper Wire Connection To Pipe Using Cadweld

Remove a section of coating 3" long and file pipe bright so that a space 1" wide and 2" long is clean and dry.



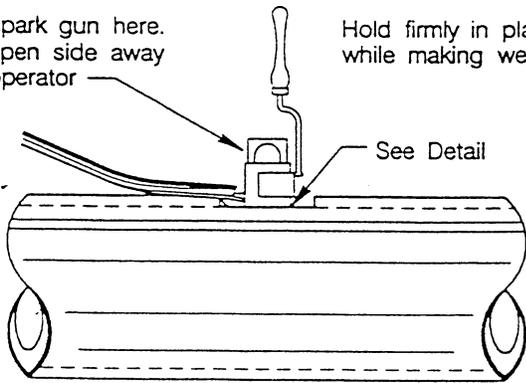
Step 1

Strip 1/2" of insulation from wire and place copper sleeve on #10 and smaller wire.



Step 2

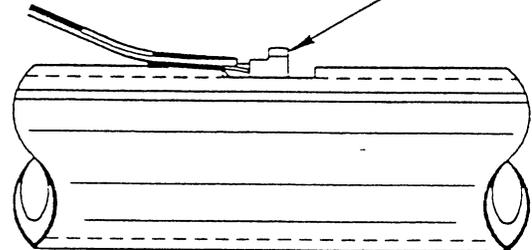
Apply spark gun here. Keep open side away from operator



Step 3

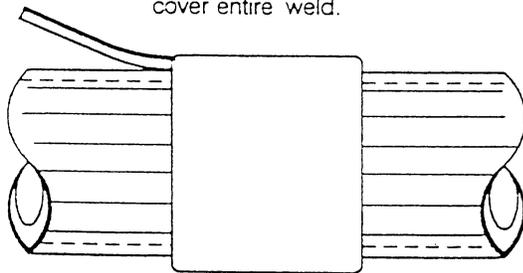
Hold firmly in place while making weld.

Remove slag with hammer and paint thoroughly with primer.

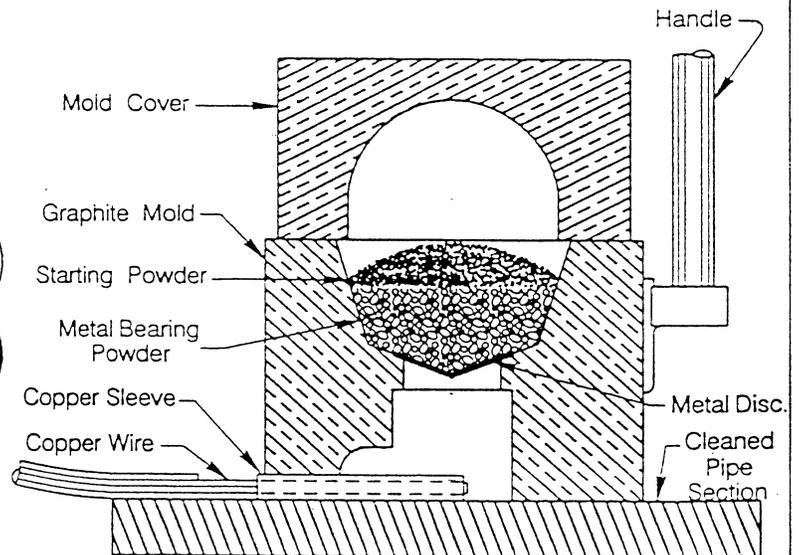


Step 4

Repair pipe coating with care cover entire weld.



Step 5



Detail

Cadweld mold with sleeve for #10 wire and smaller.

IMPORTANT

1. Remove red cap of cadwell cartridge and dump all of contents into mold. The charge will not ignite without the fine starting powder on top.
2. The cartridges must be kept dry at all times.

	DATE	APPROVED	CITY PUBLIC SERVICE BOARD CONSTRUCTION STANDARD (GAS)	DRAWING DS - 31
ISSUED	4-13-54	W.D.B.		

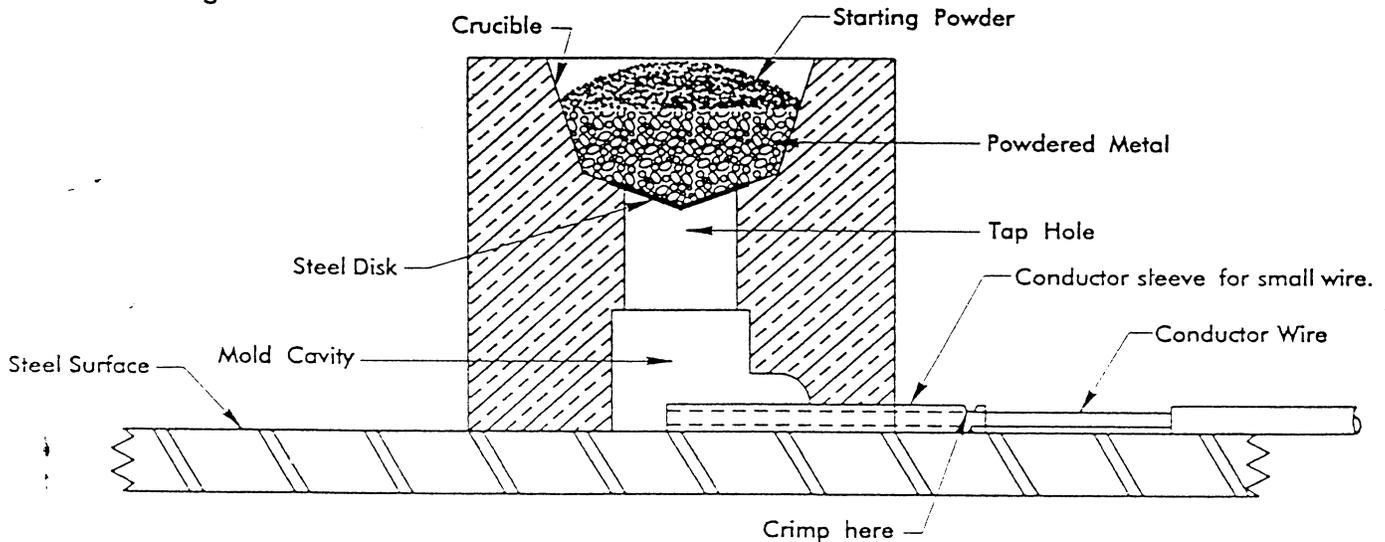
INSTRUCTION SHEET - TYPE TB-3 WELDER

PREPARATION OF SURFACE:

To obtain a good weld, surface must be bright clean and dry.
 Steel surface should be ground or filed to remove all scale, rust, grease and dirt.
 Galvanized steel must be cleaned with emery cloth to remove oxide.

PREPARATION OF WIRE:

Strip the insulation from the conductor and scrape until wire is bright and clean.
 For # 10 and smaller sizes, place the wire in a copper sleeve, ends flush, and crimp the sleeve tightly to the wire at the insulation to provide additional mechanical strength at the weld.

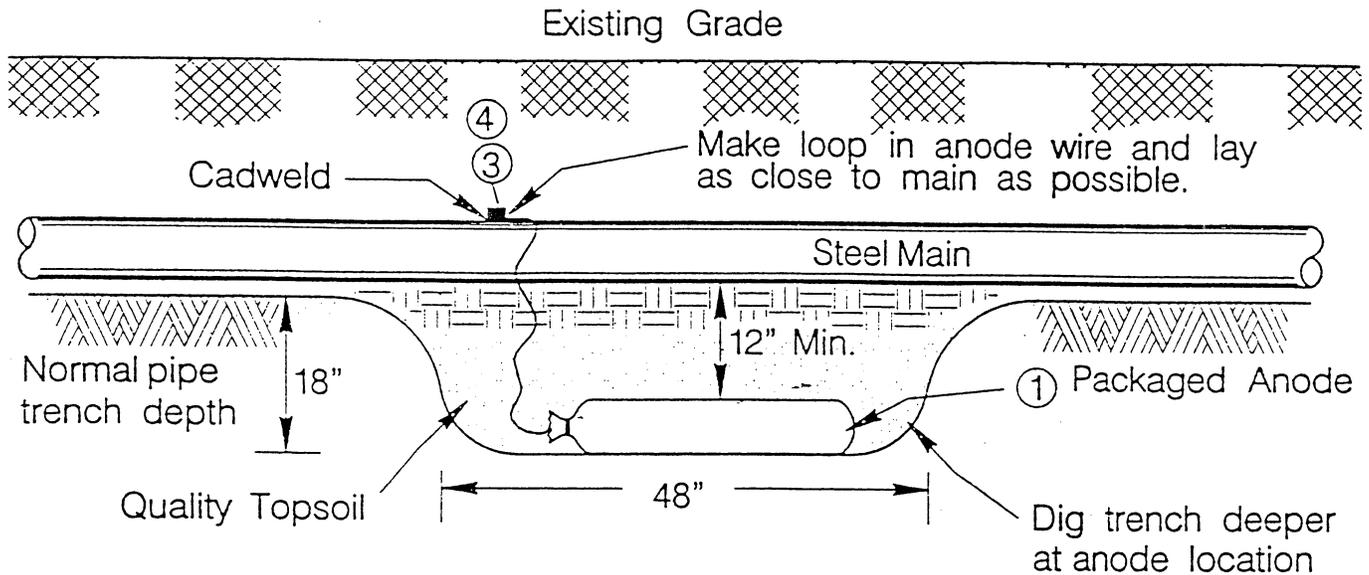


WELDING PROCEDURE:

- (1) PLACE WELDER OVER CLEAN STEEL SURFACE and insert the wire until it is under the CENTER of the tap hole.
- (2) COVER TAP HOLE WITH STEEL DISK.
- (3) DUMP CARTRIDGE IN CRUCIBLE AND CLOSE COVER. (Tap bottom of cartridge to be sure starting powder is emptied). Replace empty cartridge in box to keep remaining cartridges in an upright position.
- (4) HOLD DOWN ON WELDER TO PREVENT LEAKS AND IGNITE WITH FLINT GUN. Jerk gun away to prevent fouling. Should gun become fouled, soak in Spirits of Ammonia.
- (5) DO NOT REMOVE WELDER UNTIL METAL HAS SOLIDIFIED.
- (6) ALL SLAG MUST BE CLEANED FROM MOLD BEFORE MAKING NEXT WELD.

Note: Wet or damp molds produce porous welds. Mold can be dried out by firing a charge before making the desired weld.

	Date	Approved	City Public Service Construction Standard (Gas)	G-S-222-1-1
Issued				Drawing DS - 50
Revised				

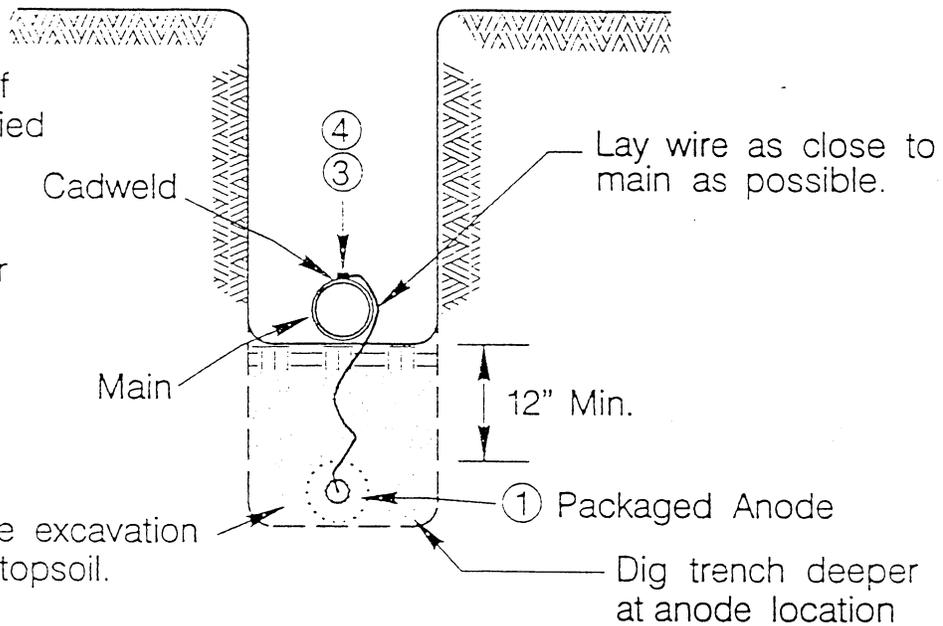


Note:

Size and location of anode will be specified on main sketch.

Anode should never be picked up by lead wire or thrown around.

Backfill anode excavation with quality topsoil.

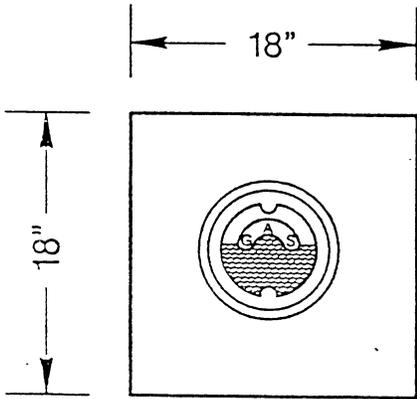


Notes:

- A. Cadweld connection to be primed and coated carefully.
- B. Packaged anode should be covered with fine soil containing no rocks, clods, or sand.
- C. Pour 5 gallons of water over anode location and tamp thoroughly,
- D. Provide test leads when specified. (See test lead standard)
- E. Anode specification sheet will be attached to main order, and is to be completed by the main construction foreman.

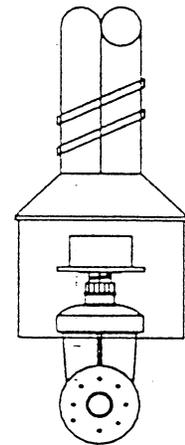
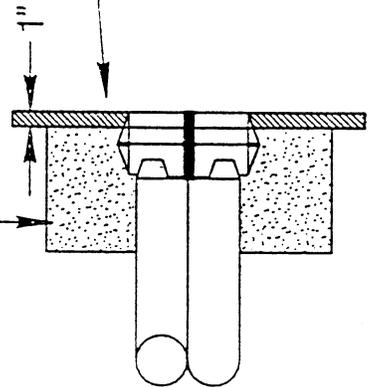
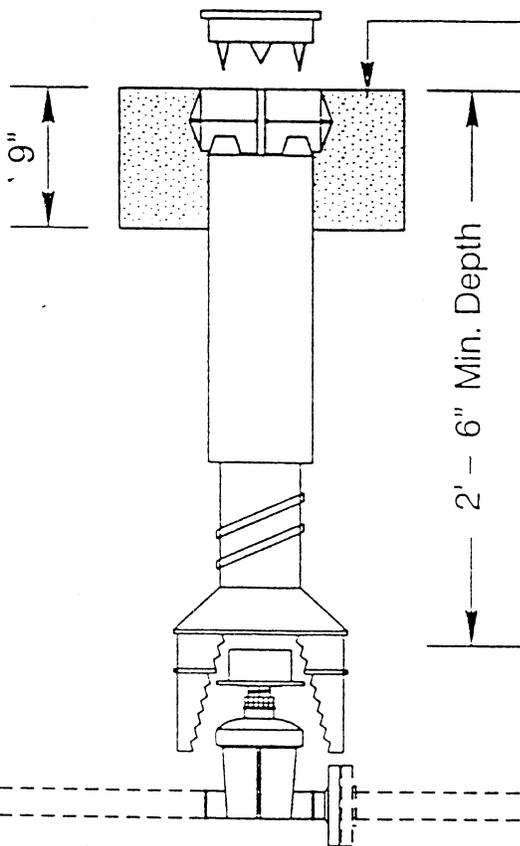
	Date	Approved	City Public Service Construction Standard (Gas)	G-S-171-1-2
Issued	9-4-70	CJH		Drawing DS - 33
Revised				

CAM Units
VGS2WXF
VGS4WXF



Note: Tamp and backfill valve box above pipe.

Optional method for asphalt streets

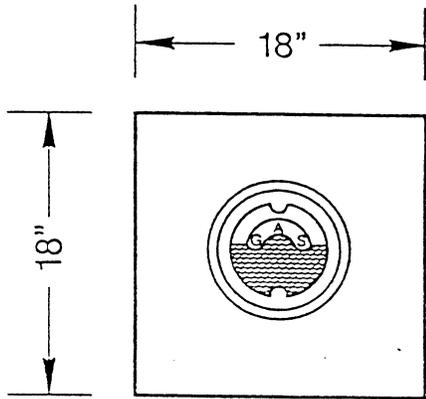


Note: Coat valve up to top of packing gland.

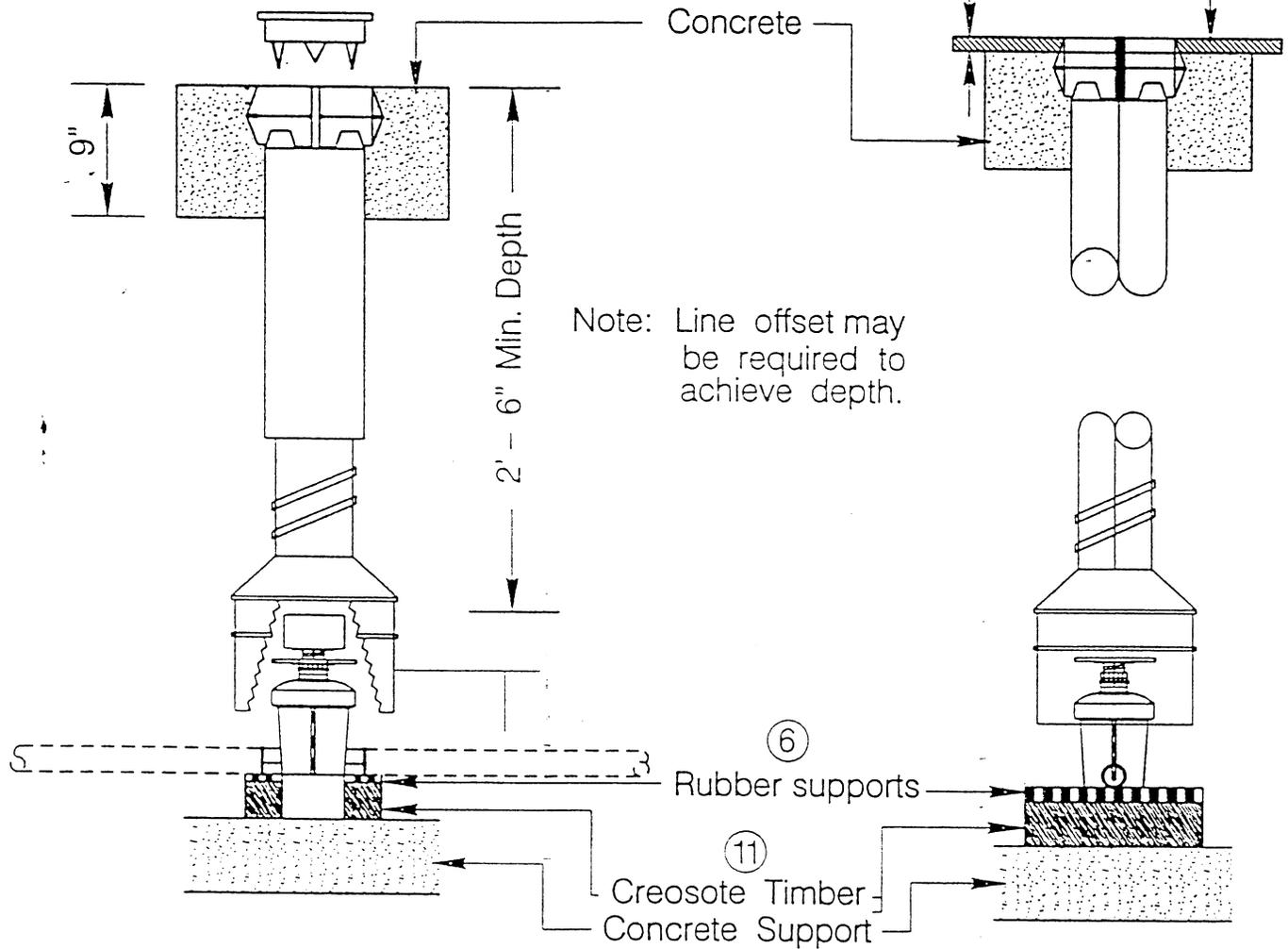
Available sizes: 2 and 4

	Date	Approved	City Public Service Construction Standard (Gas)	G-S-127-1-0
Issued				Drawing DS - 36
Revised				

CAM Units	
VGS2WE	VGS8WE
VGS4WE	VGS12WE
VGS6x8WE	VGS16WE



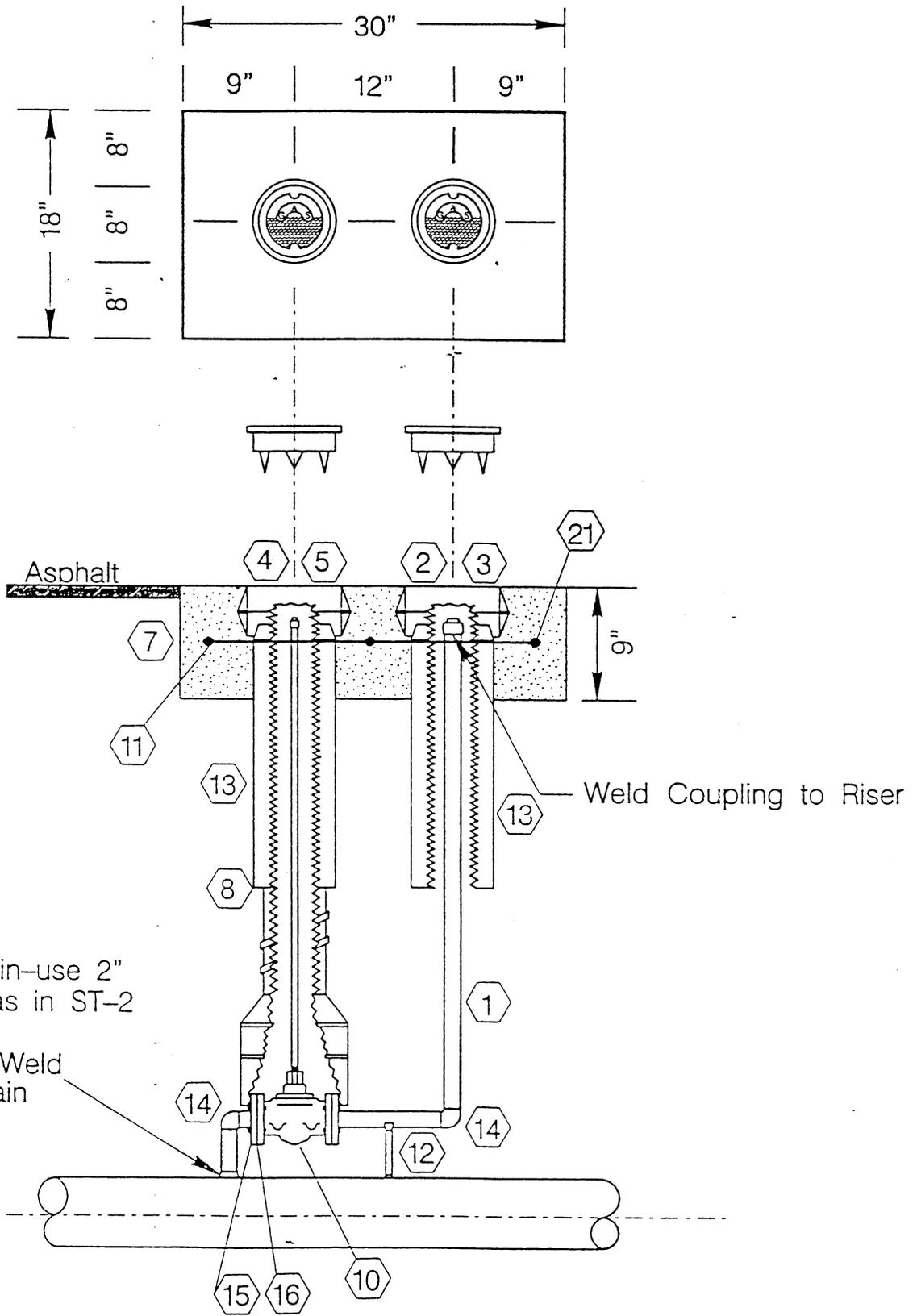
Optional method for asphalt streets



Note: Items 6 and 11 are to be installed for 12" valves, or larger. Coat valve up to top of packing gland.

Available sizes: 2, 4, 8 x 6, 8 and 12

Date	Approved	City Public Service Construction Standard (Gas)	G-S-127-2-0
Issued			Drawing DS - 37
Revised			

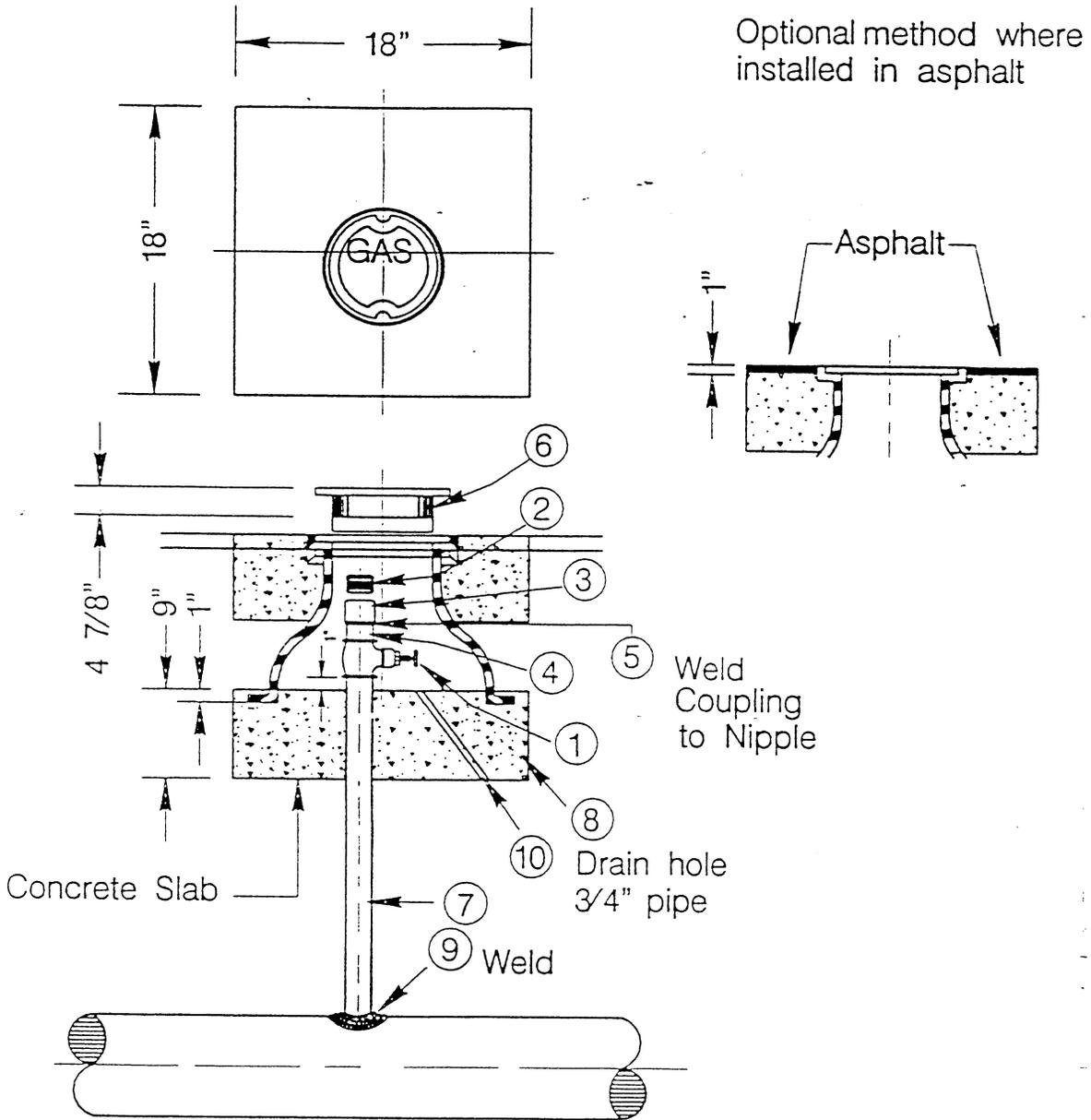


Note:

Existing main-use 2" Thredolet as in ST-2

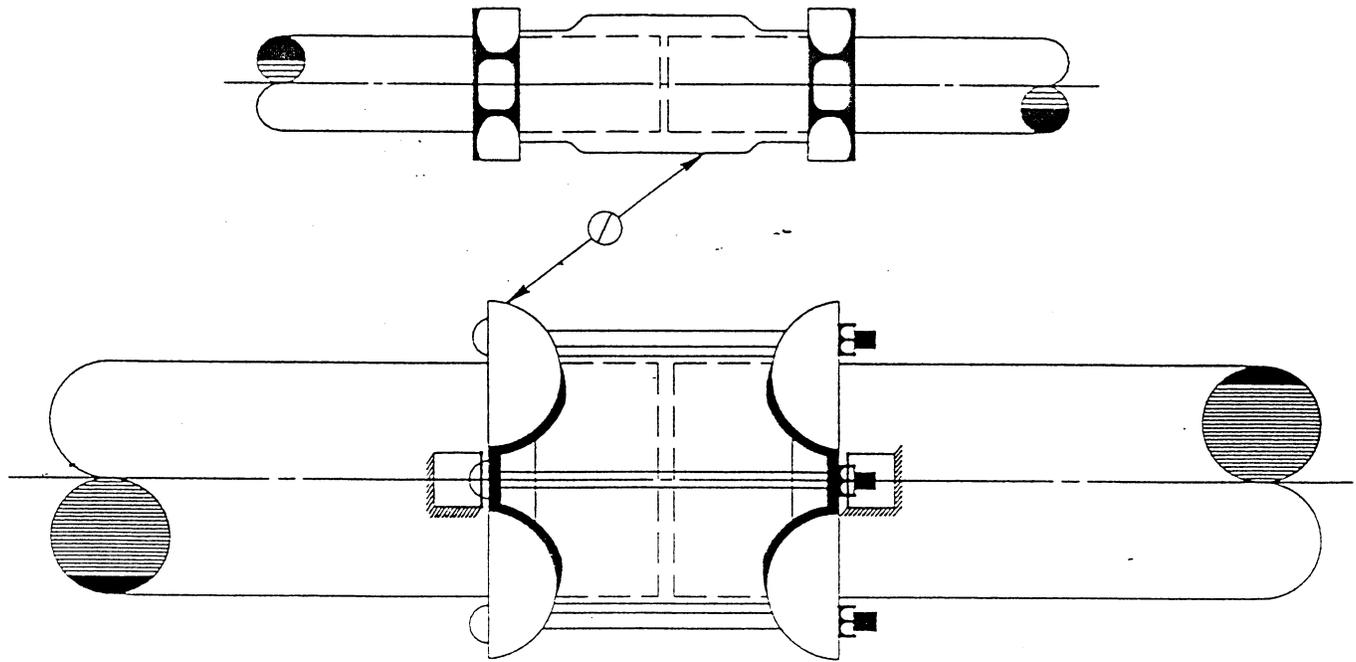
New Main-Weld direct to main

	Date	Approved	City Public Service Construction Standard (Gas)	G-S-142-1-1
Issued	9-2-92	D. Voges		Drawing DS - 38
Revised				



	Date	Approved	City Public Service Construction Standard (Gas)	G-S-141-1-0
Issued	9-1-70	CJH		Drawing DS - 39
Revised				

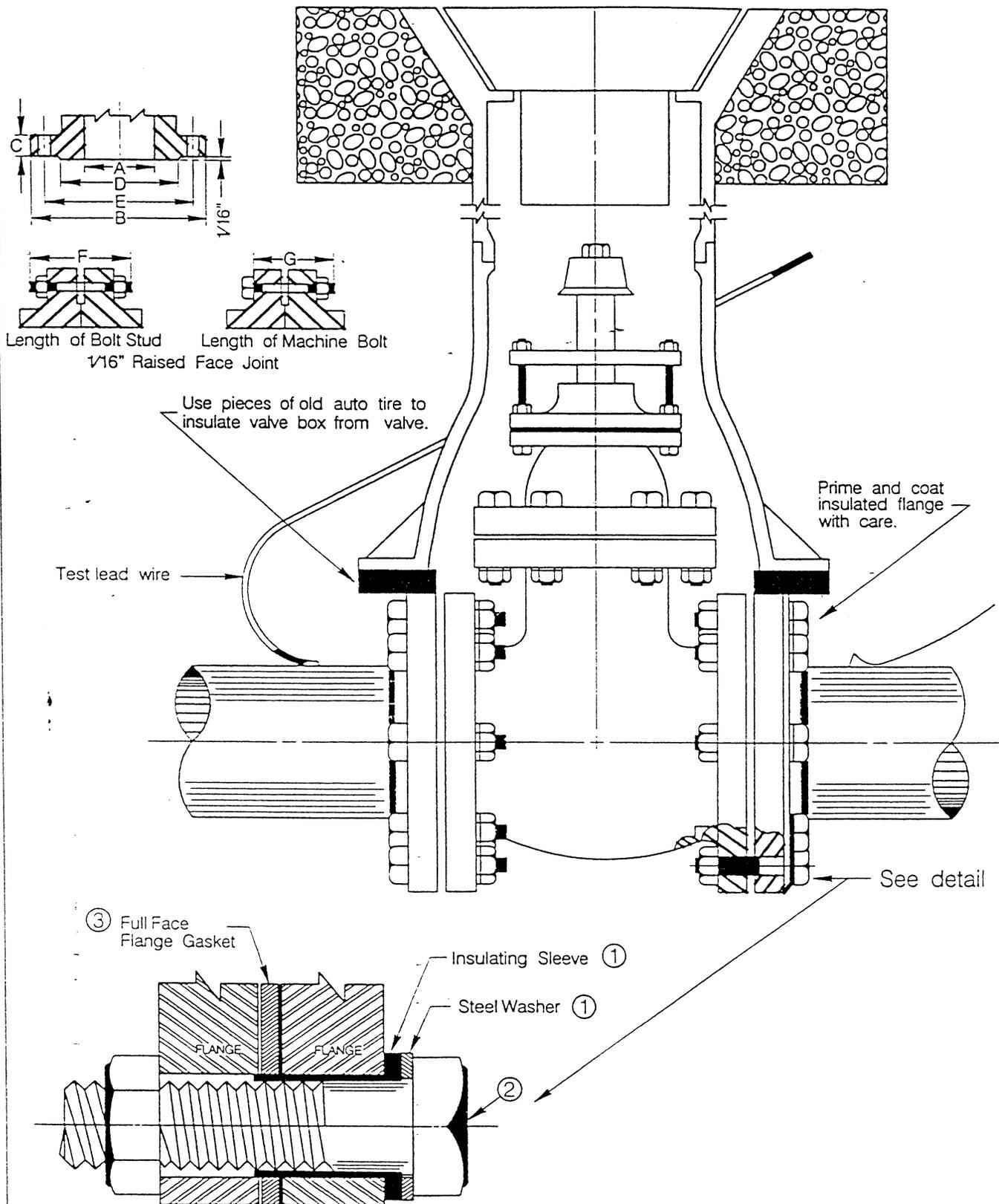
COUPLING, BONDED
WITH WELD LUGS



- NOTE: 1. All couplings to be centered over pipe joint with minimum spacing between pipe ends. Spacing shall not exceed 1".
2. File pipe to bright finish over areas covered by bonding gaskets. Area should be a minimum of 2-1/2" wide.
3. Lubricate gaskets with soap water before installing.
4. Tighten all bolts on coupling uniformly.

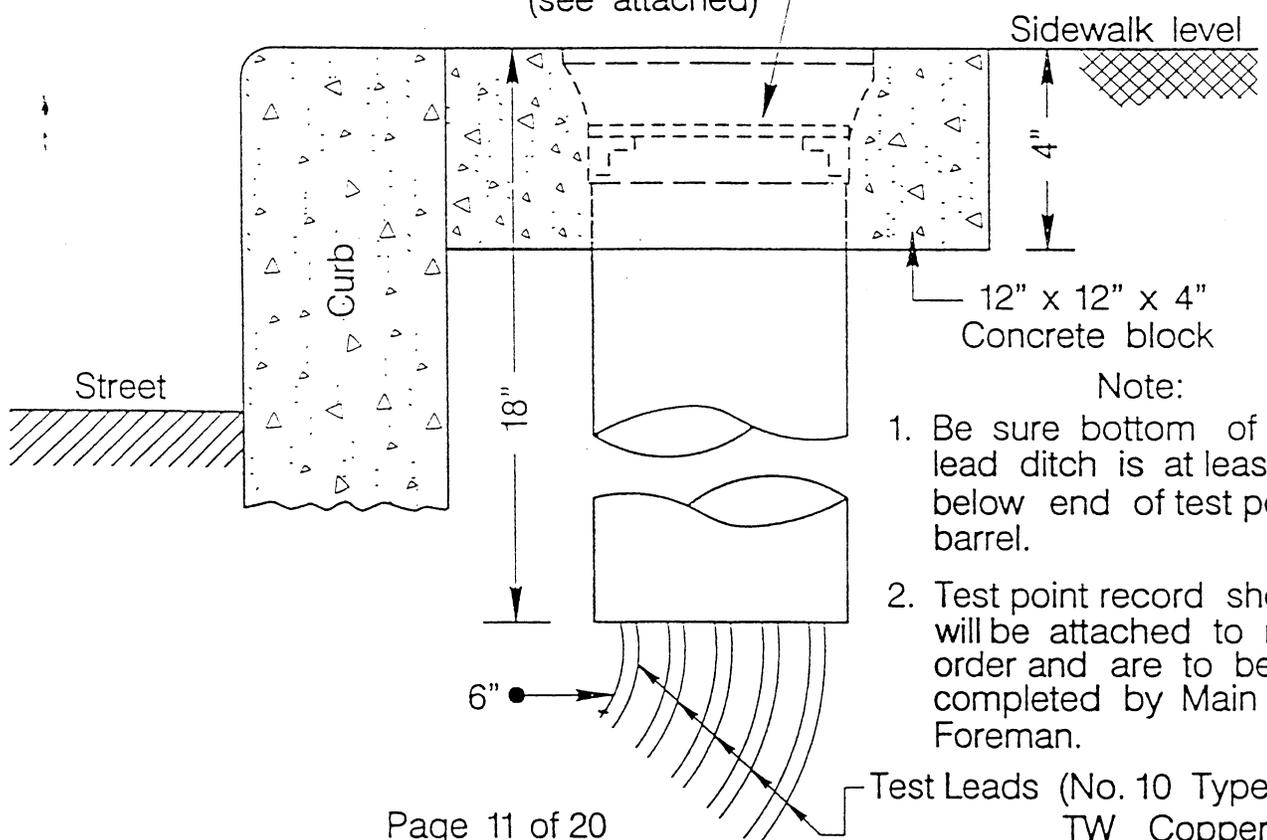
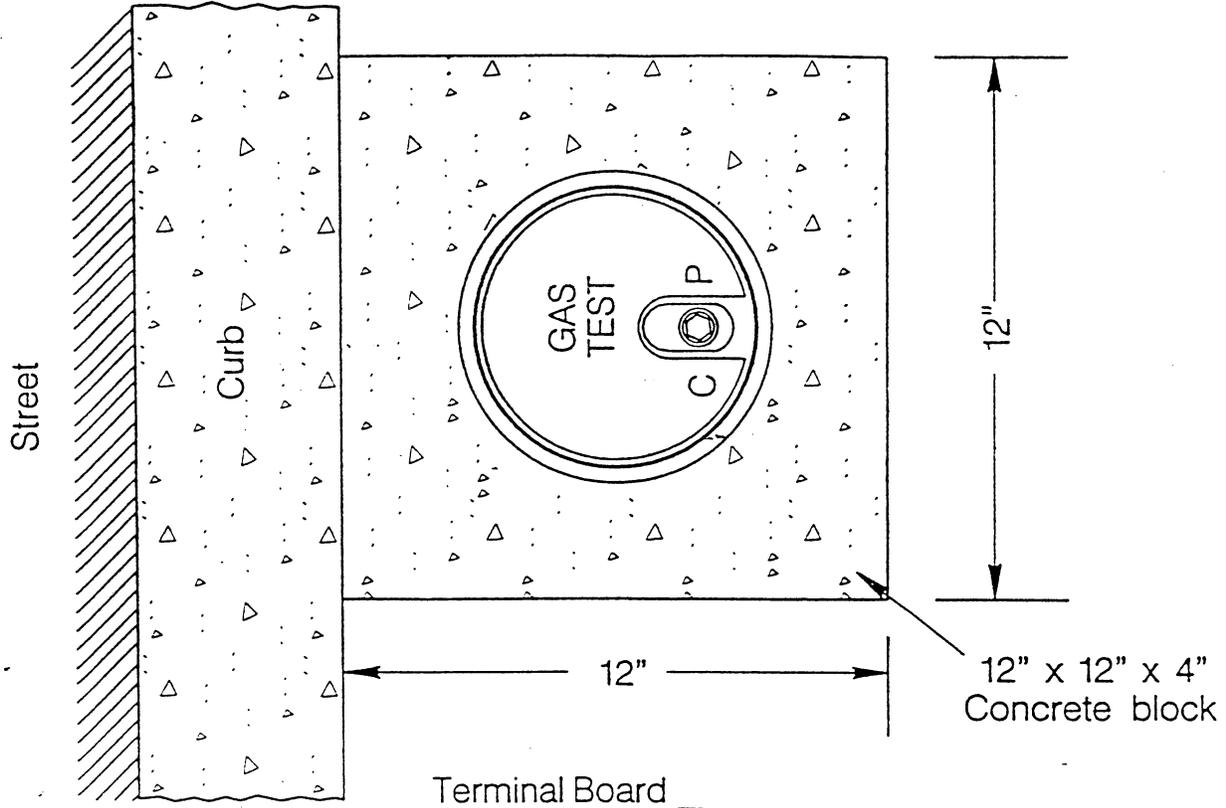
AVAILABLE SIZES: 3/4", 1", 1-1/4", 1-1/2"
2", 4", 8", 12", 16", 18", 20", 24", 30"

	DATE	APPROVED	CITY PUBLIC SERVICE BOARD CONSTRUCTION STANDARD (GAS)	DRAWING DS - 40
ISSUED	9-1-70	CJH		G-S-051-1-1
REVISED				



Available Sizes: 150# Flg (2, 4, 8, 12, 16) ; 150# Exist Flg (2, 4, 8, 12, 16) ; 300# Flg (8, 12, 16, 20) Page 10 of 20

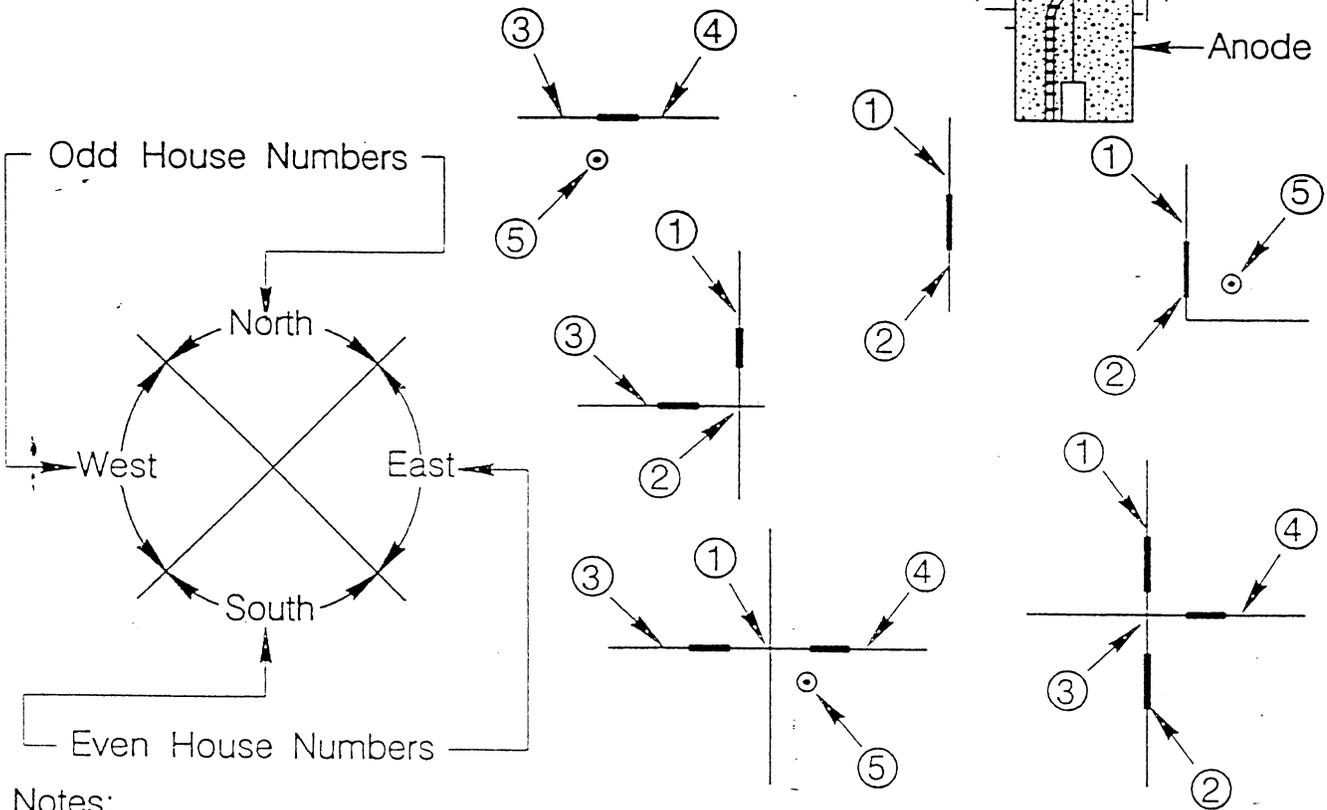
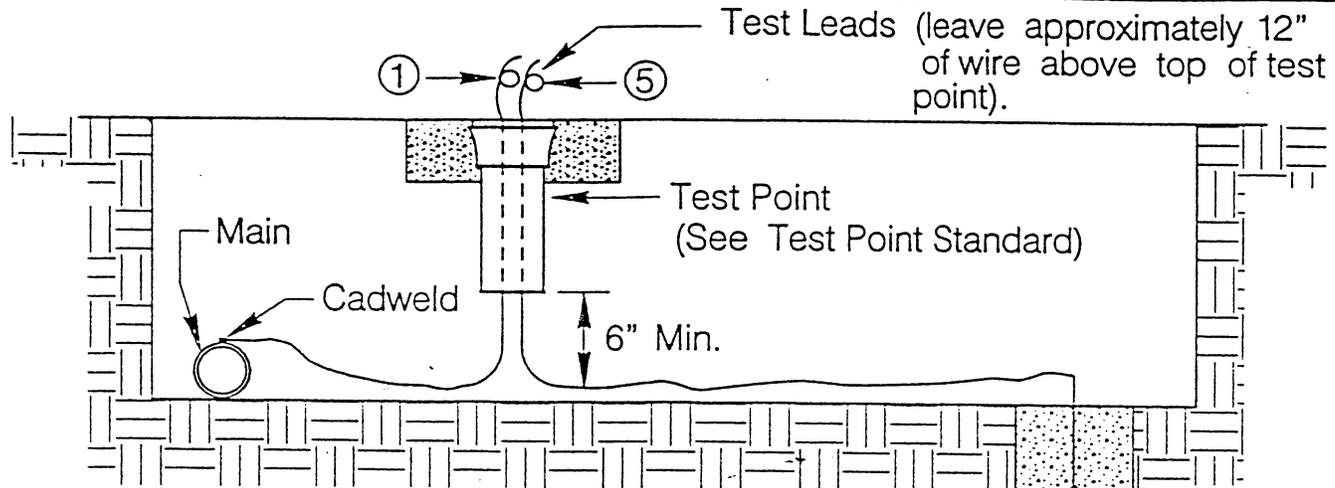
	DATE	APPROVED	CITY PUBLIC SERVICE BOARD CONSTRUCTION STANDARD (GAS)	DRAWING DS - 41
ISSUED	9-1-70	CJH		G-S-118-1-1
REVISED				



- Note:
1. Be sure bottom of test lead ditch is at least 6" below end of test point barrel.
 2. Test point record sheets will be attached to main order and are to be completed by Main Foreman.

Test Leads (No. 10 Type TW Copper Wire)

	Date	Approved	City Public Service Construction Standard (Gas)	G-S-182-2-0
Issued				Drawing DS - 42
Revised				

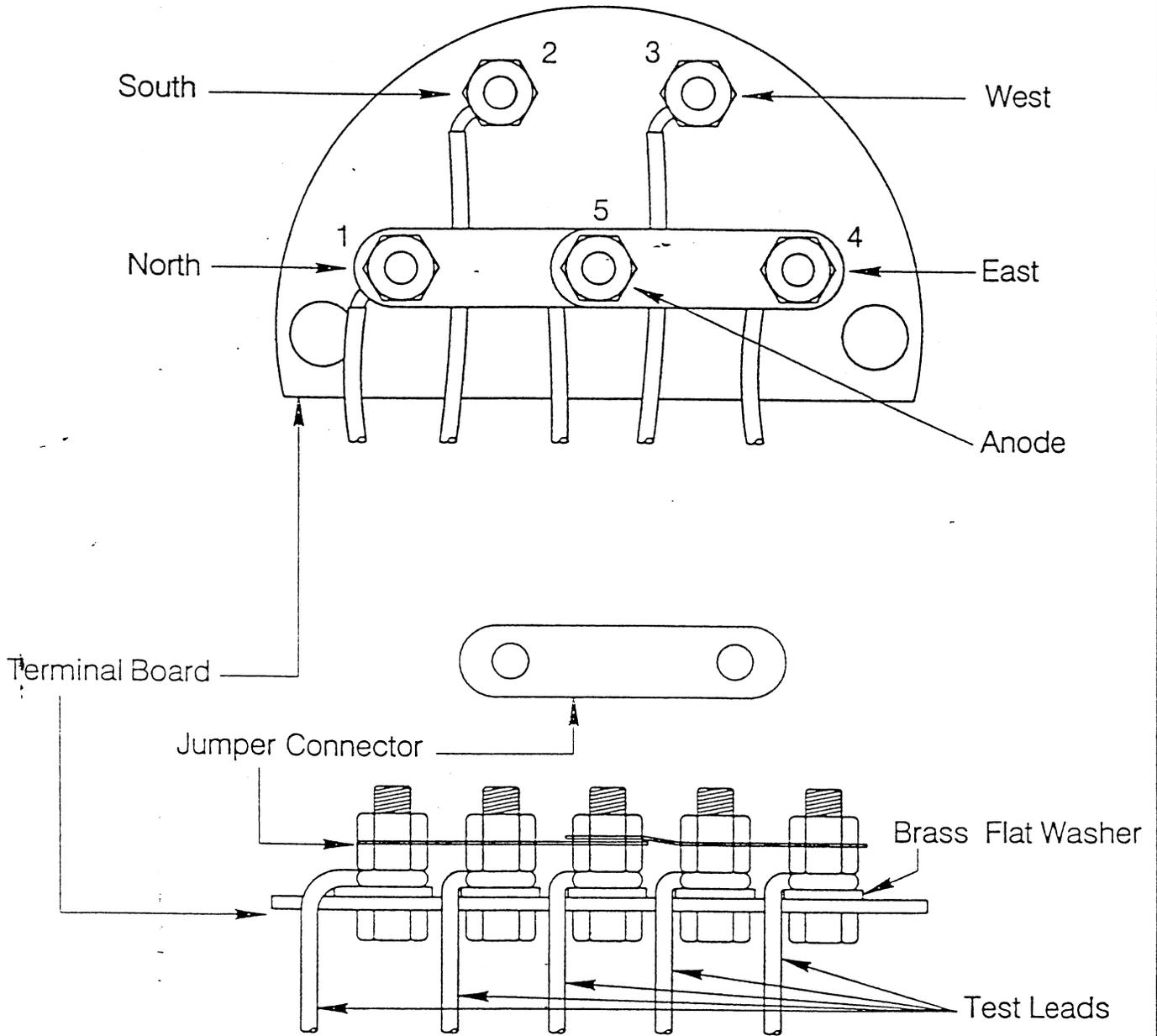


Notes:

1. All test leads to be No. 10 type TW solid copper wire.
2. Test point record cards will be attached to main order, and are to be completed by the main foreman.
3. All test leads should be tagged with a metal tague about 6" from end of lead according to the following numbering code:

- | | |
|---------|---------|
| 1 North | 4 East |
| 2 South | 5 Anode |
| 3 West | |

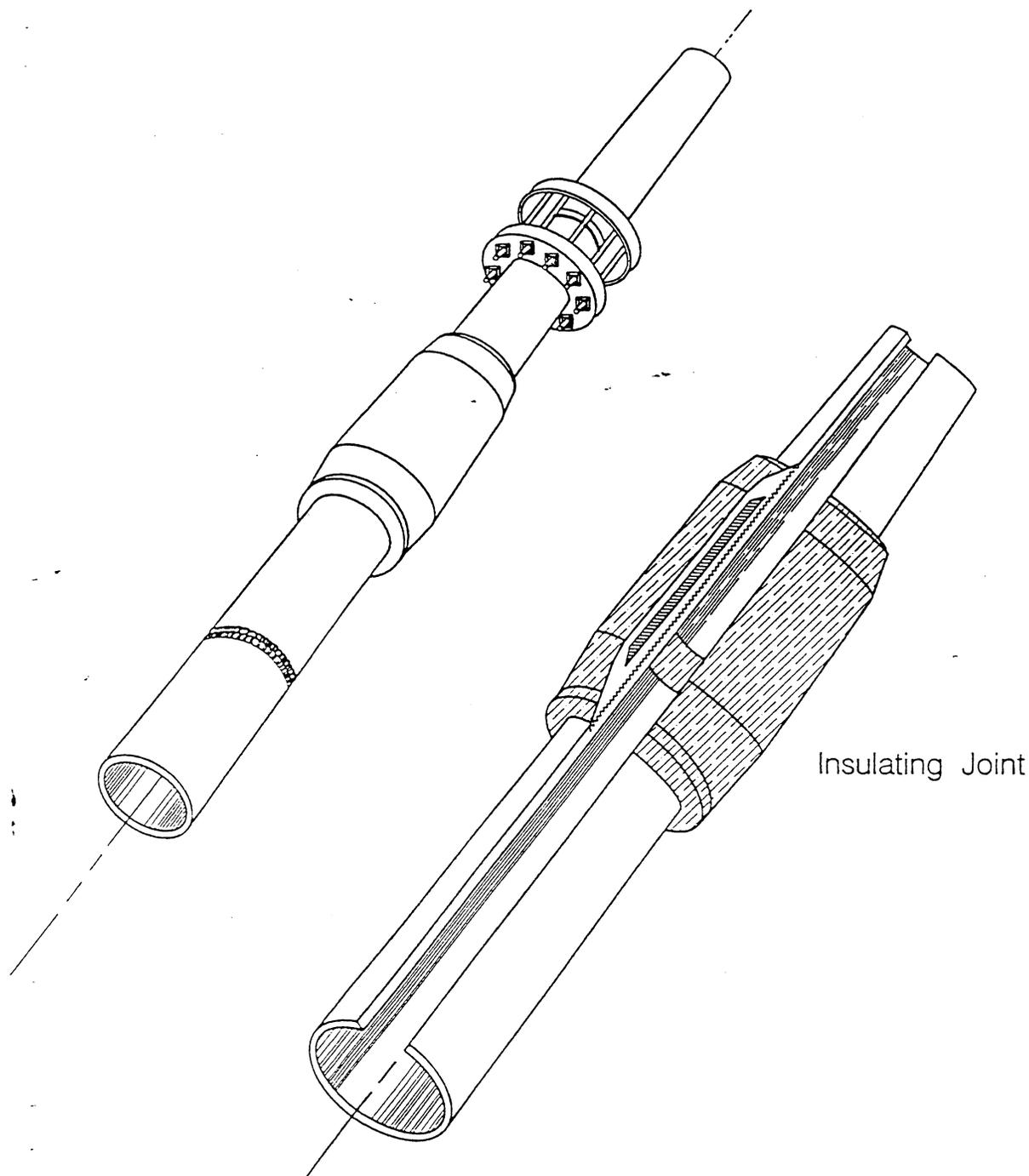
	Date	Approved	City Public Service Construction Standard (Gas)	G-S-182-1-0
Issued	9-1-70	CJH		Drawing DS - 43
Revised				



Note:

Connect test leads on top side of terminal board

	Date	Approved	City Public Service Construction Standard (Gas)	G-S-182-3-0
Issued	11-23-94	M. Kotara		Drawing DS - 44
Revised				

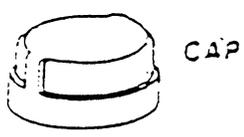
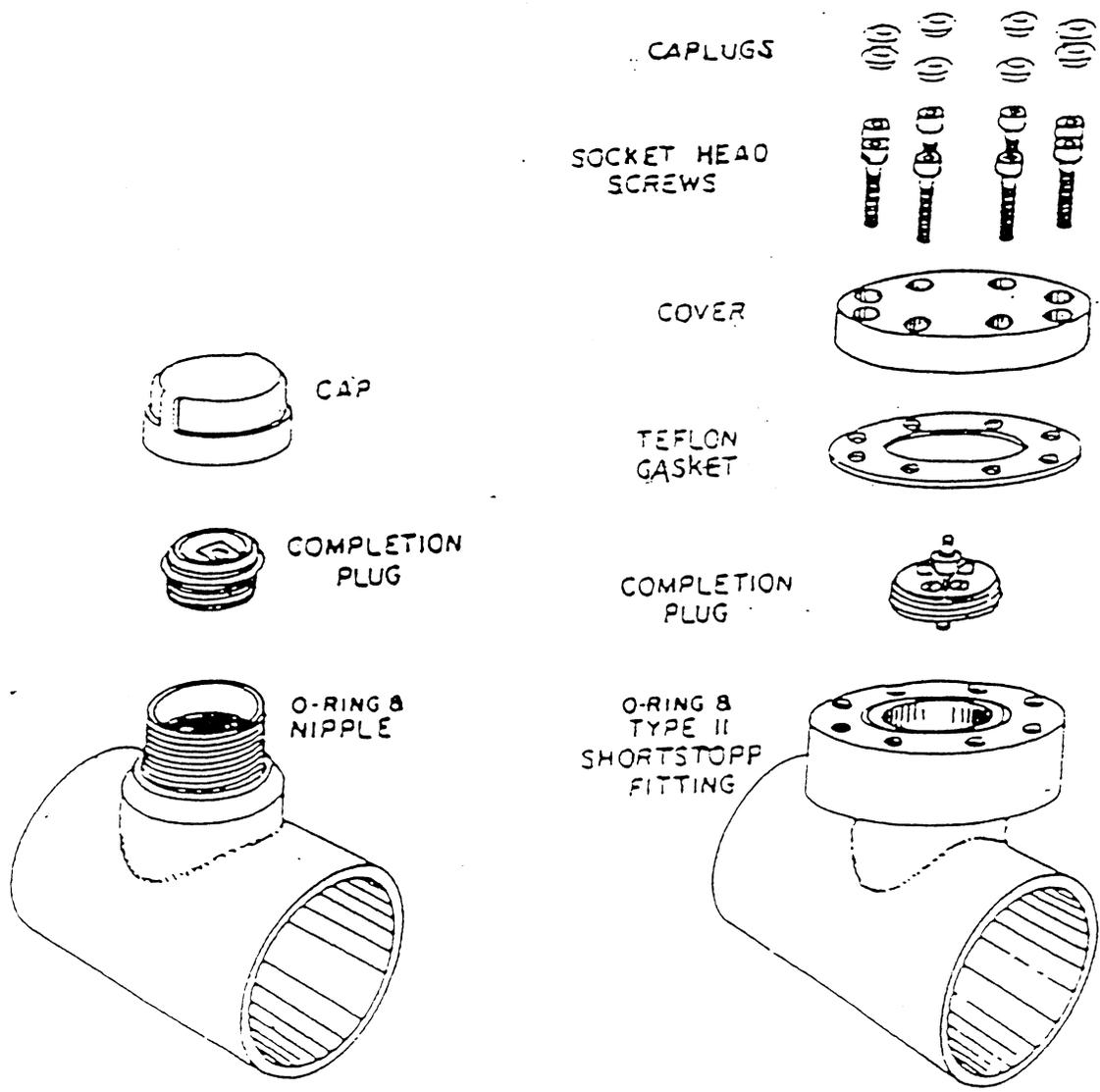


Available sizes; 8" & 12"

Page 14 of 20

	Date	Approved	City Public Service Construction Standard (Gas)	G-S-119-2-0
Issued	6-3-80	D.R.V.		Drawing DS - 45
Revised				

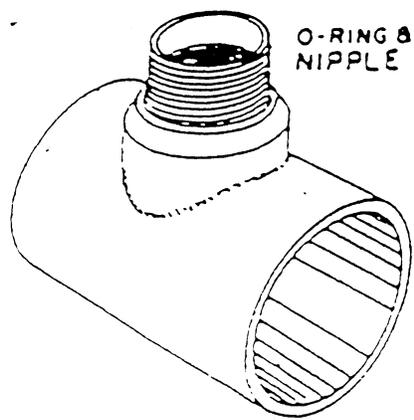
PLUGGING EQUIPMENT FITTINGS - SHORTSTOP WELDING FITTING



CAP



COMPLETION PLUG



O-RING & NIPPLE

2"

CAPPLUGS

SOCKET HEAD SCREWS

COVER

TEFLON GASKET

COMPLETION PLUG

O-RING & TYPE II SHORTSTOP FITTING

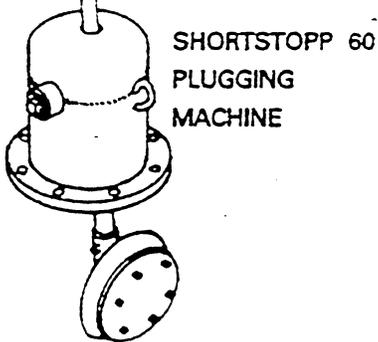
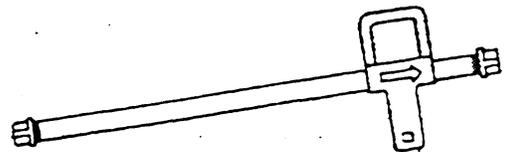
4" 8" & 12"

NOTE:
 4" YELLOW BALL MARKERS
 (PASSIVE ANTENNA) TO BE
 BURIED DIRECTLY ABOVE 8 IN.
 AND 12 IN SHORTSTOP FITTINGS
 AT A MAXIMUM DEPTH OF 4 FEET

PLUGGING EQUIPMENT INSTALLATION

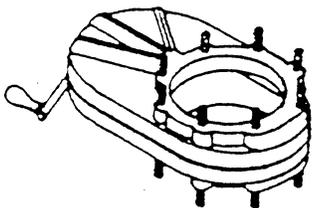
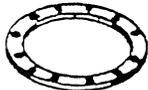
IMPORTANT
 THE ARROW ON THE TEE HANDLE AND THE
 PLUGGING HEAD SHOULD BOTH FACE TOWARD
 THE SECTION OF MAIN BEING CUT.

TYPICAL SETUP
 4" THROUGH 12"



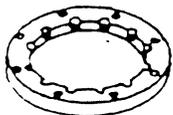
SHORTSTOPP 60
 PLUGGING
 MACHINE

GASKET



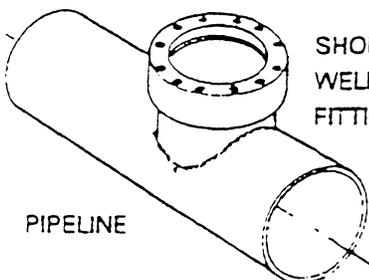
SHORTCUTT
 VALVE

GASKET



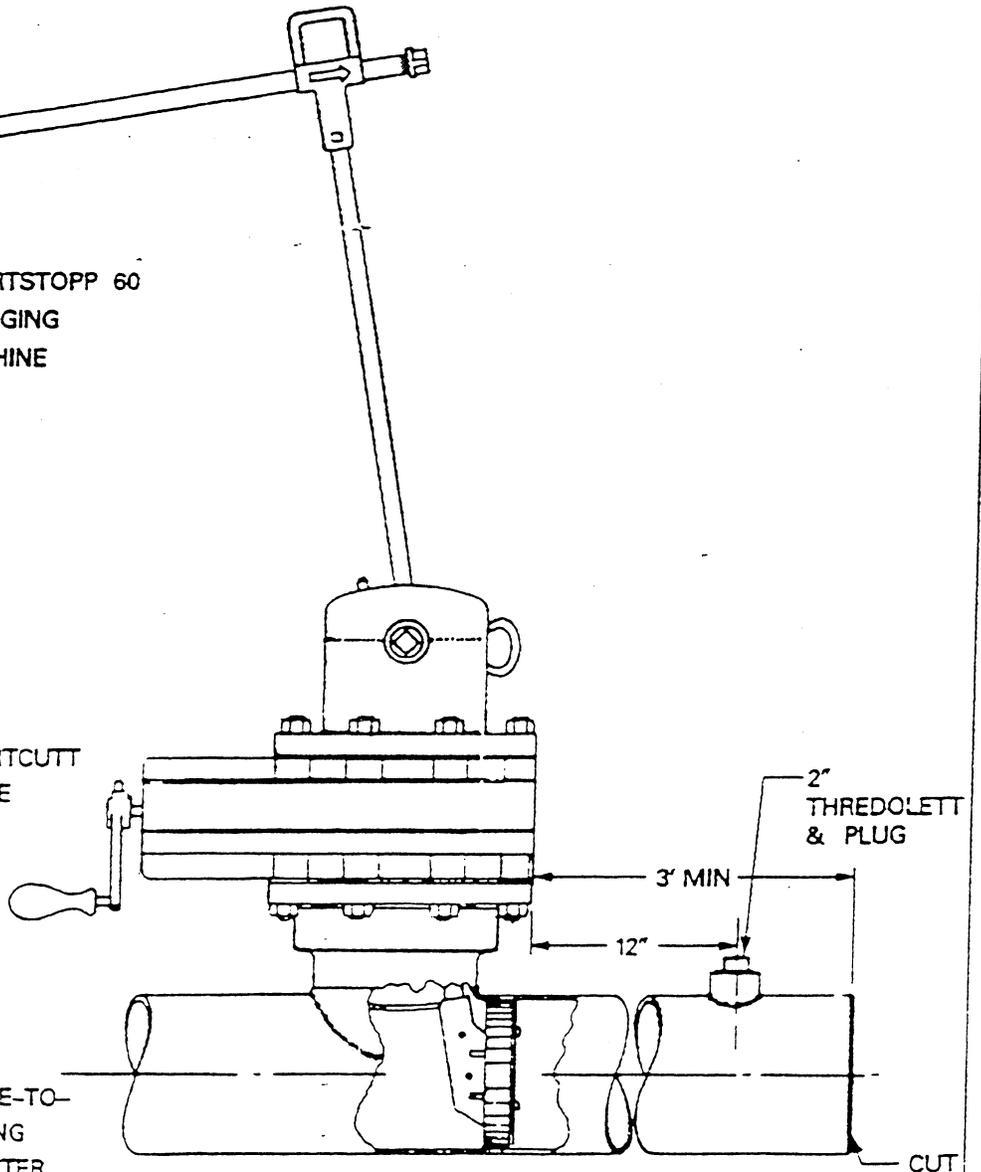
VALVE-TO-
 FITTING
 ADAPTER

GASKET



SHORTSTOPP
 WELDING
 FITTING

PIPELINE



ALL SIZES MEET ANSI CLASS 150 SERVICE RATINGS. WHEN
 USED WITH TDW PLUGGING MACHINES. THE MAXIMUM
 RECOMMENDED WORKING PRESSURE IS 60 PSI FOR
 SHORTSTOPP 60 PLUGGING MACHINES.

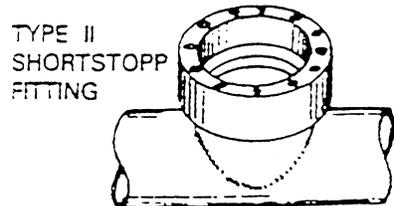
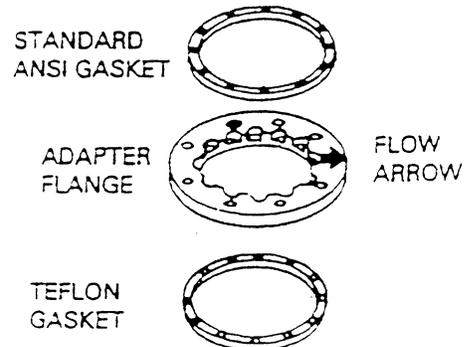
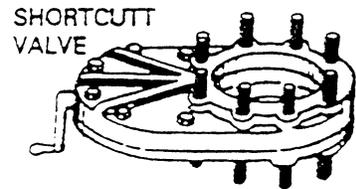
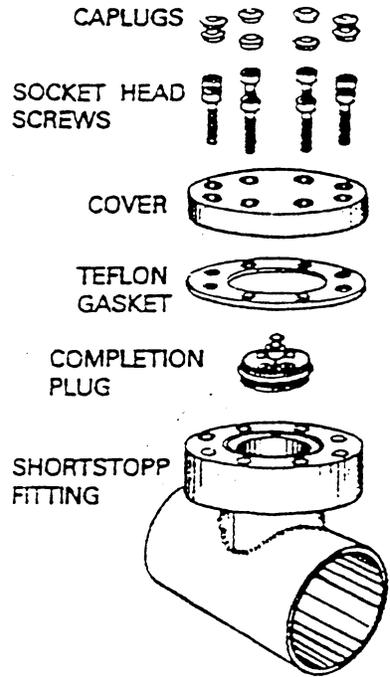
1. REMOVE COMPLETION PLUG FROM INSIDE FITTING BEFORE WELDING.
2. CLEAN ALL WELD EDGES THOROUGHLY - REMOVE ALL PAINT, DIRT, RUST, OIL, ETC.
3. APPLY GREASE TO MACHINED SURFACE INSIDE FITTING TO PROTECT MACHINED SURFACE FROM WELD SPLATTER.
4. CENTER AND LEVEL FITTING. FLANGE CENTERLINE SHOULD INTERSECT CENTERLINE OF PIPE, AND FLANGE GASKET SURFACE PARALLEL TO PIPE.
5. MAINTAIN 1/16" TO 1/8" GAP BETWEEN FITTING AND PIPE SURFACE FOR PROPER PENETRATION. DO NOT WELD INSIDE OF FITTING TO AVOID TAPPING PROBLEMS.
6. PLACE WHITE TEFLON GASKET ON FACE OF FITTING.
7. POSITION REUSABLE VALVE ADAPTER FLANGE ON FITTING SO THAT THE FLOW ARROW STAMPED ON FLANGE ADAPTER IS IN LINE WITH THE PIPE. BE SURE THAT FITTING AND VALVE ADAPTER FLANGE BORES ARE CONCENTRIC.
8. ATTACH VALVE ADAPTER FLANGE TO FACE OF FITTING; USE SOCKET HEAD SCREWS FURNISHED WITH THE FITTING. A MINIMUM TORQUE ON SOCKET HEAD SCREWS ASSURES A LEAKTIGHT JOINT.

- 4" FITTING ... 40 TO 60 FT. LBS.
- 8" FITTING ... 60 TO 90 FT. LBS.
- 12" FITTING ... 60 TO 90 FT. LBS.

CAUTION

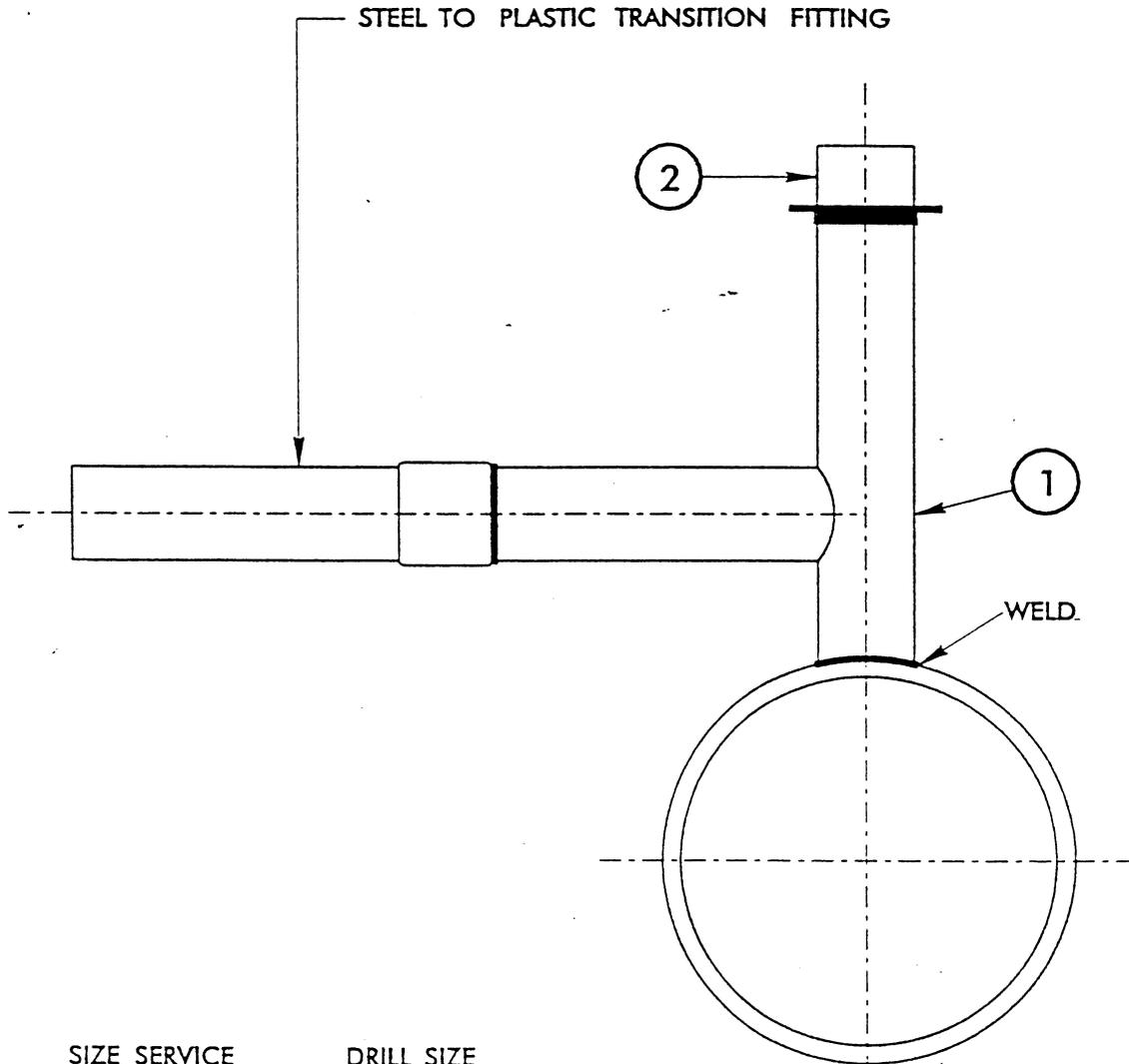
EXCESSIVE OVERTORQUING CAN BREAK SOCKET HEAD SCREWS. BROKEN SOCKET HEAD SCREWS CAN BE DIFFICULT TO REMOVE AND COULD ALLOW GASKET TO LEAK.

9. PLACE A STANDARD ANSI FLANGE GASKET ON FACE OF VALVE ADAPTER FLANGE. THEN INSTALL T.D.W. SHORTCUTT VALVE ON THE VALVE ADAPTER FLANGE.
10. PROCEED AND USE STANDARD T.D.W. SHORTSTOPP EQUIPMENT.
11. AFTER COMPLETION PLUG HAS BEEN SET AND SHORTCUTT VALVE HAS BEEN REMOVED, REMOVE REUSABLE VALVE ADAPTER FLANGE.
12. INSTALL COVER (BLIND FLANGE) ON FITTING WITH USE OF SOCKET HEAD SCREWS AND TEFLON GASKET. USE MINIMUM TORQUE VALUES AS SHOWN IN ITEM 8.
13. INSERT PLASTIC CAPPLUGS INTO HEX HOLES OF SOCKET HEAD SCREWS ON COVER. CAPPLUGS HELP PROTECT FITTING FROM DIRT AND OTHER FOREIGN MATTER.



TEE SERVICE WELDED TRANSITION
STEEL TO PLASTIC

Exhibit DST-3



SIZE SERVICE
1"
1 - 1/4"

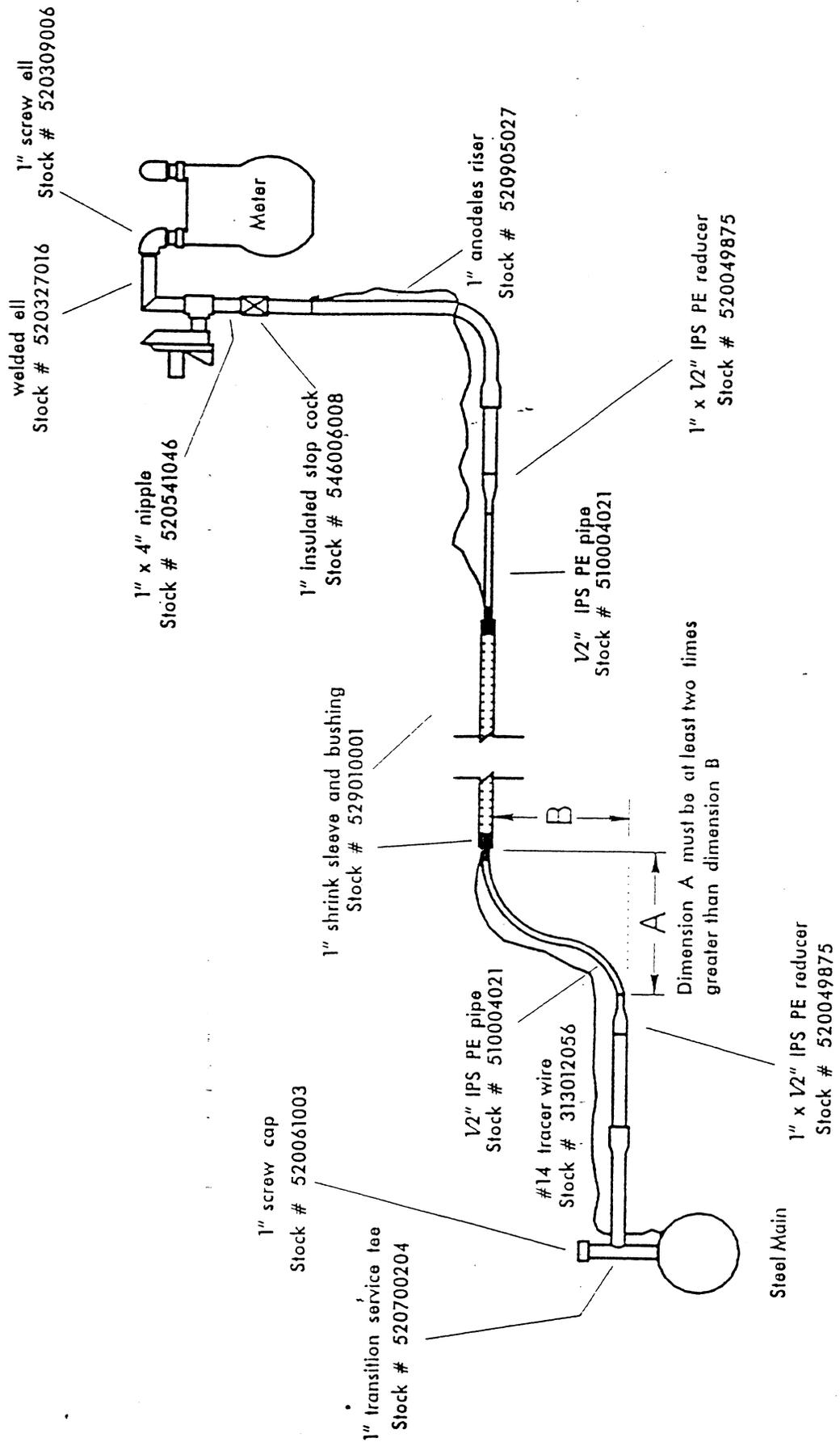
DRILL SIZE
7/8"
1 - 1/8"

TEE SERVICE WELDED TRANSITION STEEL TO PLASTIC 1"
C.P.S. STOCK #520700204
TEE SERVICE WELDED TRANSITION STEEL TO PLASTIC 1 - 1/4"
C.P.S. STOCK #520700220

	Date	Approved	City Public Service Construction Standard (Gas)	G-S-127-2-0
Issued				Drawing DS - 49
Revised				

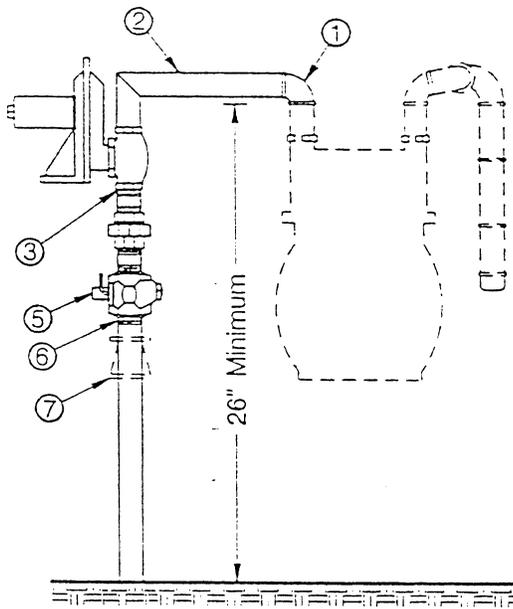
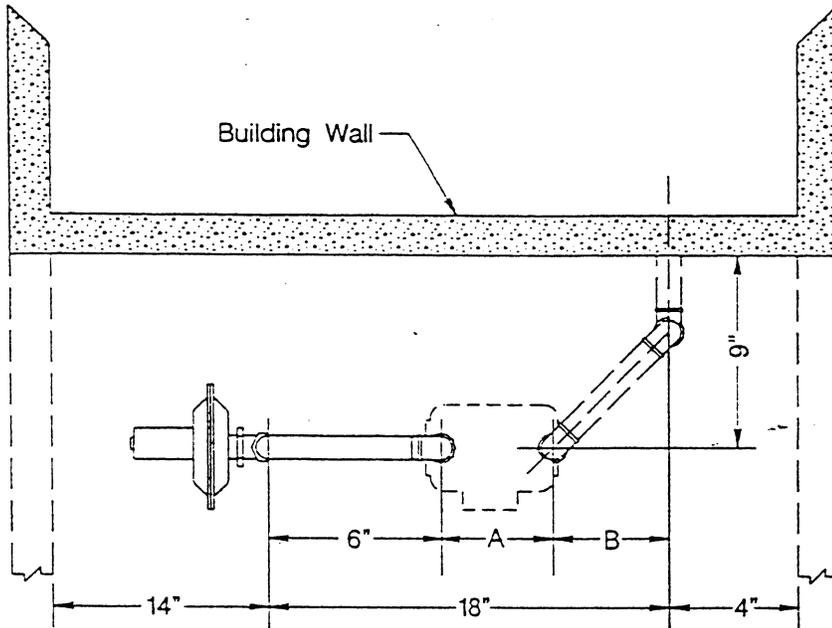
Service Insertion Overview

Exhibit DST - 3



DATE APPROVED	M.K.K.
1-29-98	<i>M.K.K.</i>
UED	
ISED	

NOTE: FOR DIMENSIONS OF METERS REFER TO EXHIBIT 8-1 IN THE PLANNING INSTRUCTIONS.



Available Sizes: ●

Service Size	Size of Meter Connection		
	1"	1 1/4"	1 1/2"
1"	●	●	●
1 1/4"	●	●	●
1 1/2"			●

	Date	Approved
Issued	9-1-70	CJH
Revised	1-28-98	MKK <i>[Signature]</i>

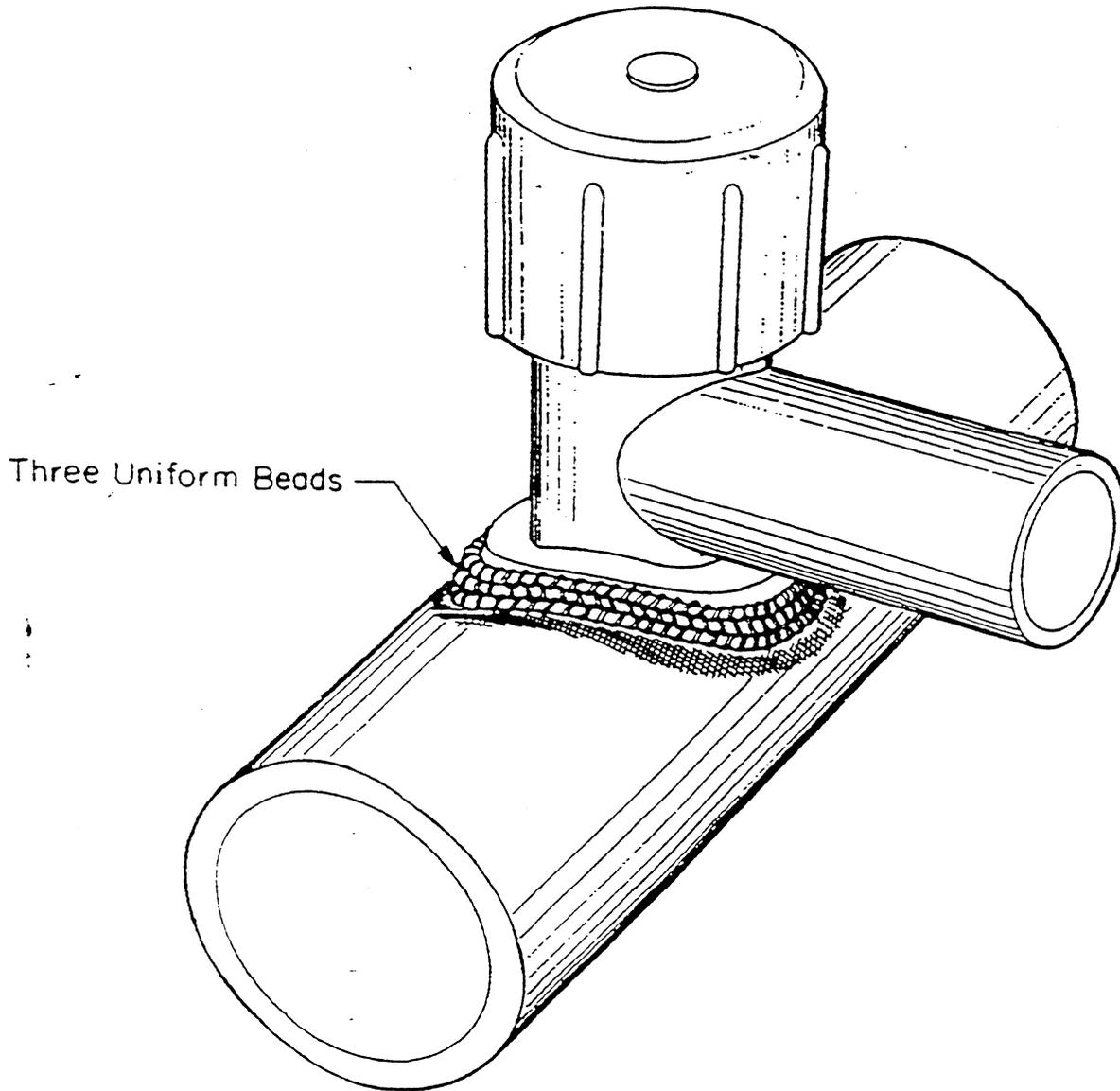
**CITY PUBLIC SERVICE
EXHIBIT GAS-4
DESIGN STANDARDS FOR
POLYETHYLENE GAS PIPING**

**CITY PUBLIC SERVICE
EXHIBIT GAS-4
DESIGN STANDARDS FOR
POLYETHYLENE GAS PIPING**

Drawing Number	Drawing Description	Latest Revision	Page#
DS-21	Plastic Pipe, Tapping Tee		2
DS-24	Posi-Hold Coupling Installation	5/80	3
DS-26	Plastic Pipe & Tracer Wire	12/18/92	4
DS-27	Tee Splice	6/05/80	5
DS-28	Examples for Anodeless Risers		6-7
DS-29	Anodeless Riser		8
DS-30	Termination of Tracer Wire on Anodeless Systems	2/83	9
DS-31	Copper Wire Connection to Pipe Using Cadweld		10
DS-32	Instruction Sheet Type TB-3 Welder		11
DS-33	Packaged Anodes		12
DS-34	Plasti-Lok Transition Coupling	9/81	13

4.5

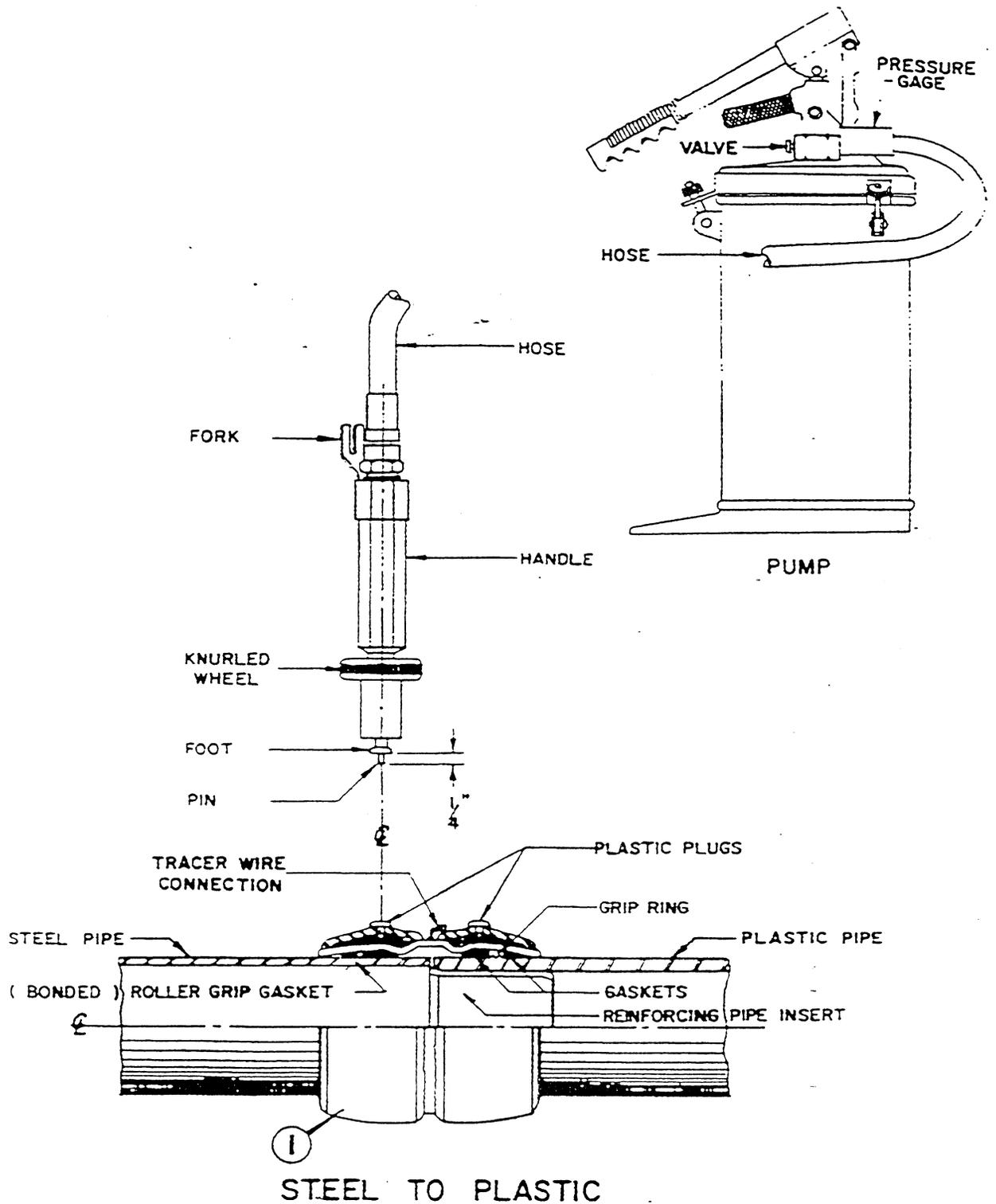
PLASTIC PIPE, TAPPING TEE



	DATE	APPROVED	CITY PUBLIC SERVICE BOARD	DRAWING DS-21
ISSUED	3/10/77	R. K. J.	CONSTRUCTION STANDARD (GAS)	G-S-505-6-0
REVISED				

4.5

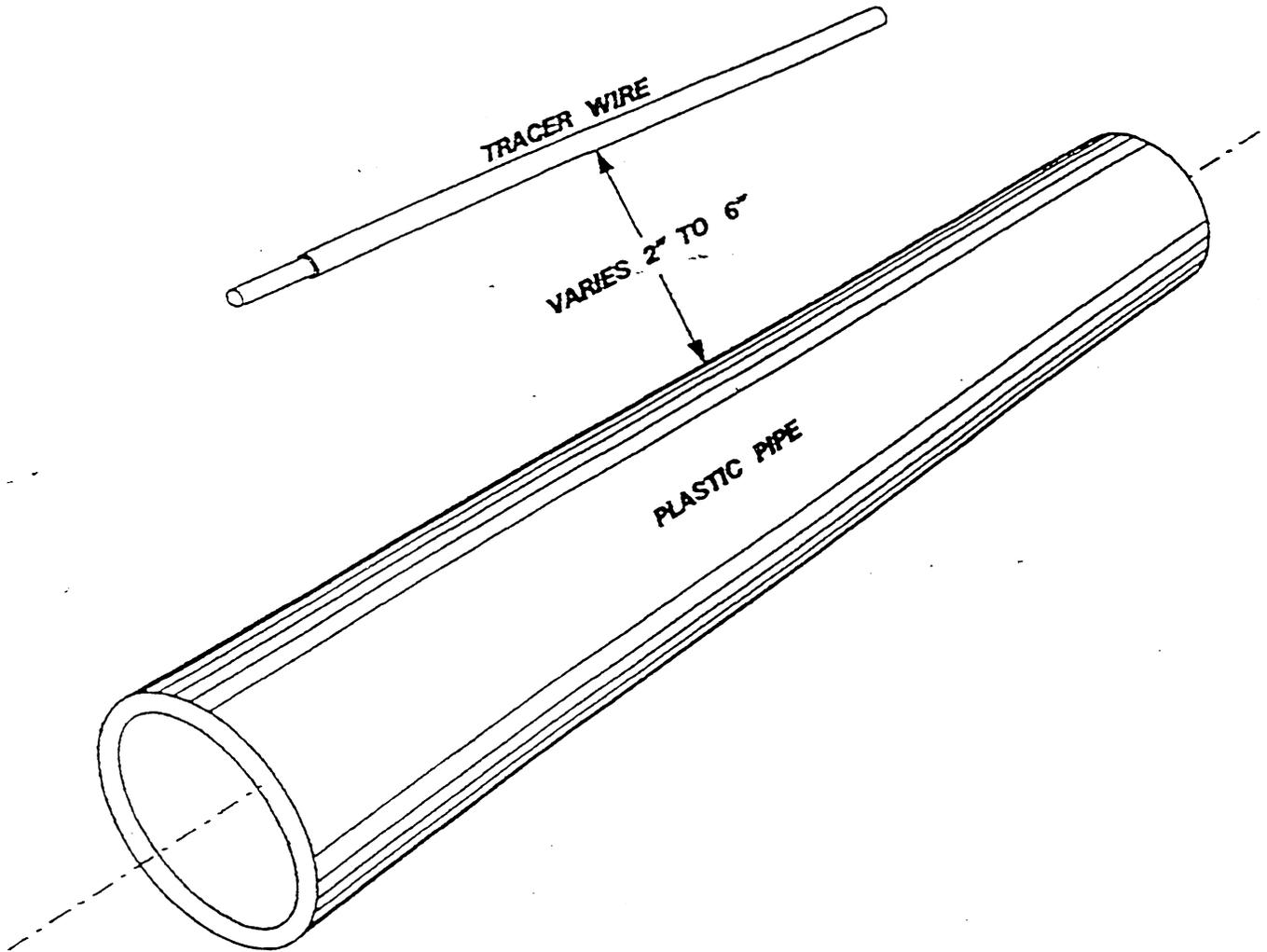
POSI-HOLD COUPLING INSTALLATION



DATE	APPROVED	CITY PUBLIC SERVICE BOARD CONSTRUCTION DRAWING (GAS)	DRAWING DS-24
ISSUED 5/80	<i>BAK</i>		G-S-507-8-0
REVISED			

4.5

PLASTIC PIPE & TRACER WIRE

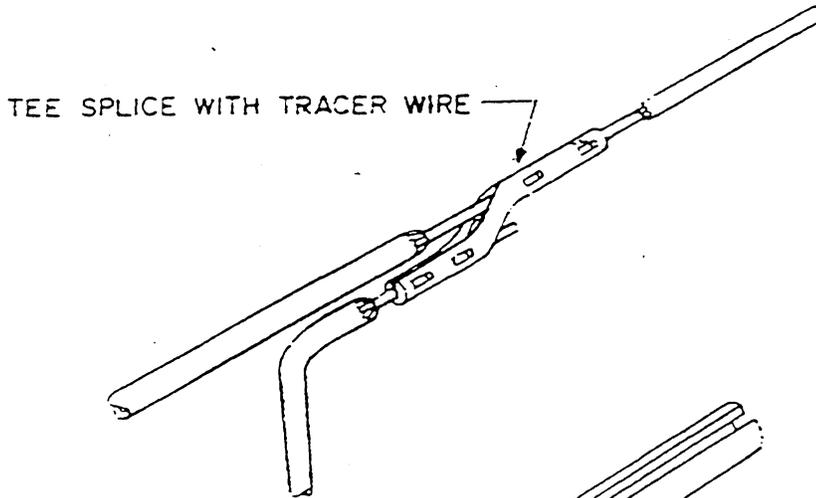


NOTE: THERE IS TO BE 2" TO 6" OF SEPARATION BETWEEN PIPE AND TRACER WIRE

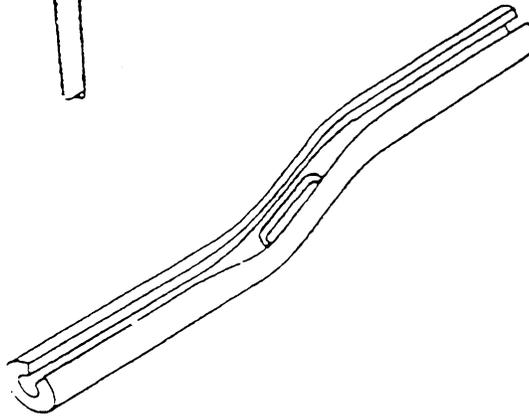
	DATE	APPROVED	CITY PUBLIC SERVICE CONSTRUCTION STANDARD	G-S-501-2-1
ISSUED	6-5-80	D.R.S.		
REVISED				
			DATE: 18-Dec-82 12:47	

4.5

TEE SPLICE



TEE SPLICE WITH TRACER WIRE



TEE SPLICE

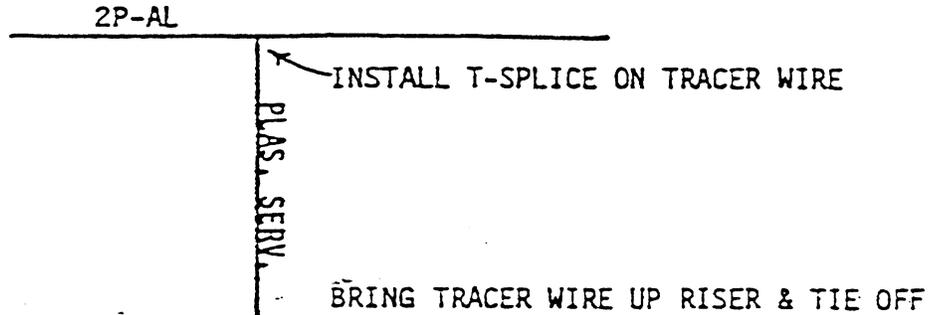
NOTE:

1. APPLY PIPELINE TAPE WRAP PRIMER (ALLOW TO DRY UNTIL TACKY)
2. USE PIPELINE TAPE WRAP ONLY (CIGARETTE WRAP)

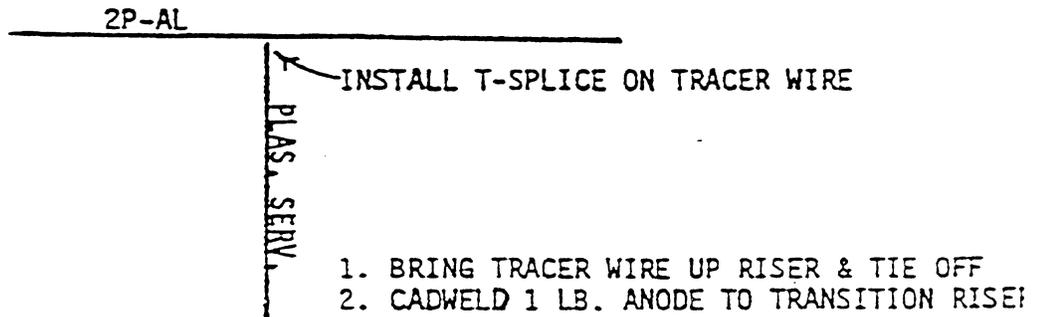
	DATE	APPROVED	CITY PUBLIC SERVICE BOARD CONSTRUCTION DRAWING (GAS)	DRAWING DS-27
ISSUED	6/25/00	A.R.S.		
REVISED				

DRAWING DS-28
 EXAMPLES FOR ANODELESS RISERS
 (Page 1 of 2)

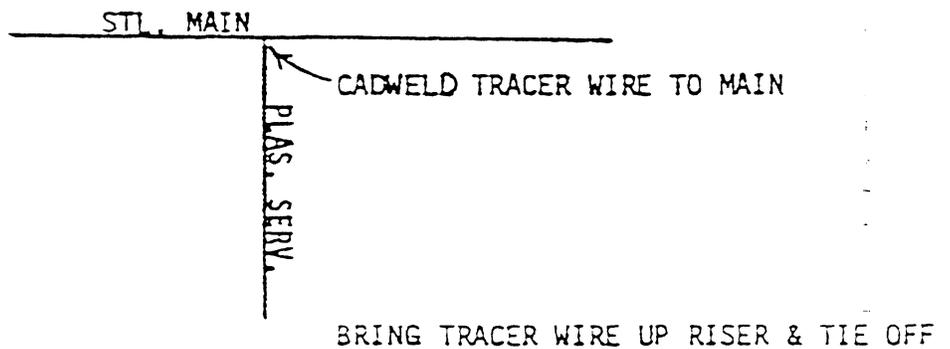
- ① ANODELESS TRACER WIRE ON PLASTIC MAIN - PLASTIC SERVICE WITH ANODELESS RISER



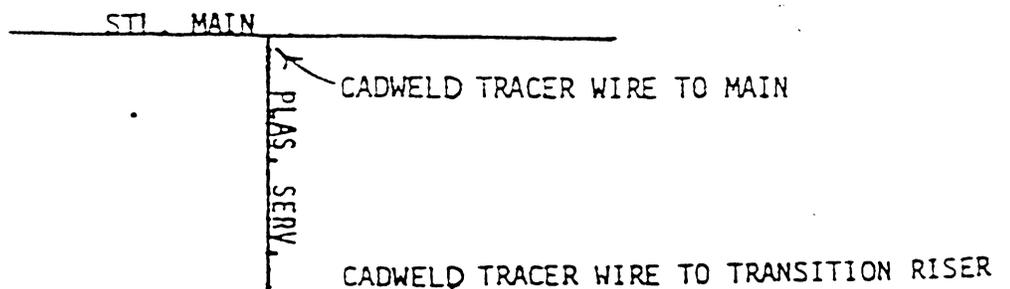
- ② ANODELESS TRACER WIRE ON PLASTIC MAIN - PLASTIC SERVICE WITH STEEL TRANSITION RISER



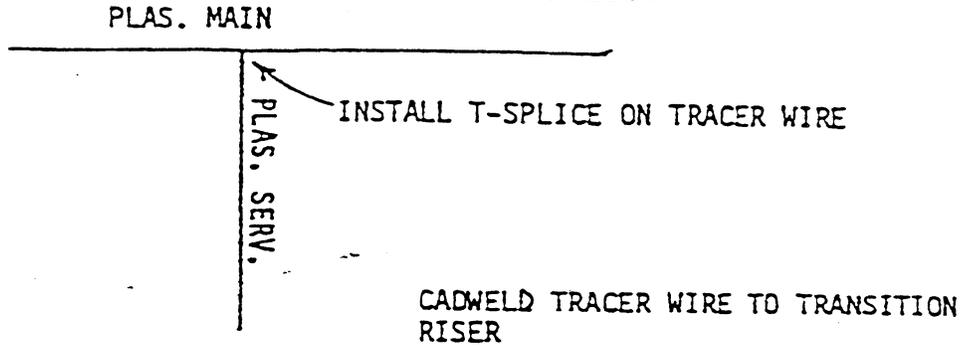
- ③ STEEL MAIN - PLASTIC SERVICE WITH ANODELESS RISER - ALSO RERUNS



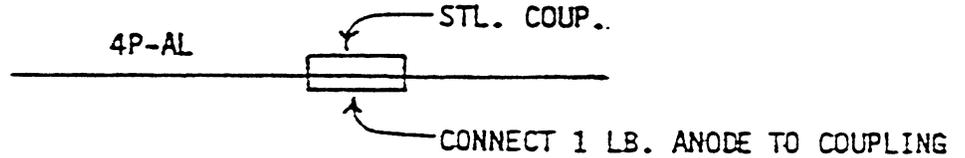
- ④ STEEL MAIN - PLASTIC SERVICE WITH STEEL TRANSITION RISER



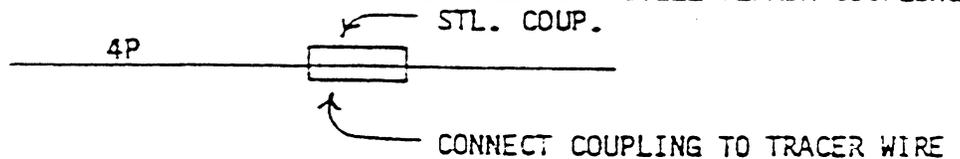
- ⑤ PROTECTED TRACER WIRE ON PLASTIC MAIN - 2" OR 4" PLASTIC SERVICE WITH STEEL TRANSITION RISER



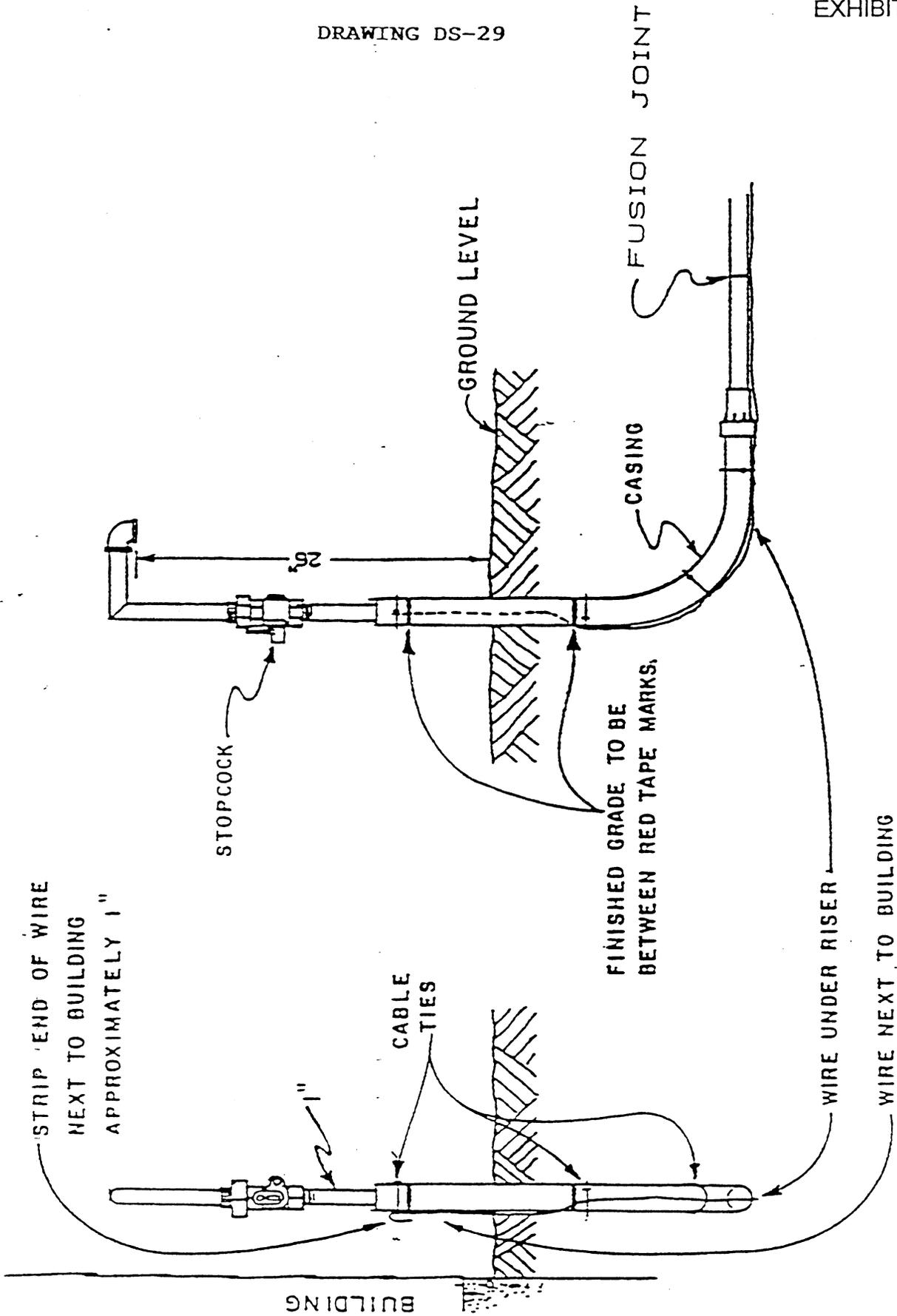
- ⑥ ANODELESS TRACER WIRE ON PLASTIC MAIN OR SERVICE WITH STEEL REPAIR COUPLING



- ⑦ PROTECTED TRACER WIRE ON PLASTIC MAIN OR SERVICE WITH STEEL REPAIR COUPLING

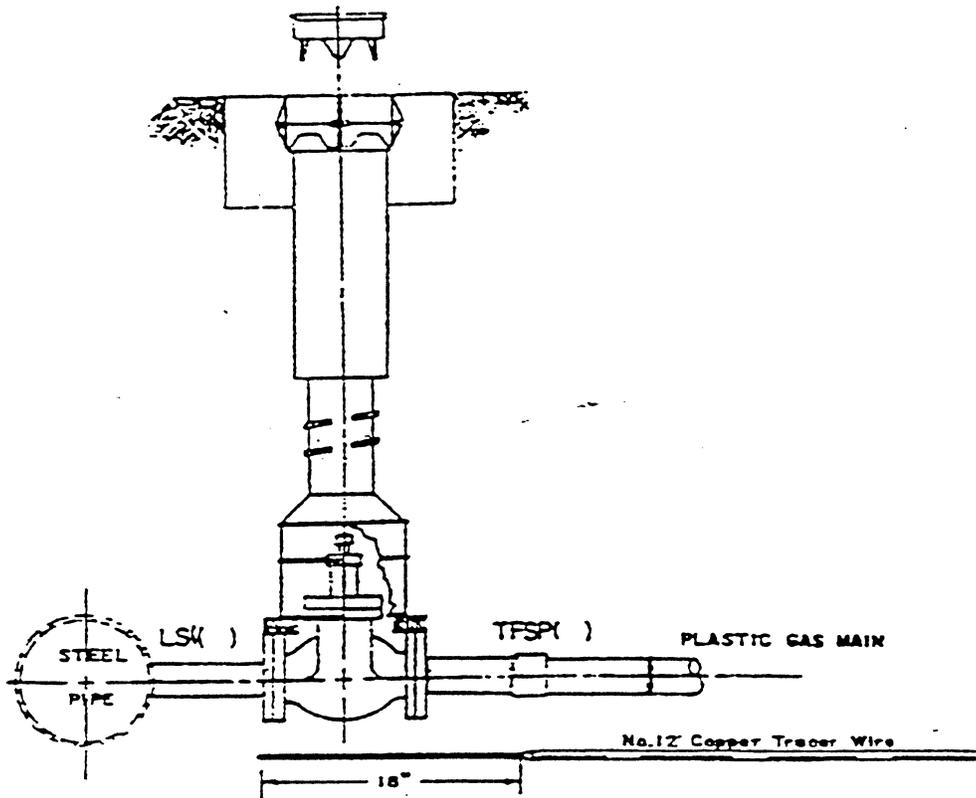


NOTE - NEVER CADWELD TRACER WIRE TO THE NEW ANODELESS SERVICE RISER

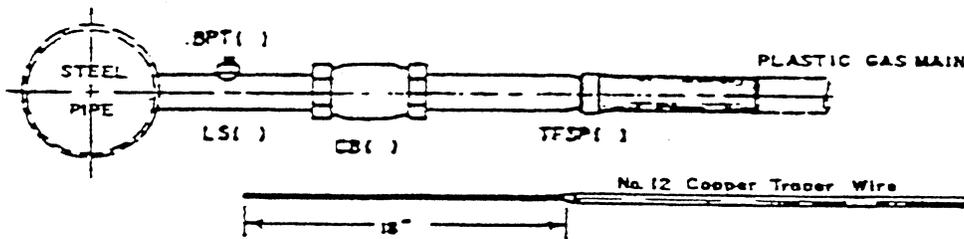


ANODELESS RISER

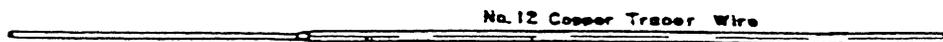
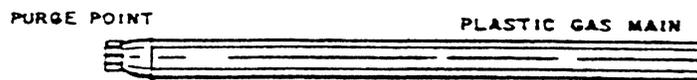
TERMINATION OF TRACER WIRE ON ANODELESS SYSTEMS



REMOVE 18" OF INSULATION AT END OF TRACER WIRE - LEAVE WIRE BARE
DO NOT LET WIRE TOUCH STEEL MAIN OR FITTINGS



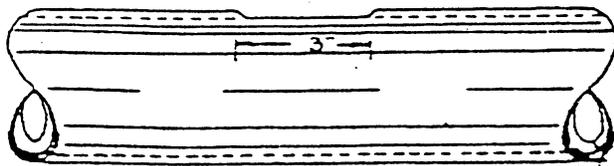
REMOVE 18" OF INSULATION AT END OF TRACER WIRE - LEAVE WIRE BARE
DO NOT LET WIRE TOUCH STEEL MAIN OR FITTINGS



REMOVE 18" OF INSULATION AT END OF TRACER WIRE - LEAVE WIRE BARE

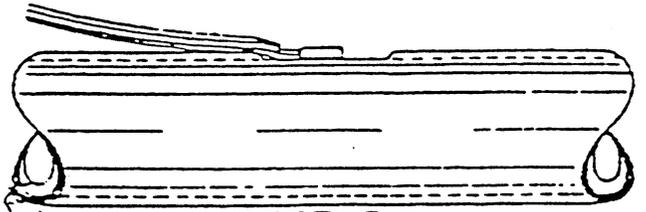
DRAWING DS-31

Remove a section of coating 3" long and file pipe bright so that a space 1" wide and 2" long is clean and dry.



STEP 1

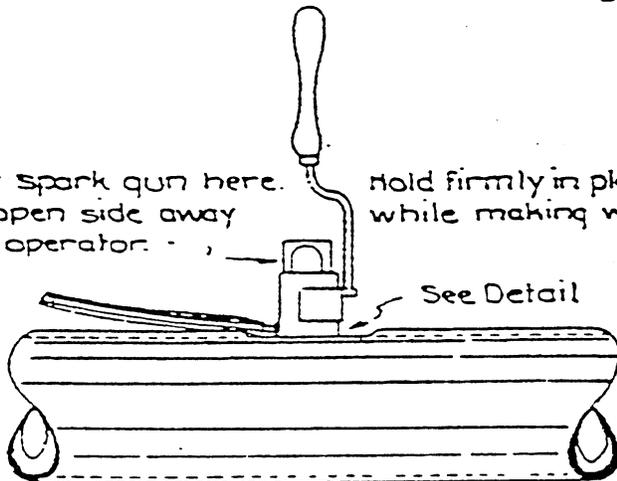
Strip 1/2" of insulation from wire and place copper sleeve on #10 and smaller wire.



STEP 2

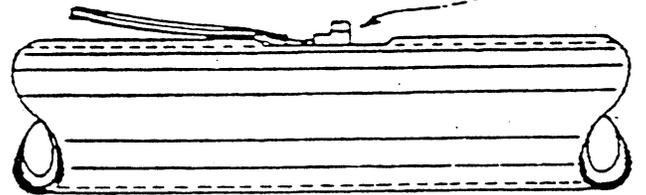
Apply spark gun here. Keep open side away from operator.

Hold firmly in place while making weld.



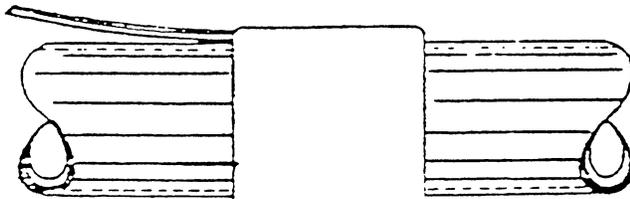
STEP 3

Remove slag with hammer and paint thoroughly with primer.

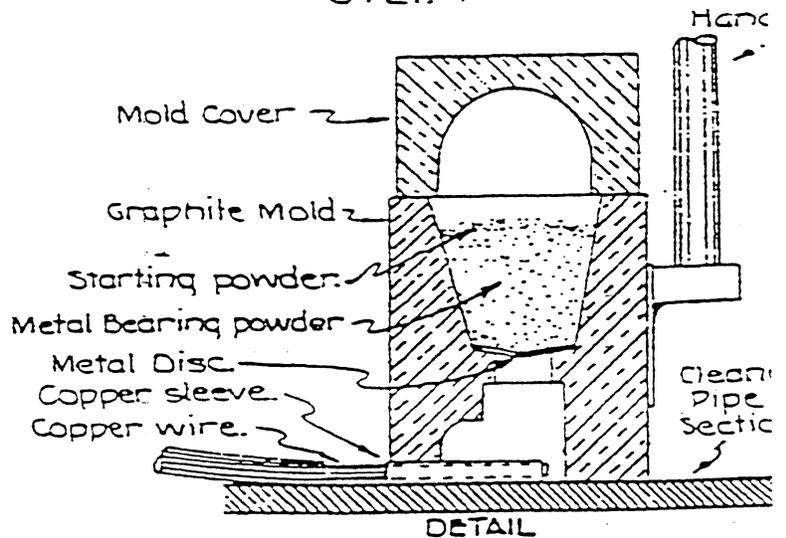


STEP 4

Repair pipe coating with care. Cover entire weld.



STEP 5



DETAIL

IMPORTANT

1. REMOVE RED CAP OF CADWELD CARTRIDGE AND DUMP ALL OF CONTENTS INTO MOLD. THE CHARGE WILL NOT IGNITE WITHOUT THE FINE STARTING POWDER ON TOP.
2. THE CARTRIDGES MUST BE KEPT DRY AT ALL TIMES.

Cadweld mold with sleeve for #10 wire and smaller.

CITY PUBLIC SERVICE BOARD
SAN ANTONIO TEXAS
GAS DEPARTMENT

COPPER WIRE CONNECTION TO PIPE USING CADWELD.

INSTRUCTION SHEET - TYPE TB-3 WELDER**PREPARATION OF SURFACE:**

To obtain a good weld, surface must be bright clean and dry.

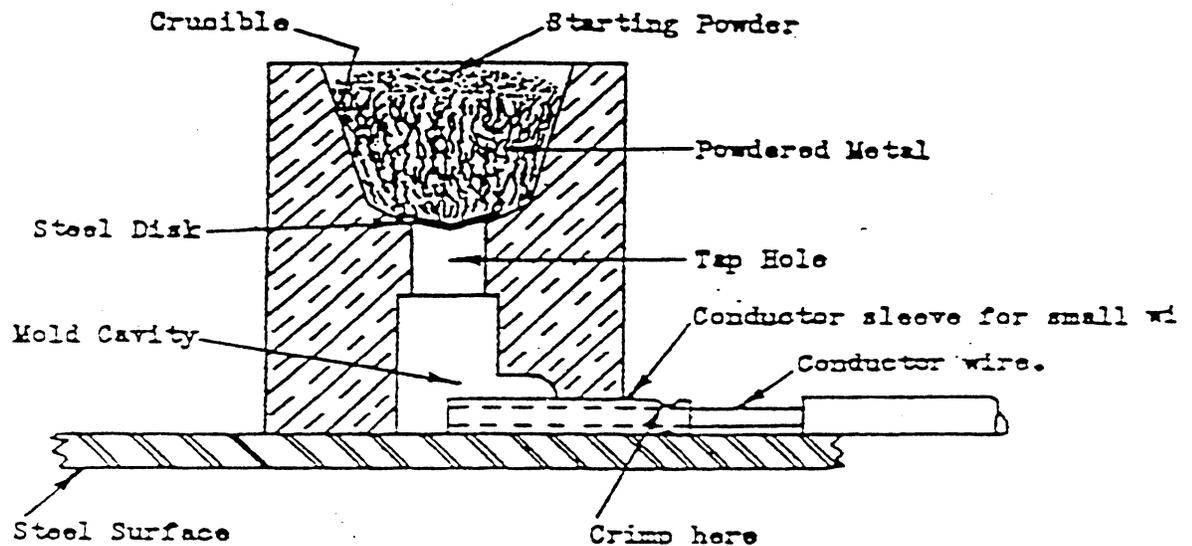
Steel surface should be ground or filed to remove all scale, rust, grease and dirt.

Galvanized steel must be cleaned with emery cloth to remove oxide.

PREPARATION OF WIRE:

Strip the insulation from the conductor and scrape until wire is bright and clean.

For #10 and smaller sizes, place the wire in a copper sleeve, ends flush, and crimp the sleeve tightly to the wire at the insulation to provide additional mechanical strength at the weld.

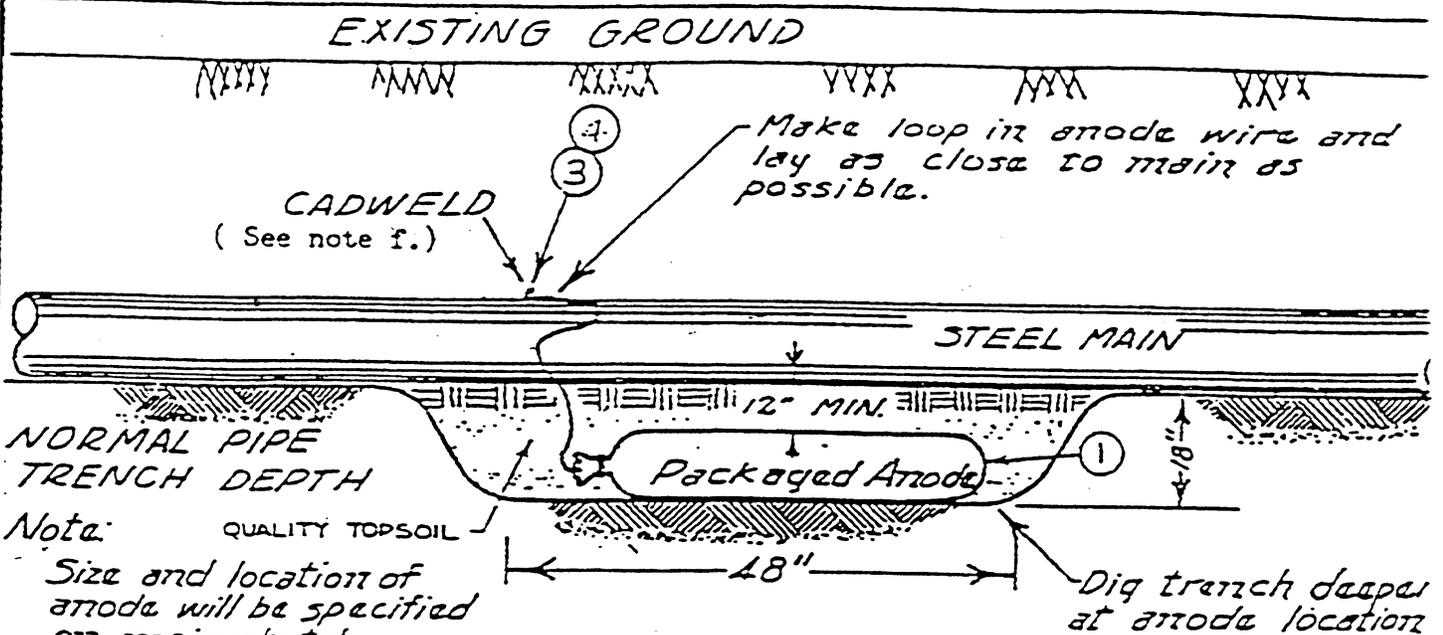
**WELDING PROCEDURE:**

- (1) PLACE WELDER OVER CLEAN STEEL SURFACE and insert the wire until it is under the CENTER of the tap hole.
- (2) COVER TAP HOLE WITH STEEL DISK.
- (3) DUMP CARTRIDGE IN CRUCIBLE AND CLOSE COVER. (Tap bottom of cartridge to be sure starting powder is emptied). Replace empty cartridge in box to keep remaining cartridges in an upright position.
- (4) HOLD DOWN ON WELDER TO PREVENT LEAKS AND IGNITE WITH FLINT GUN. Jerk gun away to prevent fouling. Should gun become fouled, soak in Spirits of Ammonia.
- (5) DO NOT REMOVE WELDER UNTIL METAL HAS SOLIDIFIED.
- (6) ALL SLAG MUST BE CLEANED FROM MOLD BEFORE MAKING NEXT WELD.

Note: Wet or damp molds produce porous welds. Mold can be dried out by firing a charge before making the desired weld.

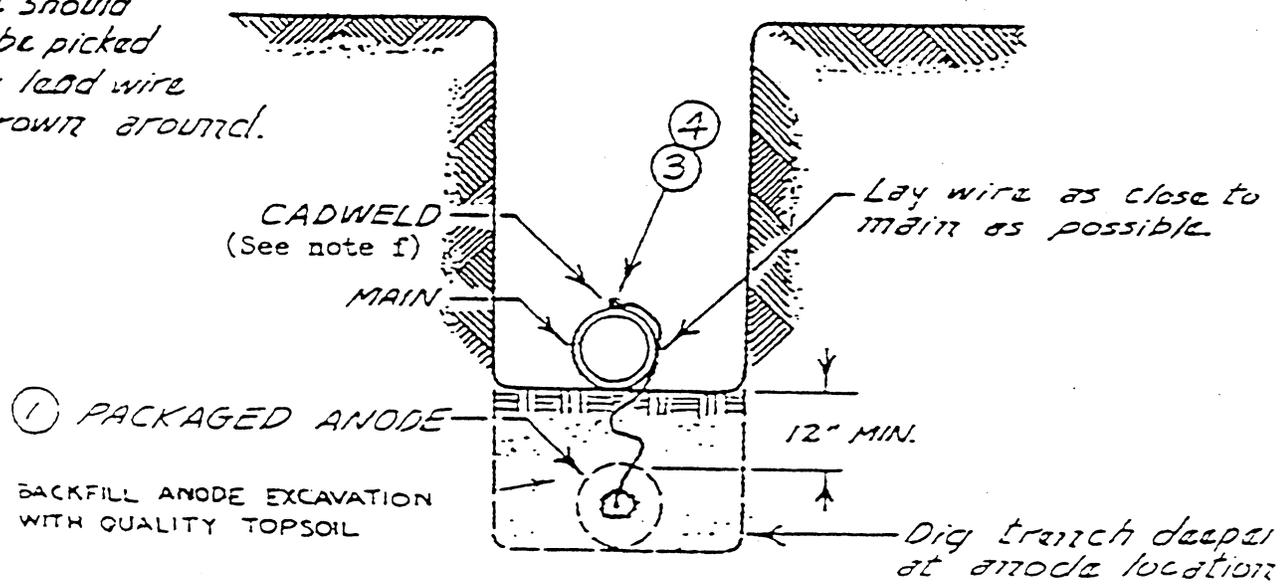
4.5

PACKAGED ANODES



Note: Size and location of anode will be specified on main sketch.

Anode should never be picked up by lead wire or thrown around.



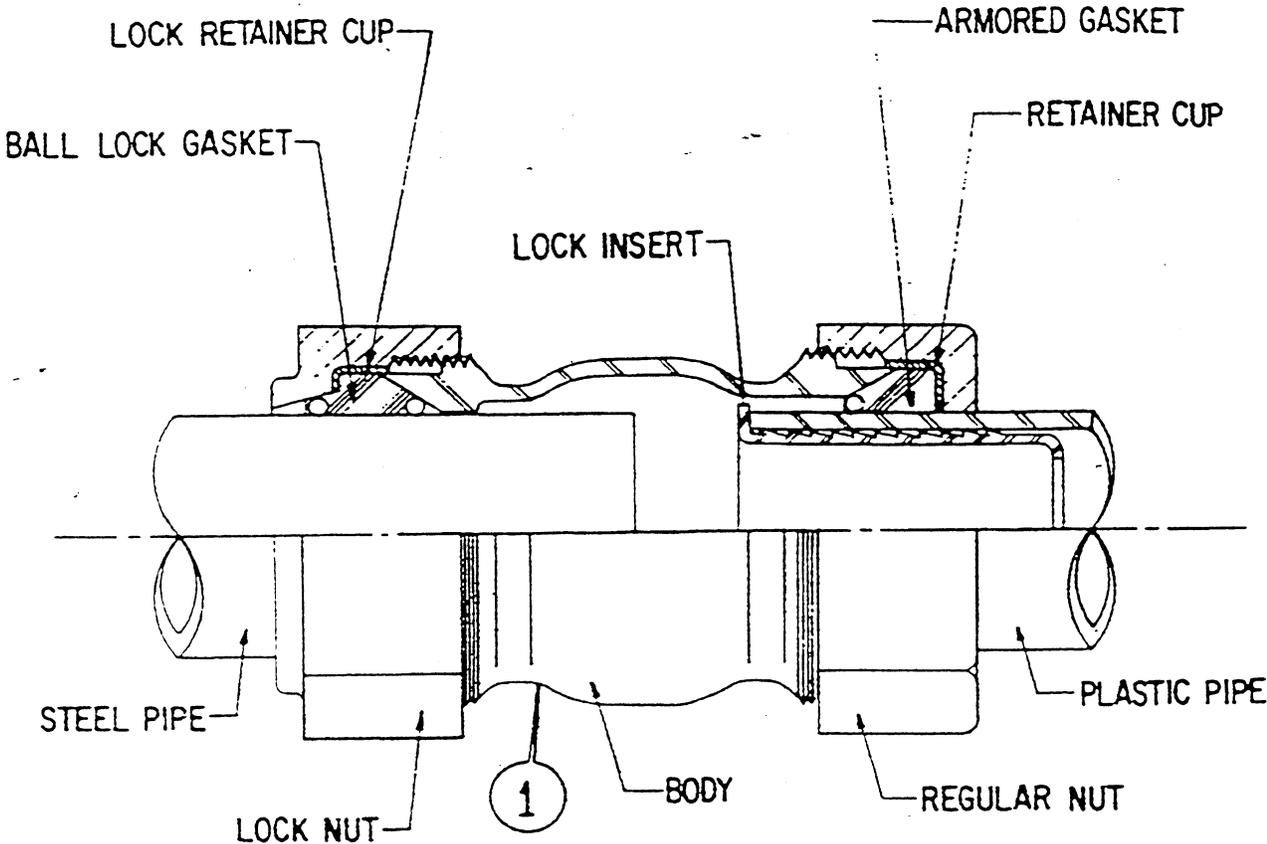
NOTES:

- a. Cadweld connection to be primed and coated carefully.
- b. Packaged anode should be covered with fine soil containing no rocks, clods, or sand.
- c. Pour 5 gallons of water over anode location and camp thoroughly.
- d. Provide test leads when specified. (See test lead standard)
- e. Anode specification sheet will be attached to main order, and is to be completed by the main construction foreman.
- f. Where plastic main is installed in place of steel, use tee splice to connect anode wire to tracer wire.

ISSUED	DATE	APPROVED	CITY PUBLIC SERVICE BOARD	DRAWING DC-33
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4.5

PLASTI-LOK TRANSITION COUPLING INSTALLED



STEEL TO PLASTIC

AVAILABLE SIZES: 1", 1 1/4", 2"

DATE	APPROVED	CITY PUBLIC SERVICE BOARD CONSTRUCTION DRAWING (GAS)	DRAWING DS-34
ISSUED 9/81	GRS		C - S - 507 - 1 - 0

SPECIAL SPECIFICATION

6011

Testing, Training, Documentation, Final Acceptance, and Warranty

1. **Description.** Perform or furnish testing, training, documentation, final acceptance, and warranty on the applicable equipment or systems.
2. **Testing.** Unless otherwise shown on the plans, perform the following tests on the applicable equipment or systems.
 - A. **Test Procedures Documentation.** Provide 5 copies of the test procedures and blank data forms 60 days prior to testing for each test required on this project. Include the sequence of the tests in the procedures. The Engineer will approve test procedures prior to submission of equipment for tests. Conduct all tests in accordance with the approved test procedures.

Record test data on the data forms, as well as quantitative results. Ensure the data forms are signed by an authorized representative (company official) of the equipment manufacturer. Submit 1 copy of the completed and signed data forms for acceptance or rejection of the test or equipment.

- B. **Design Approval Test.** Conduct a Design Approval Test on randomly selected units from the prototype design manufacturing run. If only 1 design prototype is manufactured, perform this test on that unit. If supplying multiple types of the equipment, provide and test a sample of each type.

Certification from an independent testing laboratory of a successfully completed Design Approval Test is acceptable. Ensure that the testing by this laboratory is performed in accordance with the requirements of this specification. Failure of independent tests to comply with the requirements of this specification will be grounds for rejection of any certification.

Notify the Engineer 10 working days before conducting this testing. The Department may witness all the tests. Perform the following tests:

1. **Power Service Transients.** The equipment shall meet the performance requirements, specified in the parent specification, when subjected to the power service transients as specified in Section 2.2.7.2, “Transient Tests (Power Service)” of the NEMA TS 2 standard, latest edition.
2. **Temperature and Condensation.** The equipment shall meet the performance requirements, specified in the parent specification, when subjected to the following conditions in the order specified below:

- Stabilize the equipment at -30°F and test as specified in Sections 2.2.7.3, “Low-Temperature Low-Voltage Tests” and 2.2.7.4, “Low-Temperature High-Voltage Tests” of the NEMA TS 2 standard, latest edition.
 - Allow the equipment to warm up to room temperature in an atmosphere having relative humidity of at least 40%. Operate the equipment for 2 hr., while wet, without degradation or failure.
 - Stabilize the equipment at 165°F and test as specified in Sections 2.2.7.5, “High-Temperature High Voltage Tests” and 2.2.7.6, “High-Temperature Low-Voltage Tests” of the NEMA TS 2 standard, latest edition.
3. **Relative Humidity.** The equipment shall meet the performance requirements, specified in the parent specification, within 30 min. of being subjected to a temperature of 165°F and a relative humidity of 18% for 48 hr.
 4. **Vibration.** The equipment shall show no degradation of mechanical structure, soldered components, or plug-in components and shall operate in accordance with the manufacturer's equipment specifications after being subjected to the vibration tests as described in Section 2.2.8, “Vibration Test” of the NEMA TS 2 standard, latest edition.
 5. **Power Interruption.** The equipment shall meet the performance requirements, specified in the parent specification, when subjected to nominal input voltage variations as specified in Section 2.2.10 “Power Interruption Test” of the NEMA TS 2 standard, latest edition.
- C. **Demonstration Test.** Conduct a Demonstration Test on applicable equipment at an approved Contractor facility. Notify the Engineer 10 working days before conducting this testing. The Department may witness all the tests. Perform the following tests:
1. **Examination of Product.** Examine each unit carefully to verify that the materials, design, construction, markings and workmanship comply with the requirements of the parent specification.
 2. **Continuity Tests.** Check the wiring to determine conformance with the requirements of the appropriate paragraphs in the parent specification.
 3. **Operational Test.** Operate each unit for at least 15 min. to permit equipment temperature stabilization and an adequate number of performance characteristics to ensure compliance with the requirements of the parent specification.
- D. **Stand-Alone Tests.** Conduct a Stand-Alone Test for each unit after installation. The test shall exercise all stand-alone (non-network) functional operations. Notify the Engineer 5 working days before conducting this test. The Department may witness all the tests.
- E. **System Integration Test.** Conduct a System Integration Test on the complete functional system. Demonstrate all control and monitor functions for each system component for 72 hr. Supply 2 copies of the System Operations manual before the

System Integration Test. Notify the Engineer 10 working days before conducting this testing. The Department may witness all the tests.

- F. Final Acceptance Test.** Conduct a Final Acceptance Test on the complete functional system. Demonstrate all control, monitor, and communication requirements for 90 days. The Engineer will furnish a Letter of Approval stating the first day of the Final Acceptance Test. The completion of the Final Acceptance Test occurs when system downtime due to mechanical, electrical, or other malfunctions to equipment furnished or installed does not exceed 72 hr. and any individual points of failure identified during the test period have operated free of defects as required in Article 2.G.5.
- G. Consequences of Test Failure.** If a unit fails a test, submit a report describing the nature of the failure and the actions taken to remedy the situation prior to modification or replacement of the unit. If a unit requires modification, correct the fault and then repeat the test until successfully completed. Correct minor discrepancies within 30 days of written notice to the Engineer. If a unit requires replacement, provide a new unit and then repeat the test until successfully completed. Major discrepancies that will substantially delay receipt and acceptance of the unit will be sufficient cause for rejection of the unit.

If a failure pattern develops in similar units within the system, implement corrective measures, including modification or replacement of units, to all similar units within the system as directed. Perform the corrective measures without additional cost or extension of the contract period.

- 1. Consequences of Design Approval Test Failure.** If the equipment fails the Design Approval Test, correct the fault and then repeat the Design Approval Test until successfully completed.
- 2. Consequences of Demonstration Test Failure.** If the equipment fails the Demonstration Test, correct the fault and then repeat the Demonstration Test until successfully completed.
- 3. Consequences of Stand-Alone Test Failure.** If the equipment fails the Stand-Alone Test, correct the fault and then repeat the Demonstration Test until successfully completed.
- 4. Consequence of System Integration Test Failure.** If the equipment fails the System Integration Test, correct the fault and then repeat the Systems Integration Test until successfully completed.
- 5. Consequences of Final Acceptance Test Failure.** If a defect within the system is detected during the Final Acceptance Test, document and correct the source of failure. Once corrective measures are taken, monitor the point of failure until a consecutive 30 day period free of defects is achieved.

If after completion of the initial test period, the system downtime exceeds 72 hr. or individual points of failure have not operated for 30 consecutive days free of defects, extend the test period by an amount of time equal to the greater of the

downtime in excess of 72 hr. or the number of days required to complete the performance requirement of the individual point of failure.

- 3. Training.** When required on the plans, provide a minimum of 24 hr. of instruction to 10 designated personnel in the operation and maintenance procedures of equipment or systems installed. Provide the training during installation, testing, and integration. Provide the training through practical demonstrations, seminars, and other related technical procedures.

Furnish a training session agenda, a complete set of training material (manuals and schematics), and the names and qualifications of proposed instructors for approval 60 days before the training. Provide a training location. Provide 1 copy of the course material for each person. Provide training in the following areas of interest and as shown on the plans:

- The “Hands-on” operation for each type of equipment.
- Explanation of all system commands, their function and usage.
- Required preventative maintenance procedures.
- All equipment servicing procedures.
- System “troubleshooting”/problem identification procedures.

- 4. Documentation.** Provide “as-built” documentation for the entire system and all of its individual components. Supply 1 mylar reproducible copy of the wiring diagrams. Supply 3 copies of the following in a manual for each equipment component:

- Complete and accurate schematic diagrams.
- Complete and accurate cabinet, enclosure, and building wiring diagrams.
- Complete installation procedures.
- Complete performance specifications (functional, electrical, mechanical and environmental) on the unit.
- Complete parts list including names of vendors for parts not identified by universal part numbers such as JEDEC, RETMA, or EIA.
- Pictorial of component layout on circuit board.
- Complete maintenance and trouble-shooting procedures.
- Complete stage-by-stage explanation of circuit theory and operation.
- Complete and detailed system operations manuals.

Furnish additional information as shown on the plans.

- 5. Final Acceptance.** Final acceptance is made when all work is complete, the system has successfully completed all test requirements, and the Engineer, in writing, accepts all work for the work locations in the Contract in accordance with Item 5, Article 8, “Final Acceptance.” Final acceptance relieves the Contractor from further Contract responsibilities.
- 6. Warranty.** Guarantee equipment furnished and installed to perform according to the manufacturer’s published specifications. Warrant equipment against defects or failure in design, materials, and workmanship in accordance with the manufacturer’s standard warranty. Supply equipment with no less than 95% of the manufacturer’s warranty

remaining on the date that equipment invoices are submitted for final payment. Any equipment with less than 95% warranty remaining will be rejected.

The Contractor shall warrant or guarantee all such electronic, electrical, and mechanical equipment, materials, technical data, and products furnished and installed for a period of 1 year after final acceptance of the project by the Department. The Contractor's warranty or guarantee shall provide for the "on-site" repair or replacement, at the Contractor's option, within 2 working days and at no cost to the Department.

Once the Contractor's warranty or guarantee expires, assign to the Department any manufacturer's standard warranty or guarantee coverage still remaining on all such electronic, electrical, and mechanical equipment, materials, technical data, and products furnished for and installed on the project. Repair or replace defective equipment, at the manufacturer's option, at no cost to the Department.

- 7. Measurement and Payment.** The work performed, materials furnished, equipment, labor, tools, and incidentals will not be measured or paid for directly, but will be considered subsidiary to bid items of the Contract.

SPECIAL SPECIFICATION

6013

Electronic Components

- 1. Description.** Use electronic components to manufacture electronic equipment.
- 2. Materials and Construction Methods.** Use electronic components that comply with Electronic Industries Association (EIA) and Joint Electronic Device Engineering Council (JEDEC) Specifications. Provide industry standard electronic components available from several manufacturers. When special monolithic integrated circuits are necessary for cost-effective designs, waiving the multi-source requirements will be as directed.

Design the electronic circuitry to ensure an adjustment range from normal adjustment settings of variable components. Provide a range of adjustment to compensate for composite variations in the associated circuitry due to changes in part values during the normal or specified life of the device. Ensure the range of adjustment can compensate for variations in replacement parts within the specified tolerances. Unless otherwise shown on the plans, design the components to be under operating conditions 24 hr. a day for 10 yr. Derate electronic components by 20% with regard to ambient temperature, applied voltage, and power dissipation.

On electronic components weighing more than 2 oz., use supports other than the component's pins or electrical connectors. Solder electronic components of 2 or more leads in place. Mark the circuit reference symbol next to the component.

Meet the above requirements and satisfy the following specific requirements for the different components:

- A. Capacitors.** Provide industrial grade capacitors. Insulate the capacitors. Mark capacitors with their capacitance value, working voltage, and polarity.

Provide capacitor encasements resistant to cracking, peeling, and discoloration due to humidity and changes in temperature. Provide electrolytic capacitors capable of operating at least 185°F. Do not use electrolytic capacitors of less than 1.0 microfarad.

Use a clamp or fastener to support a capacitor to avoid damage by shock or vibration. Use a capacitor with a specific ripple or AC voltage rating, if possibly subjected to a ripple voltage in excess of 10% of the actual DC voltage across the capacitor. Use an aluminum electrolytic capacitor only when continually energized.

- B. Diodes.** If low forward drop is required in logic circuit applications, furnish justification for use of Germanium diodes prior to incorporation in the design. Mark diodes with the JEDEC part number, using an industry approved color code or clearly legible printing. Indicate the diode polarity on the diode case by the use of the diode symbol, by the 360° band on the cathode end, or by the shape of case.

- C. Indicators.** Use solid-state (LED) indicators with a useful life at least 25,000 hr.
- D. Integrated Circuits.** Print the manufacturer's part number and any information required to install the integrated circuit assembly upon the package. Test integrated circuits with at least 1 test from each group below:

1. Group 1

- Stabilization Bake
- Temperature Cycling
- Power Burn-in

2. Group 2

- Functional test with the device at the manufacturer's maximum specified temperature
- Static and dynamic test per manufacturer's data sheet

- E. Potentiometers and Rheostats.** Use industrial grade potentiometers. Use potentiometers with a power rating at least 100% greater than the maximum power requirements of the circuit.

F. Printed Circuit Boards.

- 1. Design, Fabrication and Mounting.** Use NEMA Grade G-10 glass epoxy or equivalent for printed circuit boards (refer to NEMA Publications No. L1 1-1982, Industrial Laminated Thermosetting Products). Provide a nominal thickness of 1/32 in. for circuit boards not exceeding 2 in. in any dimension. Provide a nominal thickness of 1/16 in. for circuit boards exceeding 2 in. in any dimension.

Coat the printed circuit board assembly with a protective coating to combat mildew, moisture, and fungus. Plate the through holes that carry electrical connections from one side of the board to the other. Use 1 oz./sq. ft. of copper to plate through holes. Use non-corrosive material for electrical mating surfaces.

Design and fabricate printed circuit boards and the mounting of parts and assemblies in accordance with MIL-STD-275 (latest revision) except as follows:

- Mount semiconductor devices on spacers or transipads if the device dissipates more than 250 mW. or if the case temperature will rise 20°F above ambient.
- Remove residual flux from the printed circuit board.
- Provide a resistance between any 2 isolated, independent conductor paths of at least 100 megohms when a 500 VDC potential is applied.

Mark operating circuit components mounted on the circuit boards. Reference the identifying characters to their respective components in the schematic diagram and in the parts list.

- 2. Soldering.** Hand solder in accordance with MIL-STD-55110. Use of automatic flow soldering is acceptable.

- G. Relays.** Install diodes across the coils for transient suppression in DC relays. Provide replaceable relays that do not require special tools for replacement.
 - H. Resistors.** Use fixed composition insulated resistors in accordance with the performance requirements of MIL-R-11. Provide industrial grade resistors with a 15 yr. design life. Mark with their resistance value, using EIA color codes or industry approved marking technique.

Use resistors with a 10% tolerance or better and a resistance variation of no more than 5% over the temperature range 0°F to 165°F. Do not use resistors with a power rating greater than 2 w., unless special ventilation or heat sinking is provided. Insulate these resistors from the printed circuit board.
 - I. Transistors.** Use JEDEC registered transistors. Mark the JEDEC part number on the case. Designate the emitter or collector by use of an industry approved marking technique.
 - J. Transformers.** Mark transformers with the manufacturer's part number on the case or frame, using a Radio-Electronics-Television Manufacturers Association (RETMA) color code or numbered in a manner to facilitate proper installation.
 - K. Switches.** Derate switch contacts 50% from their maximum current ratings.
- 3. Measurement and Payment.** The work performed, materials furnished, equipment, labor, tools, and incidentals will not be measured or paid for directly, but will be subsidiary to the bid items of the Contract.

SPECIAL SPECIFICATION

6026

National Transportation Communications for ITS Protocol for Dynamic Message Signs

1. **Description.** Provide Dynamic Message Signs (DMS) software that complies with the National Transportation Communications for ITS Protocol (NTCIP).
2. **Requirements.** Ensure software complies with the NTCIP Standards when installed. Ensure software complies with the relevant current NTCIP standards, including associated amendments. The term “software” include both software and firmware.

[Official printed copies of the NTCIP Joint Standards Publications referenced in this specification may be purchased from Global Engineering Documents, phone 1-800-854-7179, or <http://www.global.ihs.com>.]

- A. Ensure software complies with NTCIP 1101, Simple Transportation Management Framework and shall meet the requirements for Conformance Level 2.
- B. Ensure software complies with NTCIP 2101, Subnet Profile for PMPP over RS-232 (direct connect).
- C. Ensure software complies with NTCIP 2103, Subnet Profile for PPP over RS-232 (dial up).
- D. Ensure software implements all mandatory objects of the mandatory conformance group defined in NTCIP 1201, Global Object Definitions, as follows: Configuration Conformance Group.
- E. Ensure software implements all mandatory objects of the optional conformance groups defined in NTCIP 1201, Global Object Definitions, as follows:
 - Database Management Conformance Group
 - Time Management Conformance Group
 - Time Base Event Schedule Conformance Group
 - Report Conformance Group
 - STMF Conformance Group
 - PMPP Conformance Group
- F. Ensure software implements the following optional objects defined in NTCIP 1201, Global Object Definitions, as follows:
 - globalSetIDParameter
 - dbMakeID

- eventLogOID
 - eventConfigAction
 - eventClassDescription
- G.** Ensure software implements all mandatory objects of all mandatory conformance groups defined in NTCIP 1203, Object Definitions for DMS, as follows:
- Sign Configuration Conformance Group
 - Message Table Conformance Group
 - Sign Control Conformance Group
- H.** Ensure software implements all mandatory objects of all optional conformance groups defined in NTCIP 1203, Object Definitions for DMS, as follows:
- GUI Appearance
 - Font Configuration
 - VMS Sign Configuration
 - Time Base Event Schedule Conformance Group
 - MULTI Configuration
 - Default Message Control
 - Pixel Service Control
 - MULTI Error Control
 - Illumination/Brightness Control
 - Scheduling
 - Auxiliary I/O (Note: this is moved to NTCIP 1201 in v2.0)
 - Sign Status
 - Status Error
 - Pixel Error Status
 - Lamp Error Status
 - Fan Error Status
 - Power Status
 - Temperature Status
- I.** Ensure software implements the following optional objects defined in NTCIP 1203, Object Definitions for DMS, as follows:
- dmsMessageBeacon
 - dmsMessagePixelService
 - dmsSWReset
 - dmsMessageTimeRemaining
 - dmsShortPowerRecoveryMessage

- dmsLongPowerRecoveryMessage
- dmsShortPowerLossTime
- dmsResetMessage
- dmsCommunicationsLossMessage
- dmsTimeCommLoss
- dmsPowerLossMessage
- dmsEndDurationMessage
- vmsPixelServiceDuration
- vmsPixelServiceFrequency
- vmsPixelServiceTime
- dmsMultiOtherErrorDescription
- dmsCurrentSpeed
- dmsCurrentSpeedLimit
- dmsStatDoorOpen
- fanFailures
- fanTestActivation
- signVolts
- lowFuelThreshold
- fuelLevel
- engineRPM
- tempMinCtrlCabinet
- tempMaxCtrlCabinet
- tempMinAmbient
- tempMaxAmbient
- tempMinSignHousing
- tempMaxSignHousing

J. Ensure that objects that are required to support this NTCIP requirement support all values within its standardized range. Standardized range is defined by a size, range, or enumerated listing indicated in the object’s SYNTAX field and/or through descriptive text in the object’s description field of the relevant standard.

The following table provides the current listing of known variances for this project.

OBJECT	MINIMUM PROJECT REQUIREMENTS
NTCIP 1201	
Max Time Base Schedule Entries	7
Max Day Plans	7
Max Day Plan Events	7

Max Event Log Configurations	50
Event Configuration Mode	2,3, and 4
Max Event Log Size	200
Max Event Classes	7
Max Group Address	1

OBJECT	MINIMUM PROJECT REQUIREMENTS
NTCIP 1203	
Number Fonts	4
Max Font Characters	255
Default Background Color	0
Default Foreground Color	Must support at least one of 2, 7, 8, or 9
Default Justification Line	2, 3, 4
Default Justification Page	2, 3, 4
DMS Num. Permanent Msg	0
DMS Max. Changeable Msg	0
DMS Max. Volatile Msg	21
Volatile Memory	5 KB
DMS Control Mode	2, 4, 5, and 6 (Simulation mode)
Number Action Table Entries	15

K. Multi. Ensure software implements the following tags (opening and closing where defined) of MULTI as defined in the NTCIP 1203, Object Definitions for DMS, or as approved.

- Field
- Flash
- Font
- Justification Line
- Justification Page
- New Line
- New Page
- Page Time

L. Hardware Limitations. Ensure that a “noSuchName” SNMP error (OID not supported) will be returned by firmware for required objects that cannot be implemented due to hardware limitations.

M. Documentation. Ensure software is supplied with full documentation, including a CD-ROM containing ASCII versions of the following Management Information Base (MIB) files in Abstract Syntax Notation 1 (ASN.1) format:

- The relevant version of each official standard MIB Module referenced by the device functionality.
- A manufacturer specific version of the official Standard MIB Module with the supported range indicated in ASN.1 format in the SYNTAX field of the associated OBJECT TYPE macro for devices that do not support the full range of any object

within a Standard MIB Module. Ensure the file name is identical to the Standard MIB Module, except having the extension “.man”.

- A MIB containing any other objects supported by the device.

Allow unrestricted use of this documentation by any authorized party for systems integration purposes, regardless of what parties are involved in the systems integration effort.

Provide documentation of any procedural implementation details for Function(s) shown in the following table, wherever multiple objects are required to implement a feature required by the DMS Specification. The following table enumerates which objects are used and any special procedures or required sequences to implementing that feature of function. Submit this table for approval prior to implementation.

Function	Objects	Procedures to Implementation
<i>Example:</i> Function X	Object T Object Y Object Z	Get object T then send objects Y and Z if T>0.
Report sign ID (location/number)		
Download temperature table		
Report temperatures in sign		
Select critical temperature (shut down)		
Report pixel status		
Automatic pixel testing (test scan)		
Display a static message		
Display a flashing message		
Display an alternating message		
Report current message		
Report origin/owner of current message		
Set on/off time for flashing message		
Set on/off time for alternating message		
Download font character tables		
Select a font		
Select font spacing		
Select single-stroke font		
Select compressed font		
Select expanded font		
Select double-stroke font		

Function	Objects	Procedures to Implementation
Select spacing between characters		
Report data transmission error		
Report receipt of invalid data		
Report recovery from comm failure		
Report light output level		
Download brightness table		
Report illumination level		
Report AC power failure		
Report recovery from power failure		
Report power supply status		
Report power supply voltages		
Report voltage readings		
Report UPS status		
Report status of fans		
Report beacon status		
Set beacons on/off		
Report heater status		
Set time/date clock in sign controller		
Report time/date of sign controller		
Set display time in hours and minutes		
Report sign appearance		
Echo command		
Perform lamp test		
Perform fan test		
Set control mode		

3. **Testing and Verification.** Demonstrate conformance to the applicable sections of NTCIP using the Texas NTCIP Tester (TNT) software developed by Southwest Research Institute. Ensure that conformance testing is performed by a qualified independent testing firm and witnessed and certified by a Professional Engineer. Executable code and documentation for the TNT is available upon request from:

Mr. Carlos Lopez, Director
Traffic Operations Division
Texas Department of Transportation
125 E. 11th Street
Austin, TX 78701-2483

The department reserves the right to have a representative witness all conformance tests. Test results will be compared to the requirements specified in this Item. Failure to meet these requirements will be counted as a defect, and the software and associated hardware will be rejected. Final inspection and acceptance of software and associated hardware will be made after installation and performance testing at the designated locations as shown on the plans, unless otherwise directed.

4. **Measurement and Payment.** No direct measurement or payment will be made for the work performed and materials furnished in order to provide Dynamic Message Signs (DMS) software that complies with the National Transportation Communications for ITS Protocol (NTCIP) in accordance with this specification.

SPECIAL SPECIFICATION

6390

Software System Interface

- 1. Description.** Integrate the new, contractor installed Fiber Optic Dynamic Message Sign System(s), Local Control Unit(s), Lane Control System(s), CCTV Field Equipment, and Radar Vehicle Sensing Devices with the existing Mainframe Computer and software located in the TransGuide Operations Control Center.

Do not install any hardware interface between the field controllers and the TransGuide mainframe.

No solutions other than specified within these specifications are acceptable.

Provide and install materials and equipment as detailed in these Special Specifications and as directed by the Engineer.

Provide controller software that interfaces the data stream and protocol as described below.

- 2. Fiber Optic Dynamic Message Sign System (DMS).** The following describes the software protocol used to communicate between the Texas Department of Transportation (TxDOT) TransGuide Operations Control Center Mainframe (TOCCM) and the Fiber Optic Dynamic Message Sign System (DMS) controller. The protocol is based on sequences of ASCII characters transmitted via a serial data connection between the TOCCM and the DMS Controller.

- A. General Command Structure.** Data to be exchanged between the TOCCM and the DMS controller is framed into blocks. Each block is comprised of a header, a data body, and end of block information. The header always starts with "SOH" (Start of Header) followed by the address of the controller. The end of the header is a "STX" (Start of Text) to indicate data follows. The data is placed after this STX character, and before the ETX character, which marks the end of the data body. Following the ETX character is a Block Check Character (BBC). Data transmitted to the controller is framed between two "NUL" characters used for synchronization. Data transmitted from the controller is framed between a leading "NUL" character and a trailing "SUB" character.

The following diagram is what a single transmission block looks like:

NUL --- SOH --- ADDR --- STX --- DATA --- ETX ---BCC ---NUL

Where:

NUL--Synchronization character (Hex 00)

SOH--The ASCII Start-of-Header character (Hex 01)

ADDR--Address of the controller determined as:

A controller address is comprised of two parts. The first part of the address is the physical address of the controller. It is a value between 0 and 255.

The second part of the address is the logical address of the controller. It is usually 01, unless the controller is in configuration mode, then the address is 00.

The controller address is sent over the line as 5 ASCII characters.

STX--The ASCII Start-of-Text character (Hex 02), the STX marks the end of the header and the start of the data

DATA--Data for to be exchanged, its length, format, and contents are dependent on the command type (details provided in the command detail section).

ETX--The ASCII End-of-Text character (Hex 03)

BCC--Block check character (to ensure data integrity). The BCC is computed as the arithmetic sum of all the block characters, up to and including the ETX character. When transmitting using a seven-bit data word, only the seven least significant bits are transmitted.

For the following command:

NUL-SOH-00101-STX-E-ETX-BCC- NUL

The BCC would be:

NUL = 00H

SOH = 01H

0 = 30H

0 = 30H

1 = 31H

0 = 30H

1 = 31H

STX = 02H

“E” = 45H

ETX = 03H

=====
13DH

BCC=(13DH).AND.(7FH)=3DH

- B. Communication Termination.** The TOCCM terminates communication with the DMS controller by using an “EOT”(Hex04) sequence. This sequence signals the controller to be ready to communicate with the computer. The sequence does not include a BCC and comprises only of an “EOT” character framed between two “NUL” characters. An example synchronization character string would be:

NUL-EOT-NUL

- C. DMS Controller Modes.** The DMS controller does not synchronously send data to the TOCCM, rather, the DMS controller communicates data in one of two fashions:
- A “SELECTING” mode in which the TOCCM requests the DMS controller to receive data. The following command sequence is sent to place the DMS controller in SELECTING mode:

NUL-SOH-ADDR-SEL-NUL

- A “POLLING” mode in which the TOCCM requests the DMS controller to send data to the TOCCM. The following command sequence is sent to place the DMS controller in POLLING mode:

NUL-SOH-ADDR-POLL-NUL

Note that there are no BCC characters attached to the above sequences.

- D. Command Acknowledgement.** Once a sequence has been sent, either from the TOCCM or the DMS controller, the listener always acknowledges the reception of data. If the reception was correctly received, an “ACK” (Hex 06) is sent over the line. If the reception was garbled or lost, a “NAK” (Hex 15) is sent over the line.

The appropriate character is framed between two synchronization characters as follows:

NUL-ACK-NUL to acknowledge command successfully received

NUL-NAK-NUL to acknowledge command not successfully received

- E. Command Summary.** In general each command starts with a capital letter (its command code), followed by various parameters to form a precise syntax. All commands are embedded between control characters according to the communication protocol discussed in the previous section.

The following commands will be sent from the TOCCM to the DMS controller to control the DMS:

- *Display Command
- *Status Retrieval
- *Lamp Status
- *Day/Night Changeover
- *Abort Sign

- *Clock/Calendar Read Command
- *Clock/Calendar Set Command
- *Overbrightness Setting
- *Echo
- *Simulation Control

The details of each of these commands will be further discussed in the following sections.

F. Command Details. The following sections provide the details for each command that is sent between the TOCCM and the DMS controller.

1. DMS Commands Sent From the TOCCM to DMS Controller. The following commands are sent from the TOCCM to the DMS Controller via the communications line.

The structure of the Display Command is as follows:

Offset	Format	Description
1	B	Command function
2	X	subsign number
3	X	X=0: Deferred display 1: Immediate display
4	X	X=0: Steady message 1: Two alternated messages
5	X	X=0: Text 1 steady 1: Text 2 flashing
6	X	Text 1 flashing time ON 3 <= X <= F (.3 sec <= 1.5 sec.)
7	X	Text 1 flashing time OFF 3 <= X <= F (.3 sec <= X <= 1.5 sec)
8	X	X=0: Text 2 steady 1: Text 2 flashing
9	X	Text 2 flashing time ON 3 <= X <= F (.3 sec <= X <= 1.5 sec.)
10	X	Text 2 flashing time OFF 3 <= X <= F (.3 sec <= X <= 1.5 sec.)
11	XX	Text 1 time ON if alternated 3 <= XX <= FF (.3 <= XX <= 25.5 sec.)
13	XX	Blank time between Text 1 and Text 2 0 <= XX <= FF (0 <= XX <= 25.5 sec.)

Offset	Format	Description
15	XX	Text 2 time On if alternated 3 <= XX <= FF (.3 <= XX <= 25.5 sec.)
17	XXXX	Display time (overall) 1 <= XXXX <= FFFF FFFF = 65534 min. FFFF = infinite
21	X	Brightness of Text 1 X = 0: Normal X = 1: Overbright
22	X	Brightness of Text 2 X = 0: Normal X=1: Overbright
23	X	Text follows or Controller text X = 0: Text follows X = 0: Programmed text
24	XX	Number of characters in Text 1 (hexadecimal ASCII coded format)
26	XX	Number of characters in Text 2 (hexadecimal ASCII coded format)
28	X.....X or XX	N characters describing Text 1 or programmed text number (see 23)
xx	X.....X or XX	N characters describing Text 2 or programmed text number (see 23)

The structure of the reply sent by the DMS controller to the TOCCM is:

Error Free Case:

Offset	Format	Description
1	sent by the DMS	to the TOCCM Function correctly processed
2	0	No error occurred

Error Occurred Case:

Offset	Format	Description
1	b	Error occurred

Offset	Format	Description
2	X	X = 1 : Unknown function code X = 2 : EEPROM parameter code X = 3 : Reset indicator X = 4 : Syntax error in command X = 5 : Undefined subsign X = 6 : Unknown preprogrammed text X = 7 : Length error in command format X = 8 : Text with non ASCII characters X = E : Time not initialized X = F : CAN board no enabled or fault sensor

2. Status Retrieval. The status retrieval command provides the status of a DMS or it's associated subsign. The structure of the command status retrieval command is:

Offset	Format	Description
1	C	Command function
2	X	Subsign number 0 <= X <= 7

Note: Subsign 0 indicates the full sign.

Offset	Format	Description
1	C	Function correctly processed
2	XXXX	Remaining display time in minutes (e) 0000: Sign blank
6	X	X = 0 : Sign Off X = 1 : Sign loaded X = 2 : Sign loaded in deferred mode X = 3 : Sign lit X = 4 : Sign busy (=lit)
7	X	X = 0 : Normal Operation X = 1 : Loop-back mode X = 2 : Back-up operation X = 3 : Lamp(s) OUT & OFF X = 4 : Lamp(s) OUT & ON X = 5 : No 48 volts X = 6 : Sign Aborted X = 7 : Bad shutter power supply X = 8 : Simulation mode active
8	X	Display from : X = 0 : Central computer X = 1 : Maintenance Terminal X = 2 : Local Control Panel X = 3 : Remote Control Panel
9	X	Day / Night sensor status X = 0 : Normal mode X = 1 : Day mode

Offset	Format	Description
10	X	Overbright sensor status X = 0 : Normal mode X = 1 : Overbright mode
11	X	Day / Night Command X = 0 : Night command X = 1 : Day command
12	X	Overbrightness Command Status X = 0 : Normal command X = 1 : Overbrightness command
13	X	Day / Night Function Status X = 0 : Automatic mode X = 1 : Manual mode
14	X	Overbrightness Function Status X = 0 : Automatic mode X = 1 : Manual mode
15	X	Shutter Service Status X = 0 : No service in progress X = 1 : Service in progress
16	X	Default Display Status X = 0 : No current default display X = 1 : Current default displayed now
17	17	Shutter Power Supply X = 0 : Power 0 X = 1 : Bad power supply
18	X	Local Display Message Active X = 0 : No local display on X <= C : Message number displayed (1-12) X = D : Not used X = E : Not used X = F : Test message displayed

Error Case:

Offset	Format	Description
1	C	Error occurred
2	X	X = 1 : Unknown function code X = 3 : Reset Indicator X = 4 : Syntax error in command X = 5 : Undefined subsign X = 7 : Length error in command format

3. **Lamp Status.** The Lamp Status command requests the status of the 12 lamps controlled by a lamp control module. A lamp control module is capable of driving up to 12 lamps.

In a standard DMS configuration, 6 of these lamps are used as primary lamps, and 6 are associated backup lamps. The structure of the command Lamp status command is:

Offset	Format	Description
1	D	Command function
2	X	Lamp control module number X <= X <= 3

The structure of the reply received from the DMS controller is:

Error Free Case:

Offset	Format	Description
1	D	Function correctly processed
2	X	X = 0 : Test performed X = 1 : Test not performed
3	X	X = 0 : Configuration
4		Analog loop-back X = 0 : With loop-back X = 1 : Without loop-back
5	X	48 volts X = 0 : No 48 volts X = 1 : 48 volts ok
6	XXXXXXXXXXXXX	12 bytes corresponding each to a lamp byte 6 = Lamp 1 Byte 18 = Lamp OUT and OFF For each byte: X = 0 : Lamp OK X = 1 : Lamp OUT and OFF X = 2 : Lamp OUT and ON X = 3 : No significant

Error Occurred Case:

Offset	Format	Description
1	d	Error occurred
2	X	X = 1 : Unknown function code X = 3 : Reset indicator X = 4 : Syntax error in command X = 5 : Undefined subsign X = 7 : Length error in command format

- 4. Day/Night Changeover.** The Day/Night Changeover command activates the Day/Night change over relay. The brightness can be set to either day or night levels. The structure of the command is as follows:

Offset	Format	Description
1	G	Command function
2	X	Change of Day / Night X = 0 Day -> Night X = 1 Night -> Day
3	X	Control X = 0 Automatic Mode X = 1 Forced Mode

The structure of the reply received from the DMS controller is:

Error Free Case:

Offset	Format	Description
1	G	Function correctly processed
2	0	No error occurred

Error Occurred Case:

Offset	Format	Description
1	g	Error occurred
2	X	X = 1 : Unknown function code X = 3 : Reset indicator X = 4 : Syntax error in command X = 7 : Length error in command format X = B : Day/Night change over impossible

- 5. Abort Sign.** The Abort Sign command is sent by the TOCCM to activate the lamp power supply abort relay, thus blanking the sign. The DMS controller should receive any commands sent after an abort command but the commands should not be processed or displayed. A un-abort (an Abort command with the restore option specified) command must be sent by the TOCCM to restore the power to the lamps (and thus the DMS controller should start normal processing again).

The structure of the Abort Sign command is as follows:

Offset	Format	Description
1	H	Command function
2	X	X = 0 48 V cut off X = 1 48 V restored

The structure of the reply received from the controller is:

Error Free Case:

Offset	Format	Description
--------	--------	-------------

Offset	Format	Description
1	H	Function correctly processed
2	0	No error occurred

Error Occurred Case:

Offset	Format	Description
1	h	Error occurred
2	X	X = 1 : Unknown function code X = 3 : Reset indicator X = 4 : Syntax error in command X = 7 : Length error in command format X = C : Abort change over impossible

- 6. Clock/Calendar Read Command.** The Clock/Calendar Read command transmitted by the TOCCM to read the current time and date from the DMS controller's clock/calendar board. The structure of the command is as follows:

Offset	Format	Description
1	L	Command function

The structure of the reply received from the controller is:

Offset	Format	Description
1	L	Command function
2	XX	Seconds (00 <= XX <= 59)
4	XX	Minutes (00 <= XX <= 59)
6	XX	Hours (00 <=XX <= 23) Military Time
8	XX	Day of month (01 <= XX <= 31)
10	XX	Month (1 <= XX <= 12)
12	X	-Day of week (1 <= XX <= 7) CAUTION : Monday = 1
13	X	Initialization X = 0 Not initialized X = 1 Time initialized

Error Occurred Case:

Offset	Format	Description
1	1	Error occurred

Offset	Format	Description
2	X	X = 1 : Unknown function code X = 3 : Rest indicator X = 4 : Syntax error in command X = 7 : Length error in command format X = A : Function not implemented

7. **Clock/Calendar Set Command.** The Clock/Calendar Set command is issued by the TOCCM to initialize the time and date in the DMS controller's clock/calendar board. The structure of the command is as follows:

Offset	Format	Description
1	M	Command function
2	00	Seconds can not set seconds
4	XX	Minutes (01 <= XX <= 59)
6	XX	Hours (00 <= XX <= 23) Military Time
8	XX	Day of month (1 <= XX <= 31)
10	XX	Month (1 <= XX <= 12)
12	X	Date of Week (1 <= X <= 7) CAUTION: Monday 1

The structure of the reply received from the controller is:

Error Free Case:

Offset	Format	Description
1	M	Function correctly processed
2	0	No error occurred

Error Occurred Case:

Offset	Format	Description
1	m	Error occurred
2	X	X = 1 : Unknown function code X = 3 : Reset indicator X = 4 : Syntax error in command X = 7 : Length error in command line X = A : Function not implemented

8. **Overbrightness Setting.** The Overbrightness Setting command is issued by the TOCCM to turn on both the normal and backup lamps simultaneously. This is used to obtain a greater brightness (overbrightness mode). The structure of the command is as follows:

Offset	Format	Description
1	R	Command function
2	X	Change of Normal/Overbright X = 0 Normal Mode X = 1 Overbrightness Mode
3	X	Control X = 0 Automatic Mode X = 1 Forced Mode

The structure of the reply received from the controller is:

Error Free Case:

Offset	Format	Description
1	R	Function correctly processed
2	0	No error occurred

Error Occurred Case:

Offset	Format	Description
1	r	Error occurred
2	x	X = 1 : Unknown function code X = 3 : Reset indicator X = 4 : Syntax error in command X = 7 : Length error in command format

9. **Echo.** The Echo command is issued by the TOCCM to return the message being displayed with all associated parameters to the TOCCM. The structure of the command is as follows:

Offset	Format	Description
1	S	Command function
2	X	Subsign number 0 <= X <= 7

The structure of the reply received from the controller is:

Offset	Format	Description
1	P B Q or D	Last display command sent
2	X	Subsign number
3	X	X = 0 : Deferred display 1 : Immediate display

Offset	Format	Description
4	X	X = 0 : Steady messages 1 : Two alternated messages
5	X	X = 0 : Text 1 steady 1 : Text 1 flashing
6	X	Text 1 flashing time ON 3 <= X <= F (.3 sec <= X <= 1.5 sec)
7	X	Text 1 flashing time OFF 3 <= X <= F(.3 sec <= X <= 1.5 sec)
8	X	X = 0 : Text 2 steady 1 : Text 2 flashing
9	X	Text 2 flashing time ON 3 <= X <= F (.3 sec <= X <= 1.5 sec)
10	X	Text 2 flashing time OFF 3 <= X <= F (.3 sec <= X <= 1.5 sec)
11	XX	Text 1 time ON if alternated 3 <= XX <= FF (.3 <= XX <= 25.5 sec)
13	XX	Blank time between Text 1 and Text 2 0 <= XX <= FF (0 <= XX <= 25.5 sec)
15	XX	Text 2 time ON if alternated 3 <= XX <= FF (.3 <= XX <= 25.5 sec)
17	XXXX	Display time (overall) 1 < XXXX < FFFF FFFE = 65534 min FFFF = infinite
21	X	Brightness of Text 1 X = 0 : Normal X = 1 : Overbright
22	X	Brightness of Text 2 X = 0 : Normal X = 1 : Overbright
23	X	Text follows or Controller est X = @ : Text follows X = 1 : Preprogrammed text
24	XX	Number of characters in Text 1 (hexadecimal ASCII coded format)
26	XX	Number of characters in Text 2 (hexadecimal ASCII coded format)
28	X...X or XX	N characters describing Text 1 or programmed text number (see 23)

Offset	Format	Description
xx	X...X or XX	N characters describing Text 2 or programmed text number

Error Occurred Case:

Offset	Format	Description
1	s	Error occurred
2	X	X = 1 : Unknown function code X = 3 : Reset indicator X = 4 : Syntax error in command X = 5 : Undefined subsign X = 7 : Length error in command format X = D : Subsign off

- 10. Simulation Control.** The simulation command allows the TOCCM to control the simulation control of a controller. When a controller enters simulation mode, if the controller is displaying a message, it blanks the sign. From this point forward, any and all messages to be displayed on the sign will be simulated. The controller will report the messages as being displayed, but the sign will remain blank. The sign status reports if the sign is in simulation mode. When the controller is in simulation mode, the sign will display the current message in the controller, or blank the sign if the controller received a blank sign command.

This command exists so that development efforts can be performed on the TOCCM without presenting information to the field DMS signs. The structure of the command is as follows:

Offset	Format	Description
1	Z	Command function
2	X	Simulation mode X = 0 : Exit simulation mode X = 1 : Lamp and shutter simulation

The structure of the reply received from the controller is:

Error Free Case:

Offset	Format	Description
1	Z	Error occurred
2	0	No error occurred

Error Occurred Case:

Offset	Format	Description
1	z	Error occurred

Offset	Format	Description
2	X	X = 1 : Unknown function code X = 3 : Reset indicator X = 4 : Syntax error in command

G. Error Codes. An error free result of the command is a buffer starting with the same upper case letter as the command issued. If no data is expected from the DMS controller, the response is the upper case letter of the command followed by “0” indicating correct processing.

If an error occurred, the lower case letter of the command is followed by an error code. This indicates that the command has not been executed. The following table lists the possible errors that may occur:

Error Code	Description
1	Unknown function code
2	EEPROM parameter error
3	Reset indicator
4	Syntax error in command
5	undefined subsign
6	Unknown preprogrammed text
7	Length error in command format
8	Text with non ASCII characters
9	Unknown MCL (lamp) module
A	Function not implemented
B	Day/Night change over impossible
C	Abort change over impossible
D	Subsign off
E	Time not initialized
F	CAN board not enabled or faulty sensor

3. CCTV Field Equipment. The following describes the software protocol used to communicate between the TransGuide Operations Center (TOC) and the CCTV Field Equipment. The protocol is based on sequences of ASCII characters transmitted via a serial data connection between the TOC and the Video Cameras.

A. General Command Structure. The communication between the TOC and the CCTV Field Equipment can be one-way in either direction or two-way, depending on the specific command. Commands are sent to the CCTV Field Equipment using ASCII characters and one of the following formats:

1. $\$ \langle CODE \rangle \langle TYPE \rangle [DATA] \langle carriage\ return \rangle \langle line\ feed \rangle$ where each character in the string is OR'ed with 80hex to set the most significant bit.
2. $\langle CODE \rangle [DATA]$

The CCTV Field Equipment is controlled by sending one or more commands terminated by a $\langle carriage\ return \rangle$. The commands are not be executed by the camera until the $\langle carriage\ return \rangle$ is received. After execution, a $\langle carriage\ return \rangle$ is sent back to the TOC to acknowledge completion.

Note: [DATA] represents 1 or more parameters required by the command. Some commands do not require data. No space is needed before the 1st parameter; if two or more parameters are transmitted, the parameters must be separated by a space.

Important Note: In cases where the host does not monitor responding carriage returns from the controller, the host will not know whether a command line has been completed. Though the controller normally can receive new commands while it is processing previous commands, there is an exception when the controller is processing a preset position recall. During a preset recall, all incoming characters are ignored except for the ASCII abort character, $\langle CtrlX \rangle$ (hex 18) which tells the controller to abort the recall. If the host unit does not monitor the controller to see whether a recall is complete, it should send a $\langle CtrlX \rangle$ preceding all command lines. This way, if a recall was in progress, it will be aborted and then the controller will accept the command; if no recall was in progress, $\langle CtrlX \rangle$ will be ignored. The TOC utilizes this paradigm.

B. Command Summary. The following commands are defined in this document.

- Shutter speed
- Auto black balance
- Auto white balance
- Auto white balance select
- Color bars on
- Gain select
- Menu
- DTL select
- IRIS control
- Title number
- Title up (display the title)
- Title down (turn off the title)
- Title set
- Stop/Start Command
- Auto Setup/File
- Manual Integration
- Backlight Compensation
- Color/Monochrome
- Auto Integration
- Auto Focus
- IRIS data

- Analog data
- Enable pan/tilt table
- Disable pan/tilt table
- Turn wiper on
- Turn wiper off
- Turn camera on
- Turn camera off
- Extend lens to 2X
- Retract lens to 1X
- Set all controls to no motion
- Set pan
- Set tilt
- Set zoom
- Set focus
- Abort command
- Move to preset position
- Move to specified pan, tilt, zoom, focus position
- Store the current position into preset
- Store the specified pan, tilt, zoom, focus into preset
- Query camera for it's pan, tilt, zoom, focus position
- Camera titling
- Set sector limit
- Set sector label
- Delete sector data
- Delete all sector data

C. Camera Commands without Data. Camera Commands without data are sent to the CCTV Field Equipment using the following format:

`$<CODE><TYPE><carriage return><line feed>`

where

\$ will prefix each command,

CODE -- Two characters which specify the command code
(i.e. What the command is),

TYPE -- Two characters which specify the type of command,
<carriage return> <linefeed> will terminate each command, and
each ASCII character transmitted will be logical OR'ed with '80' hex before being
sent to the camera by the TOC.

Notes:

- The examples in this document omit the prefix, suffix, and the OR'ing of bits.
- A <carriage return> terminates the set of one or more commands.
- A <carriage return> is returned upon command execution.

- Shutter Speed.** The Shutter Speed command is sent by the TOC to change the shutter speed of the camera. The command is structured using the following data:

Code	Type	Description
01	00	Off
	01	Low
	02	Middle
	03	Fast
	04	Auto Shutter

- Auto Black Balance.** The Auto Black Balance command is sent by the TOC to enable the auto black balance feature of the camera. The command has the following format:

Code	Type
03	01

- Auto White Balance.** The Auto White Balance command is sent by TOC to enable the auto white balance feature of the camera. The command has the following format:

Code	Type
04	01

- Auto White Balance Select.** The Auto White Balance select command is sent by the TOC to change the current settings of the auto black and white balance. The command has the following format:

Code	Type	Description
05	00	Off
	01	A
	02	B

- Color Bars On.** The Color Bars On command is sent by the TOC to display the color bars. The command has the following format:

Code	Type	Description
08	00	Off
	01	On

- Gain Select.** The Gain Select is sent by the TOC to change the gain setting on the camera. The command has the following format:

Code	Type	Description
0A	00	-3 dB
	01	0 dB
	02	+6 dB
	03	+9 dB

Code	Type	Description
	04	+15 dB
	05	+18

7. **DTL Select.** The DTL command is sent by the TOC to change the DTL setting on the camera. The command has the following format:

Code	Type	Description
17	00	off
	01	-3 dB
	02	0 dB
	03	+3 dB

8. **IRIS Select.** The IRIS command is sent by the TOC to change the IRIS setting on the camera. The command has the following format:

Code	Type	Description
1B	00	IRIS cap
	01	(Reserved)
	02	Auto
	03	Auto Adjust
	04	Manual

9. **Title Number.** The Title Number command is sent by the TOC to change the title currently being displayed on the camera. The command has the following format:

Code	Type	Description
1E	00	Page 1
	01	Page 2
	02	Page 3
	03	Page 4
	04	Off

10. **Menu.** The Menu command is sent by the TOC to display the camera's menu of internal commands. The command has the following format:

Code	Type	Description
0D	00	Menu

11. **Menu Up.** The Menu Up command is sent by the TOC to have the camera move its current cursor position up when the camera's internal menu is displayed. The command has the following format:

Code	Type	Description
20	01	Up

This command causes the camera to move its current cursor up one position.

- 12. Menu Down.** Menu Down command is sent by the TOC to have the camera move its current cursor position down when the camera's internal menu is displayed. The command has the following format:

Code	Type	Description
21	01	Down

This command causes the camera to move its current cursor down one position.

- 13. Menu Set.** The Menu Set command is sent by the TOC to inform the camera to set the current selection for the current cursor position. The command has the following format:

Code	Type	Description
22	01	Set

- 14. Stop/Start Command.** The Start/Stop command, used in conjunction with the Title set command, is sent by the TOC to have the camera update the title text. The command has the following format:

Code	Type	Description
2C	00	Stop
	01	Start

- 15. Auto Setup/File.** The Auto Setup/File command is sent by the TOC to return the camera to default conditions. The command has the following format:

- 16. Manual Integration Settings.** The Manual Integration Setting is sent by the TOC to change the integration level of the camera to adjust for low light. The command has the following format:

Code	Type	Description
60	00	Off
	02	1/30
	03	1/15
	04	1/8
	05	1/4

- 17. Back Light Compensation.** The Back Light Compensation command is used to enable/disable Back Light compensation to adjust for a bright background. The command has the following format:

Code	Type	Description
61	00	Disable Compensation
	01	Enable Compensation

- 18. Auto Integration.** The Auto Integration command is used to enable/disable Auto Integration to adjust for a low light. The command has the following format:

Code	Type	Description
62	00	Disable Auto Integration
	01	Enable Auto Integration

19. Auto Focus. The Auto Focus command is used to enable/disable Auto Focus. The command has the following format:

Code	Type	Description
63	00	Disable Auto Focus
	01	Enable Auto Focus

20. Color/Monochrome. The Auto Color/Monochrome command is used to enable/disable Auto Color/Monochrome. The command has the following format:

Code	Type	Description
64	00	Disable Auto Color/Monochrome (Color only)
	01	Enable Auto Color/Monochrome

D. Camera Commands (Requiring Data). Camera Commands requiring data are sent to the CCTV Field Equipment using the following format:

`$(CODE)(TYPE)[DATA](carriage return)(line feed)`

where

- \$ will prefix each command,
- CODE -- Two characters which specify the command code i.e. What the command is),
- TYPE -- Two characters which specify the type of command,
- DATA -- Varies based on command being sent. The format for the data will be further described in the following sections.
- (carriage return) (linefeed) will terminate each command, and
- each ASCII character transmitted will be logical OR'ed with '80' hex before being sent to the camera by the TOC

NOTE: The examples in this document omit the prefix, suffix, and this OR'ing of bits. The command string shall have the following format.

1. IRIS Control. The IRIS control command is issued by the TOC to either open or close the camera IRIS. The format of the command is as follows:

Code	Type	Data	Description
27	04	0000	(open) to 03FF (close)

Note: First send 1B04, then 270403FF to go to manual mode and close iris.

2. Analog. The Analog command is issued by the TOC to change various gain settings. The format of the command is as follows:

Code	Type	Data	Description
------	------	------	-------------

Code	Type	Data	Description
28	00	0000	(open) to 03FF (close) Red Gain
	01	0000	(open) to 03FF (close) Blue Gain
	02	0000	(open) to 03FF (close) Green Gain
	03	0000	(open) to 03FF (close) M Ped
	04	0000	(open) to 03FF (close) BPed

E. Pan/Tilt/Zoom and Titling Commands. The commands defined in this section have the following format:

<CODE>[DATA]

Where

- Each command consists of either one or two letters,
- the commands are CASE SENSITIVE,
- any numerical parameters needed for the command are:
 - specified by the string of ASCII digits representing the decimal value. For example, a value of 26 is sent as a '2' followed by a '6', (i.e. hex 32, hex 36).
 - Where a command has more than one parameter, the parameters shall be separated by a space.
 - The numerical parameters follow the command letter(s). A space may be used between the command and the first parameter, but it is not required.
- To complete the command line, a <carriage return> is placed at the end of the ASCII string.

After the command line has been completed by the unit, a <carriage return> will be sent back to the host to acknowledge completion.

IMPORTANT NOTE: The commands in this section DO NOT 1) start with the '\$' character, 2) end with a <line feed>, 3) nor is each ASCII character logical OR'ed with '80' hex.

1. Enable Pan/Tilt Table. The Enable Pan/Tilt Table command is issued by the TOC to enable the pan/tilt table. The structure of the command is as follows:

Code	Data
M	none

- a. Pan/Tilt Table.** Camera motion is controlled by four voltages corresponding to the velocity of pan, tilt, zoom, and focus which are set using the PTZF commands described in the table below. The commands have a single numerical parameter determining the voltage to which the output is set. The value of the parameter is in the range [0, 32767]. 16383 is the value at which no motion occurs. As the value moves away from 16383, the speed of motion increases. The direction of motion is determined by whether the value is greater or less than 16383 as follows:

Command	Less Than (<) 16383	Greater Than (>) 16383
P – Pan	Right	Left
T – Tilt	Down	Up
Z – Zoom	In (Tele)	Out (Wide)
F – Focus	Near	Far

2. **Disable Pan/Tilt.** The Disable Pan/Tilt command is issued by the TOC to disable the pan/tilt table. The structure of the command is as follows:

Code	Data
m	none

3. **Turn Wiper On.** The Turn Wiper On command is issued by the TOC to turn the wiper (located on the outside of the camera housing) on. The structure of the command is as follows:

Code	Data
W	none

4. **Turn Wiper Off.** The Turn Wiper Off command is issued by the TOC to turn the wiper (located on the outside of the camera housing) off. The structure of the command is as follows:

Code	Data
w	none

5. **Turn Camera On.** The Turn Camera On command is issued by the TOC to turn the camera on. The structure of the command is as follows:

Code	Data
V	none

This command shall be acknowledged by a <carriage return>.

6. **Turn Camera Off.** The Turn Camera Off command is issued by the TOC to turn the camera off. The structure of the command is as follows:

Code	Data
v	none

This command shall be acknowledged by a <carriage return>, the camera shall be reset even if Power On/Off is not supported by the camera and the camera IRIS shall be closed even if Power On/Off is not supported by the camera.

7. **Extend Lens to 2X.** The Extend Lens To 2X command is issued by the TOC to engage the 2X lens extender. The structure of the command is as follows:

Code	Data
------	------

Code	Data
X	none

8. **Retract Lens TO 1X.** The Retract Lens to 1X command is issued by the TOC to disengage the 2X lens extender. The structure of the command is as follows:

Code	Data
x	none

9. **Set All Controls To No Motion.** The Set All Controls To No Motion command is issued by the TOC to command the camera to stop (NO MOTION). This should not be confused with moving the camera to a home position. The structure of the command is as follows:

Code	Data
R	none

10. **Abort Command.** The Abort command is issued by the TOC to abort the command currently being processed by the camera. The structure of the command is as follows:

Code	Data
CtrlX	none

Note that if no command is in progress, the abort command is ignored.

NOTE: When received, all commands will be removed from the queue and all motion will stop. Even if no commands are in the queue, the Abort command is acknowledged with a <carriage return>.

11. **Move to Preset Position.** The Move To Preset Position command is sent by the TOC to instruct the camera to move to a predefined preset position. The structure of the command is as follows:

Code	Data
C	n where: $0 \leq n \leq 63$

12. **Move To Specified Pan, Tilt, Zoom, Focus Position.** The Move To Specified Pan, Tilt, Zoom, Focus Position command is sent by the TOC to instruct the camera to move to a specified condition. The structure of the command is as follows:

Code	Data
CX	<p> <t> <z> <f> Where <p> <t> <z> <f> are described in Section 3.6.

13. **Store the Current Position Into Preset.** The Store the Current Position Into Preset command is sent by the TOC to instruct the camera to store the current position in the specified preset position. The structure of the command is as follows:

Code	Data
E	n where: 0 <= n <= 63

- 14. Store Specified Pan, Tilt, Zoom, Focus Into Preset.** The Store Specified Pan, Tilt, Zoom, Into Preset command is sent by the TOC to instruct the camera to store the specified settings into the specified preset. The structure of the command is as follows:

Code	Data
EX	n P T Z F

where:

0 <= n <= 63
 <p> <t> <z> <f> are described in Section 3.6.

- 15. Query Camera for its Pan, Tilt, Zoom, Focus Position.** The Query Camera for its Pan, Tilt, Zoom, Focus Position command is sent by the TOC to instruct the camera to report its current Pan, Tilt, Zoom, and Focus position. The structure of the command is as follows:

Code	Data
ptzf	none

The camera will respond with the following data:

<p> <t> <z> <f> : Where <p> <t> <z> <f> are described in Section 3.6.

- 16. Camera Titling.** The Camera Titling command is sent to define the title for the camera. The title is included in the image transmitted by the camera.

Code	Data
T	<T B> <1 2> <Title Text>

Where:

<T|B> specifies the top or bottom position for the title.
 <1|2> specifies line 1 or line 2 of the title.
 <Title Text> is up to 20 characters of text.

- 17. Set Sector Limit.** The Set Sector Limit command is sent to define the sector limit for a specified sector ID of the camera.

Code	Data
S<L R>	n

Where:

<L|R> specifies the left or right limit for the sector.

<L|R> specifies the left or right limit for the sector.
 0 <= n <= 15, sector ID.

18. Set Sector Label. The Set Sector Label command is sent to define the sector label for a specified sector ID of the camera. The label is included in the image transmitted by the camera.

Code	Data
ST	<i>n</i> <Label Text>

Where:

0 <= n <= 15, sector ID.
 <Label Text> is up to 24 characters of text.

19. Delete Sector Data. The Delete Sector Data command is sent to delete the sector data, i.e. sector limits and sector label, for a specified sector ID of the camera.

Code	Data
SD	<i>n</i>

Where:

0 <= n <= 15, sector ID.

20. Delete All Sector Data. The Delete All Sector Data command is sent to delete all the sector data, i.e. sector limits and sector labels, for all the sector IDs of the camera.

Code	Data
SX	none

F. PTZF Voltages. Pan, Tilt, Zoom and Focus voltages are in the range [0, 4095] where 0 typically represents the center position of the full range of motion of a given function. The voltages are actually 12 bit two's complement values, so in essence, the range is [-2048, 2047] which when viewed as unsigned numbers progress from 2048 to 4095, then from 0 to 2047. The following table defines the voltages for Pan, Tilt, Zoom and Focus.

	Position	Voltage
Pan	0 degrees (left)	2400
	174.9 degrees (center)	4095
	175 degrees (center)	0
	360 degrees (right)	1607
Tilt	-90 degrees (down)	2250
	-30.1 degrees (center)	4095
	-30 degrees (center)	0
	40 degrees (up)	1855
Zoom	0% (out/wide)	1825

	50%	0
	50.1%	4095
	100% (full optical zoom)	2600
	2x digital zoom	2400
	4x digital zoom	2200
Focus	Focus In	2500
	Center	4095
	Center	0
	Focus Out	1820

4. Lane Control System. The following describes the software protocol used to communicate between the TransGuide Operations Control Center Mainframe (TOCCM) and the Lane Control Signals (LCS) controller. The protocol is based on sequences of ASCII characters transmitted via a serial data connection between the TOCCM and the LCS Controller.

A. General Command Structure. Data to be exchanged between the TOCCM and the LCS controller is framed into blocks. Each block is comprised of a header, a data body, and end of block information. The header always starts with “SOH” (Star of Header) followed by the address of the controller. The end of the header is a “STX” (Start of Text) to indicate data follows. The data is placed after this STX character, and before the ETX character, which marks the end of the data body. Following the ETX character is a Block Check Character (BCC). Data transmitted to the controller is framed between two “NUL” characters used for synchronization. Data transmitted from the controller is framed between a leading “NUL” character and a trailing “SUB” character.

The following diagram is what a single transmission block looks like:

NUL SOH ADDR STX DATA ETX BCC NUL

Where:

NUL -- Synchronization character (Hex 00)

SOH -- The ASCII Start-of-Header character (Hex 01)

ADDR -- Address of the controller determined as :

A controller address is comprised of two parts. The first part of the address is the physical address of the controller. It is value between 0 and 255.

The second part of the address is the logical address of the controller. It is usually 01, unless the controller is in configuration mode, then the address is 00.

The controller address is sent over the line as five ASCII characters.

STX --The ASCII Start-of-Text character (Hex 02), the STX marks the end of the header and the start of the data

DATA -- Data for to be exchanged, its length, format, and contents are dependent on the command type. The general format of the data area is:

<Name><parameter 1><parameter 2>...<parameter n>

Where:

<Name> --- identifies the command. It is formed using only upper case letters, 1 to 8 characters in length.

<Parameters> - are character blocks constructed with:

A mnemonic which is the parameter identifier (using 1 to 8 alphanumeric characters)

the character '='

a set of alphanumeric characters which constitutes the parameter argument.

The parameter separators are formed with one or more space characters (20h). The number parameters used can vary, and is not limited. Several parameters can be used in the same command multiple times. Inside a parameter, no space character are allowed (specifically between the mnemonic and "=" sign or between "=" sign and the arguments). When text is entered, double quotes "" are used to avoid any confusion. The relative position of the different parameters is generally not important.

A response without error has the same structure as the command.

ETX -- The ASCII End-of-Text character (Hex 03)

BCC -- Block check character (to ensure data integrity). The BCC is computed as the arithmetic sum of all the block characters, up to and including the ETX character. When transmitting using a seven-bit data word, only the 7 least significant bits are transmitted.

For the following command:

NUL-SOH-00101-STX-E-ETX-BCC-NUL

the BCC would be:

NUL = 00H

OH = 01H

0 = 30H

0 = 30H

1 = 31H

0 = 30H

1 = 31H

STX = 02H

"E" = 45H

ETX = 03H

====
13DH

$$\text{BCC} = (13\text{DH}).\text{AND}.(7\text{FH}) = 3\text{DH}$$

1. **Communication Termination.** The TOCCM terminates communication with the LCS controller by using an “EOT” (Hex 04) sequence. This sequence signals the controller to be ready to communicate with the computer. The sequence does not include a BCC and comprises only of an “EOT” character framed between 2 “NUL” characters. An example synchronization character string would be:

NUL-EOT-NUL

2. **LCS Controller Modes.** The LCS controller does not synchronously send data to the TOCCM, rather, the LCS controller communicates data in one of two fashions:

- * A “SELECTING” mode in which the TOCCM requests the LCS controller to receive data. The following command sequence is sent to place the LCS controller in SELECTING mode:

NUL-SOH-ADDR-SEL-NUL

- * A “POLLING” mode in which the TOCCM requests the LCS controller to send data to the TOCCM. The following command sequences sent to place the LCS controller in POLLING mode:

NUL-SOH-ADDR-POLL-NUL

Note that there are no BCC characters attached to the above sequences.

3. **Command Acknowledge.** Once a sequence has been sent, either from the TOCCM or the LCS controller, the listener always acknowledges the reception of data. If the reception was correctly received, an “ACK” (Hex 06) is sent over the line. If the reception was garbled or lost, a “NAK” (Hex 15) is sent over the line. The appropriated character is framed between 2 synchronization characters as follows:

NUL-ACK-NUL to acknowledge command successfully received
NUL-NAK-NUL to acknowledge command not successfully received

- B. **Command Summary.** In general each command starts with a capital letter (its command code), followed by various parameters to form a precise syntax. All commands are embedded between control characters according to the communication protocol discussed in the previous section.

The following commands will be sent from the TOCCM to the LCS controller to control the LCS:

The following commands will be sent from the TOCCM to the LCS controller to control the LCS:

- * Activation Command

* Status Request

The details of each of these commands will be further discussed in the following sections.

C. Command Details. The following sections provide the details for each command that is sent between the TOCCM and the LCS controller.

1. LCS Commands Sent From The TOCCM to LCS Controller. The following commands are sent from the TOCCM to the LCS Controller via the communication line.

- a. Activation Command.** The ANM (Activate Numeric Mode) command is issued by the TOCCM to activate a message on a sign. This command defines the display parameters for one or several Display Units. This command defines which symbols to be displayed specifying the preprogrammed page numbers. The response to the ANM command from the LCS controller is:

ANM

The different parameters for the command are:

ID : The access to this command is protected. This parameter is required

ID=idf/pwd

where:

ID ---- is the parameter identifier

= ----- is a separator

idf --- is a 1 to 8 character string (origin identifier)

/ ----- is a separator and is required whether or not a password is used

pwd --- is a 0 to 8 character string (password)

BC: This parameter defines which type of brightness the controller will use (global for all the Display Units). The syntax is:

BC=A (Automatic)

or

BC=N (Night)

or

BC=D (Day)

In the case where BC=A, the result of the command corresponds to the value of the photocell status. If the BC parameter is not used, the current display brightness value is not modified.

AU: This parameter specifies the Display Unit. This parameter may be used more than once in the same ANM command. In this case, each AU parameter effects all the succeeding parameters up to the next AU parameter.

DSP: This parameter defines the display with numerical mode. The syntax of this command is:

DSP-xxx

where:

xxx is a 1 to 3 numerical character string which represents a preprogrammed message number.

LAMPPWR: This parameter controls the power going to the lamp transformer and thus the lamps for the sign. This is a manual way via a software call to turn off power to the lamps. The syntax is:

LAMPPWR=ON Supply power to the lamps.

Or

LAMPPWR=OFF Turn off power to the lamps.

SIMU: This parameter controls the controller's simulation function. When the controller enters simulation mode, all Display Units are turned off. The controller continues to report the status of the Display Units just as if they were lit. The syntax is:

SIMU=0 No simulation

or

SIMU=1 Lamp simulation

Examples:

Command: ANM ID-ATMS/sigma BC=A AU=1 DSP=001
AU=2 DSP=001 AU=3 DSP=005 AU=4 DSP=006

Response: ANM

Command: ANM ID=ATMS/sigma LAMPPWR=ON

Response: ANM

Command: ANM ID=ATMS/sigma SIMU=1

Response: ANM

- b. Status Request.** The Status Request command causes the LCS controller to send the status details of Display Units requested to the TOCCM. Utilizing this command, the TOCCM can request various parameters status from the LCS controller. The different parameters include:

ID: The access to this command is protected. This parameter is required.

ID=idf/pwd

where:

ID ---- is the parameter identifier
= ----- is a separator
idf --- is a 1 to 8 character string (origin identifier)
/ ----- is a separator and is required whether or not a password is used
pwd --- is a 0 to 8 character string (password)

BSC: Request that the current level of the brightness status be returned.
The syntax is:

BSC=?

SIMU: Request that the current status of simulation mode function be returned. The syntax is:

SIMU=?

AU: Request the status of a specified AU when used in conjunction with the DSP and LMP parameters. The syntax is:

AU=?

DSP: Request that the current symbol being displayed, or 0 to indicate the sign is blank, be returned. The syntax is:

DSP=?

LMP: Request the current lamps out of service for each symbol for the specified AU be returned. According to the parameters which are present in the command, the following parameters are returned.

BCS: Reports the type of control and the current brightness level for the sign. The syntax is:

BCS=m/v

where:

m is the type of control. (A is for Automatic and M is for Manual) '/'
is a separator

v is the brightness level. (N is for Night and D is for Day)

SIMU: Reports the controller current simulation mode. The syntax is:

SIMU=0
(No simulation mode review)

or

SIMU=1
(Simulation mode active)

AU: Report the Display Unit. The syntax is:

AU=n

where:

n is a Display Unit number

DSP: Reports what symbol is being displayed. The syntax is:

DSP=n

where:

n is the preprogrammed symbol number.

IMP: Reports the lamp which are out of service for the Display Unit and symbol (DSP). The syntax is:

LMP=lamp 1,lamp 2,...,lamp n

or

LMP=OK

Examples:

Command: ST ID=ATMS/sigma BCS? SIMU=? AU=1 LMP=? AU=2
LMP=?

Response: ST ID=ATMS/sigma BCS=A/D SIMU=0 Au=1 DSP=1
LMP=1,2 AU=2 DSP=2 LMP=OK

Command: ST ID=ATMS/sigma AU=1 DSP=? LMP=?

Response: ST ID=ATMS/sigma AU=1 DSP=3 LMP=8

D. Error Codes. If the command cannot be executed, the LCS should send the following response to the TOCCM:

<Name><error code>:<error location>

where:

<Name> is the command name in lower case letters

<error code> is a 1 to 5 numerical character string which defines the error type encountered

:

character is a separator

<error location> shows the character number (calculated from the first character of the name command) where the error was detected.

The following is a list of error codes that the LCS should transmit:

- 1001 - Command name too long (> 8 characters)
- 1002 - Parameter name too long (> 8 characters)
- 1003 - Parameter argument too long
- 1004 - Unknown command
- 1005 - Command not implemented
- 1006 - ID name too long (> 8 characters)
- 1007 - ID name too short (no name provided)
- 1008 - ID password too long (> 8 characters)
- 1009 - Invalid name/password
- 1010 - Required ID parameter not supplied
- 1011 - Access denied
- 1012 - ID name unknown
- 1013 - Invalid ID number
- 1014 - Unknown AU number
- 1015 - Undefined AU number
- 1016 - Number of argument is incorrect
- 1017 - Value out of range
- 1018 - Too many characters
- 1019 - Too many pages
- 1020 - Required DSP parameter not supplied
- 1021 - Argument length incorrect
- 1022 - Wrong parameter name
- 1023 - Invalid argument

5. Local Control Unit. The following describes the software protocol used to communicate between the TransGuide Operations Control Center Mainframe (TOCCM) and the Local Control Units (LCUs). The TOCCM executes a piece of software known as the Local Control Unit Master (LCUM) which communicates to the LCUs installed remotely in the field. The protocol is based on sequences of ASCII data transmitted via a serial data connection between the TOCCM and the LCUs.

A. General Command Structure. The LCUM and LCUs communicate via fixed format messages containing both ASCII and binary formats. These messages have the following generic format:

SOH ID TYPE DATA LRC ETX

Where:

SOH -- The ASCII Start-of-Header character (Hex 01)

ID --- Five characters long field which defines the LCU that the message is addressed to or sent from. Each LCU will have a simple name of the form Unnnn, where nnnn is the decimal representation of a 16 bit number that the LCU considers its name. The name U0000 is reserved for use in the Power Up message.

TYPE -- One character and defines the type of message (details provided in the command detail section).

DATA --- This field may be N/A, and its length, format, and contents are dependent on the message type (details provided in the command detail section).

LRC --- One character longitudinal redundancy check field. The LRC is determined by performing a modulo-256 sum of the eight data bits in all preceding characters in the message (including the SOH).

ETX --- The ASCII End-of-Text character (Hex 03)

B. Command Summary. The following messages will be sent from the LCUM to the LCU:

- * Download Message
- * Poll Message
- * Run Diagnostics Message
- * Reset Message

The following messages will be sent from the LCU to the LCUM:

- * Power Up Message
- * Poll Response (Data) Message
- * Diagnostic Results Message

The details of each of these messages will be further discussed in the following sections.

C. Command Details. The following sections provide the details for each message that is sent between the LCUM and the LCUs.

1. LCUM to LCU Messages. The following messages are sent from the LCUM to the LCU. The LCUM is a software module executing on the TOCCM and transmitting the following messages to each of the LCUs configured into the TransGuide network.

- a. Download Message.** When the LCUM receives the LCU's power up message, or if the LCUM determines that the configuration of the LCU has changed (including device failures), the LCUM will send a download message to the LCU. This message contains the LCU's ID and the configuration of the LCU's 24 input lines (non-trap device, upstream & matching device, downstream & matching device).

The ID, TYPE and DATA areas of the message are structured as follows:

ID: "Unnnn" (LCU specific)
TYPE:"L" (Hex 4B)
DATA: :NAME:LA:LB:LC:....:LX:

Where:

NAME: A five character ID, in the same format as the ID field, to be used by the LCU in its messages to the LCUM.

Lx: A two character field that represents the type of each of the 24 lines, in one of five formats: “NT”, “Ux”, “Dx”, or “FL”, or “XX”, where:

“NT” (Hex 4D54) is a non-trap device line. “Ux” (Hex 55xx) is the upstream line of a pair, whose downstream partner is line x, whose values range from “A” (Hex 41) to “X” (Hex 58).

“Dx” (Hex 44x) is the downstream line of a pair, whose upstream partner is line x, whose values range from “A” (Hex 41) to “X” (Hex 58).

“FL” (Hex 464B) is a failed non-trap, upstream, and downstream line.

Note: If an upstream or downstream line is marked as failed, the partner line will be marked as “NT”.

“XX” (Hex 5858) is a line that is currently unused.

Example:

```
<SOH>U0001LU0001UBDAUDDCUFDEUHDGUJDIULDKUN  
DMUPDOFLNTUTDSNTNTNTNT<LRC><ET>
```

This LCU contains 10 trap pairs on lines 1-20 (with a failure on line 17, forcing line 18 to Non-Trap) and four non-trap devices on lines 21 - 24.

Example:

```
<SOH>U0001LU0001UKULUMUNUOUPUQURUSUTDADBDC  
DDDEDFDGDHDUDHBTBTXXXX<LRC><ETX>
```

This LCU contains 10 trap pairs on lines 1-20, but paired as (1 & 11), (2 & 12), (3 & 13), etc., two non-trap devices on lines 21 and 22, and lines 23 and 24 are unused.

Note that the overall message length is 62 characters long.

- b. Poll Message.** The LCUM will poll each LCU at regular intervals (this interval is under software control on the TOCCM and is nominally set at 20 seconds). The interval can be software adjusted within a range of 10 to 60 seconds.

The ID, TYPE, and DATA areas of the message are structured as follows:

ID: “Unnnn” (LU specific)

TYPE: “P” (Hex 50)

|DATA: :SERIAL:

Where:

SERIAL: A 16-bit cyclical serial number, identifying the specific poll for tracking.

Example: <SOH>U0001P<xy><LRC><ETX>

Note that the overall message length in 11 characters long.

- c. **Run Diagnostics Message.** The LCUM can request the LCU to run one or more of its set of diagnostics. The ID, TYPE and DATA areas of the message are structured as follows:

ID: "Unnnn" (LCU specific)
TYPE: "R" (Hex 52)
DATA: :TESTS:

Where:

TESTS:

A 16-bit mask, where a set bit indicates the corresponding diagnostic should be run.

Example: <SOH>U0001R<<0110000000000000>><LRC><ETX>

This example requests the LCU to run two diagnostics.

Note that the overall message length is 11 characters long.

- d. **Reset Message.** When error conditions are detected on a loop device, the LCUM can request the LCU to reset the line. The ID, TYPE and DATA areas of the message are structured as follows:

ID: "Unnnn" (LCU specific)
TYPE: "S" (LCU specific)
DATA: :LINE:

Where:

LINE: A one- character field that represents the line to be reset. Values from "A" (Hex 41) to "X" (Hex 58), the same line identification used in the Download Message.

Example: <SOH>U0001SB<LRC><ETX>

This example requests a reset on the second line.

Note that the overall message length is 10 characters long.

2. LCU to LCUM Messages.

The following messages are sent from the LCUs to the LCUM.

- a. **Power Up Message.** The Power Up message is sent by the LCU when it powers up to inform the LCUM that the LCU needs to be downloaded. The message is sent in response to a Poll Messages until the LCU receives a Download Message.

The ID, TYPE and DATA areas of the message are structured as follows:

ID: "U0000" (Hex 5530303030)
TYPE: "U" (Hex 55)

DATA: LCU name, a 16 bit binary number. The first 12 bits are latched for each LCU, with the last four bits being set from a flywheel on the LCU case. The ASCII decimal version of this number shall be used in the ID field of all further messages.

Example: <SOH>U0000U<xx><LRC><ETX>

Note that the overall message length is 11 characters long.

- b. Poll Response (Data) Message.** The LCU shall respond to each poll with a Data message (unless a Run Diagnostic message has been received, in which case the poll response is the Diagnostic Results message). The serial number field of the Data message will be transferred from the Poll message being answered.

The ID, TYPE and DATA areas of the message are structured as follows:

ID: "Unnnn" (LCU specific)
TYPE: "D" (Hex 44)
DATA: :SERIAL"DELTAT:CA:CB:CC:...CX:

Where:

SERIAL: A 16 bit cyclical serial number, taken from the received Poll Message.

DELTAT: A 32 bit integer, representing the time the LCU has been accumulating the counts, in milliseconds.

Cx: A field containing two 32 bit subfields. The format of the field depends on the configuration of the corresponding line from the download message. Lines configured as "NT" or "Ux" contain "vvvvoooo". Lines configured as "Dx" contain "tttsssss". Lines configured as "FL" contain "FAILFAIL". Lines configured as "XX" contain "XXXXXXXXXX". If the LCU detected a problem with a line or resent the line, the field will not contain data but will contain a flag and status code, "nnnncccc", where:

vvvv is the 32-bit integer count of vehicles for the line or pair.

oooo is the 32-bit integer count of total time, in milliseconds, that the device was occupied for the line or pair.

tttt is the 32-bit integer count of vehicles that contributed to the speed time count.

ssss is the 32-bit integer count of total elapsed time between the pair of devices for the pair.

FAILFAIL (hex 4641494B4641494B) is filler for failed lines.

XXXXXXXXXX (Hex 5858585858585858) is filler for unused lines.

nnnn is a 32-bit flag, set to all ones (Hex FFFFFFFF) marking the field as status instead of data.

cccc is a 32-bit field of status codes. The list of possible code values is provided in Subarticle 5.4 of this document.

Example:

```
<SOH>U0001D<xy><time><vvva>000a<ttdb>  
<sssb><vvvc><oooc><ttdt><sssd><vvve><oooe>  
<ttdf><sssf><vvvg>>000g<ttdh><sssh><vvvi>  
<oooi><ttdj><sssj><vvvk><ookk><ttdl><sssl>  
<vvvm><oomm><ttdn><sssn><vvvo><oooo><ttdp>  
<sssp><FAILFAIL><vvvr><oorr><vvvs><ooos>  
<ttdt><ssst><vvvu><ooou><vvvv><ooov><vvvw>  
<ooow><vvvx><ooox><LRC><ETX>
```

This example uses the configuration from the first download example and matching the Poll Message example.

Example:

```
<SOH><U0001D<xy><time><vvva><000a> <vvvb><000b>  
<vvvc><oooc><vvvd><000d><vvve><oooe><vvvf>  
<ooof><vvvg><000g><vvvh><oooh><vvvi><oooi>  
<vvvj><oooj><ttdk><sssk><ttdl><sssl><nnnm>  
<cccm><ttdn><sssn><ttdo><ssso><ttdp><sssp>  
<ttdq><sssq><ttdt><sssr><ttds><ssss><ttdt>  
<ssst><vvvu><ooou><vvvv><ooov>  
XXXXXXXXXXXXXXXXXXXX<LRC><ETX>
```

This example uses the configuration from the second download example, matching the Poll Message example, but with a status code on line M.

Note that the overall message length is 207 characters long.

- c. **Diagnostic Results Message.** If the LCU receives a Run Diagnostics message, the LCU shall run the specified self-diagnostic tests and report the results with the Diagnostic Results message in response to the next Poll Message. The LCU shall respond to each poll with a Data Message. The serial number field of the Results message will be transferred from the Poll message being answered.

The ID, TYPE and Data areas of the message are structured as follows:

ID: "Unnnn" (LCU specific)
TYPE: "G" (Hex 47)
DATA: :SERIAL:R1:R2:R3:....:R16:

Where:

SERIAL: A 16-bit cyclical serial number, taken from the received Poll Message.

Rn: A field containing two 32-bit subfields, representing the results of the corresponding diagnostic. Fields for diagnostics that were not run should be cleared to binary 0.

Example:

```
<SOH><U0001G<xy><000a><000a><rrrb><rrrb><rrrc><rrrc>
<000d><000d><000e><000e><000f><000f><000g><000g>
<000h><000h><000i><000i><000j><000j><000k><000k>
<000l><000l><000m><000m><000n><000n><000o><000o>
<000p><000p><LRC><ETX>
```

Note that this example matches the poll message example previously provided.

Note that the overall message length is 107 characters long.

6. **Radar Vehicle Sensing Device.** The following describes the software protocol used to communicate between the TransGuide Operations Center (TOC) and the Radar Vehicle Sensing Devices if the devices are not connected to Local Control Units via the use of Dual Loop emulation cards. The protocol is based on sequences of ASCII characters transmitted via a serial data connection between the TOC and the devices.

- A. **General Command Structure.** The protocol defines a set of messages using ASCII characters. The ASCII code assigns letters, numbers, punctuation marks, and other common characters to the decimal numbers 0 to 127.

ASCII Codes (Decimal) for Select Characters

Character	Line Feed				Carriage Return ('/r')				Space				'~'	
Code	10				13				32				126	
Character	'0'	'1'	'2'	'3'	'4'	'5'	'6'	'7'	'8'	'9'				
Code	48	49	50	51	52	53	54	55	56	57				
Character	'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'	'M'	
Code	65	66	67	68	69	70	71	72	73	74	75	76	77	
Character	'N'	'O'	'P'	'Q'	'R'	'S'	'T'	'U'	'V'	'W'	'X'	'Y'	'Z'	
Code	78	79	80	81	82	83	84	85	86	87	88	89	90	
Character	'a'	'b'	'c'	'd'	'e'	'f'	'g'	'h'	'i'	'j'	'k'	'l'	'm'	
Code	97	98	99	100	101	102	103	104	105	106	107	108	109	
Character	'n'	'o'	'p'	'q'	'r'	's'	't'	'u'	'v'	'w'	'x'	'y'	'z'	
Code	110	111	112	113	114	115	116	117	118	119	120	121	122	

For example, the character ‘0’ is assigned the decimal number 48. Each message of the protocol consists of a string of ASCII characters. For example, the 3-character string “XA\r” is sent by an application to request the next event data. (The “\r” character is used here and by some programming languages to represent an ASCII “carriage return”. In the ASCII code, a “carriage return” is assigned the decimal number 13.)

When using a polling communication paradigm, the messages can be divided into two groups: requests and responses. Each request-response pair shares the same header substring. For example, both the event data request and response begin with the substring “XA”. The header is at the beginning of each message.

The header is followed by the payload and footer as diagrammed below for the response message: “XA01CB3DC5100AF00370~\r\r”.

Format of Example Message

	Header	Payload	Footer	
			Checksum	Terminator
Example	“XA”	“01CB3DC5100AF00370”		“~\r\r”

The payload is the data portion of the message. The footer is the used to validate and terminate the message. Validation is performed using a checksum on critical information within a message. Some messages (like the “XA” response) have no checksum. However, when used, the checksum is a 4-character hexadecimal string formulated by adding the numerical ASCII codes of all the characters in a critical substring of the message. As an example, if a checksum was calculated on the payload substring above then the checksum would be determined in the following manner:

$$\begin{aligned}
 \text{Checksum} &= '0' \ '1' \ 'C' \ 'B' \ '3' \ 'D' \ 'C' \ '5' \ '1' \ '0' \ '0' \ 'A' \ 'F' \ '0' \ '0' \ '3' \ '7' \ '0' \\
 &= 48 + 49 + 67 + 66 + 51 + 68 + 67 + 53 + 49 + 48 + 48 + 65 + 70 + 48 + 48 + 51 + 55 + 48 \\
 &= 999 \quad (\text{Decimal}) \\
 &= 3E7 \quad (\text{Hexadecimal}) \\
 &= \text{“03E7”} \quad (\text{4-character hexadecimal string})
 \end{aligned}$$

Termination of a message is indicated by a terminator substring. For request messages, the terminator substring is “\r”. For response messages, the terminator substring is a “~\r\r”. The device shall return the terminator substring string, however, some devices like an internal CDPD modem will strip off the “~\r” and so only a “\r” will be observed by the receiving application.

The following list of messages is supported. The third column indicates which messages use a checksum.

Message Description	Header	Checksum in Footer
Get Time Interval Data	“XD”	Yes, in Response Only
Get Presence Data	“X1”	No
Get Event Data	“XA”	No
Get Time	“SB”	No

Get Time Interval	“SJS00008E0008”	Yes, in Response Only
Get Baud Rate	“SJS0000970004”	Yes, in Response Only
Get Classification Lengths	“SJS0200000028”	Yes, in Response Only
Set Time	“S4”	No
Set Time Interval	“SKS00008E0008”	Yes, in Request Only
Set Baud Rate	“SKS0000970004”	Yes, in Request Only
Set Classification Lengths	“SKS0200000028”	Yes, in Request Only

B. Retrieving Time Interval Data. Store volume, average speed, occupancy, and vehicle classification statistics for each lane within the device based on a user-configured time-interval, and request this information using the message “XD\r”. The “XD\r” request message will retrieve the most recently generated time interval data packet.

In order to retrieve time interval traffic data previously generated on the device, the “XD” header of a request must be followed by a 4-character index substring. For example, if time interval data is being generated every 5 minutes and the time is now 12:07pm, then sending an “XD0002\r” request will retrieve the traffic data generated at 12:00pm. Furthermore, the traffic data generated at 12:05pm can be retrieved by sending any of the following requests: “XD\r”, “XD0000\r”, or “XD0001\r”.

The time interval for traffic data aggregation can be anything from 5 seconds to 1 month. The time interval is specified by an 8-character substring that contains a hexadecimal number representing the number of seconds in the interval.

The time interval is requested using the “SJS00008E0008\r” command. If the time interval is 1 hour, the response will be “SJ00000E100196~\r\r” (See figure below). The time interval substring is comprised of the first 8-characters of the response following the “SJ”. For the given example, the time interval substring “00000E10” corresponds to 3600 seconds (1 hour) when converted to decimal. A 4-character checksum is appended to the time interval substring. The checksum is calculated on the characters of the time interval substring.

Format of Get Time Interval Response Message

	Header	Payload	Footer	
		Time Interval	Checksum	Terminator
Length	13	8	4	3
Indices	1-13	14-21	22-25	26-28
Example	“SJS00008E0008”	“00000E10”	“0196”	“~\r\r”
Value		1 hour		

To set the time interval, the time interval substring should first be formulated. The four-character checksum is then calculated. In this case, the checksum is calculated starting with the “S” following the “SK” at the beginning of the message. So for the example in the figure below the checksum is calculated on the substring “S00008E00080000001E”. In this example the value of the time interval when converted to decimal is 30 seconds.

Format of Set Time Interval Request Message

	Header	Payload	Footer	
		Time Interval	Checksum	Terminator
Length	13	8	4	3
Indices	1-13	14-21	22-25	26-28
Example	“SKS00008E0008”	“0000001E”	“03EE”	“~\r\r”
Value		30 seconds		

In the event of a success, the response will be “SKSuccess~\r\r”. In the event of a failure, the response will be “SKFailure~\r\r”.

The device must be capable of storing information in flash (non-volatile) data backup which can buffer up to 2480 intervals.

A successful response to a time interval data request will be as follows:

Example of Successful XD Response

```
“XD000000B4100000032004B00660333008F003D200000032004B00660333008F003D
300000032004B00660333008F003D400000032004B00660333008F003D500000032004
B00660333008F003D600000032004B00660333008F003D700000032004B00660333008
F003D800000032004B00660333008F003D3062~\r\r”
```

In the event of a failure, one of three error messages will be returned: empty, invalid, or failure. “XDEmpty~\r\r” is returned if no interval data exists in SRAM or FLASH. “XDInvalid~\r\r” is returned if the index is not valid because it is too large or malformed. “XDFailure~\r\r” is returned if there was a failure while retrieving the interval data from memory.

The payload of a successful response starts after the “XD” header. The 4-character index substring is not present in the response message. As an alternative for sequence verification, the timestamp substring can be checked.

The payload starts with an 8-character **TIMESTAMP** substring that represents the number of seconds from Jan 1, 2000 at 00:00am based on the PC clock’s UTC time. In the above example of a successful XD response, the timestamp substring is “000000B4”. This timestamp translates to Jan 1, 2000 at 00:03am UTC.

The payload of the timestamp substring is followed by up to 8 lane data substrings. The number of lane data substrings in the response depends upon the number of lanes configured on the device. For instance, if only 3 lanes are configured then only 3 lane data substrings will be returned (See below). Each lane data substring is 29 characters long.

Example Format of XD Response

	Header	Payload			Footer		
		Timestamp	Lane Data 1	Lane Data 2	Lane Data 3	Checksum	Terminator
Length	2	8	29	29	29	4	3

The 29 characters of each lane data substring are grouped into 7 segments as diagramed below. In the successful response above, all 8 of the lane data substrings happen to be exactly the same, except for the (underlined) lane IDs. The lane data substring “200000032004B00660333008F003D” for lane 2 is used as the example below:

Format of Lane Data Substring

	Lane ID	Volume	Average Speed	Occupancy %	Small Class %	Medium Class %	Large Class %
Length	1	8	4	4	4	4	4
Indices	1	2-9	10-13	14-17	18-21	22-25	26-29
Example Substring	‘2’	“00000032”	“004B”	“0066”	“0333”	“008F”	“003D”
Decimal Value	2	50 vehicles	75 mph	10.0%	80.0%	14.0%	6.0%

The 1-character **LANE ID** indicates the position of the lane. The closest lane configured is labeled with ID 1. The next closest lane configured is labeled with ID 2, and so on until the last lane.

The 8-character **VOLUME** substring contains a hexadecimal integer that represents the total number of vehicles detected in the lane, during the time interval. In the above figure, the example volume substring “00000032” translates to 50 vehicles.

The 4-character **AVERAGE SPEED** substring contains a hexadecimal integer that represents the average speed vehicles traveled in the lane, during the interval. The speed units are miles per hour or kilometers per hour depending upon whether English or metric units are selected. If English units are assumed, then the example speed substring of the above figure translates to 75 mph.

The 4-character **OCCUPANCY %** substring contains a hexadecimal integer that must be converted to decimal, multiplied by 100, and divided by 1024 to derive the percentage of time lane was occupied during the interval. In the above figure, the example occupancy % substring “0066” translates to 10.0% when rounded.

The 4-character **SMALL CLASS %** substring contains a hexadecimal integer that must be converted to decimal, multiplied by 100, and divided by 1024 to derive the percentage of vehicles whose lengths were classified as small. In the above figure, the example small class % substring “0333” translates to 80.0% when rounded.

The 4-character **MEDIUM CLASS %** substring contains a hexadecimal integer that must be converted to decimal, multiplied by 100, and divided by 1024 to derive the

percentage of vehicles whose lengths were classified as medium. In the above figure, the example medium class % substring “008F” translates to 14.0% when rounded.

The 4-character **LARGE CLASS %** substring contains a hexadecimal integer that must be converted to decimal, multiplied by 100, and divided by 1024 to derive the percentage of vehicles whose lengths were classified as large. In the above figure, the example large class % substring “003D” translates to 6.0% when rounded.

The lane data substrings are followed by the checksum and terminator in the footer as shown in the “Example Format of XD Response”. The checksum is calculated on the payload portion of the packet only. In the “Example of Successful XD Response” figure, the checksum substring is “3062”.

- C. Retrieving Presence Data.** To query the device whether vehicles are present in the lanes being monitored, transmit the message request “X1\r”. The response from the device shall contain a four-character payload substring that contains a hexadecimal integer. The lower 8 bits of the binary representation of this integer indicate the presence of a vehicle in a particular lane. The least significant bit corresponds to the lane closest to the sensor and the most significant bit corresponds to lane farthest from the sensor. If the bit is set then a vehicle is present in that lane.

To illustrate, suppose that a device monitoring a 4-lane highway is queried for presence and responds with the string “X1000A~\r\r”.

Converting “000A” to its binary equivalent yields “00001010” for the lower 8 bits.

The following figure shows how these 8 bits indicate the presence of a vehicle in lanes 1-8.

Example Parsing of Presence Information

	MSB							LSB
Lane	8	7	6	5	4	3	2	1
Bit Value	0	0	0	0	1	0	1	0
Presence	No	No	No	No	Yes	No	Yes	No

- D. Retrieving Event Data.** Whenever a vehicle leaves the device’s detection zone a vehicle event is generated. A vehicle event message is created and stored for every vehicle leaving the device’s detection zone. The maximum number of events that the device shall buffer is 10.

To query the device whether vehicles events have been recorded in the lanes being monitored, transmit the command message “XA\r”. Only one event can be acquired per request. The first event recorded in the buffer, is the first event returned by the device (First In First Out). Once an event has been requested, it is removed from the device’s buffer. If the event buffer is empty, the response is “XAEmpty~\r\r”. If an event is found, the response message will look something like “XA01CB3DC51AF00370~\r\r”. This response is used as the example below:

Format of Event Data Response Message

	Header	Payload					Footer
		Timestamp	Lane ID	Duration	Speed	Class ID	Terminator
Length	2	8	1	4	4	1	3
Indices	1-2	3-10	11	12-15	16-19	20	21-23
Example	“XA”	“01CB3DC5”	‘1’	‘AF’	‘0037’	‘0’	“~\r\n”
Value		20:54:02:092 UTC	1	437.5 ms	55 mph	Small	

The 8-character **TIMESTAMP** substring contains a hexadecimal integer that indicates the number of 2.5 ms increments since the beginning of the day (UTC time). For example, if the timestamp field contains the string “01CB3DC5”, then the event occurred at 20:54:02:092 UTC time. (This is true as long as the device time is UTC time.)

The 1-character **LANE ID** indicates the position of the lane in device configuration. The closest lane configured is labeled with ID 1. The next closest lane configured is labeled with ID 2, and so on until the last lane.

The 4-character **DURATION** substring contains a hexadecimal integer that indicates the number of 2.5 ms increments that the vehicle was present in the detection zone. A duration substring of “00AF” translates to 175 increments, or 437.5 ms.

The 4-character **SPEED** substring contains a hexadecimal integer that indicates the speed assigned to the vehicle. A speed substring of “0037” equates to a speed of 55 mph, if the units are English.

The 1-character **CLASS ID** indicates the classification of the detected vehicle. The possible classifications are ‘0’, ‘1’, and ‘2’; corresponding to small, medium, and large vehicles, respectively. The classification lengths shall be adjustable.

- E. Retrieving and Setting the Time.** Device clock time is maintained by a hardware timer. This timer provides a resolution of 2.5ms for event data, and 1 second for time-interval traffic data. The clock records time as the number of seconds since Jan 1, 2000 at 00:00am UTC time using a 32-bit integer.

In the event of a power cycle or other irregularity, an application can re-synchronize (set) the seconds count using an “S4” request message. Similarly, an application can retrieve the current seconds count on the sensor using an “SB” request message. The payload for both the “S4” set request and “SB” get response is an 8-character timestamp substring that represents the 32-bit seconds count integer in hexadecimal.

To translate the seconds count to a date and time, the zero-reference point (“00000000” = Jan 1, 2000 at 00:00am UTC) should be used. As an example, a seconds count of “074554BD” translates to Nov 12, 2003 at 20:29:49 UTC. Since the seconds count is a 32-bit integer it will not rollover until the year 2068.

To set the date and time on the device to Nov 12, 2003 at 20:29:49 UTC, send an “S4074554BD\r” request message. In the event of a success, an “S4Success~\r\r” response message will be returned. In the event of a failure, an “S4Failure~\r\r” response message will be returned.

To check the updated time, send an “SB\r” request message. If successful and the date and time is currently Nov 12, 2003 at 20:30:00 UTC, the response will “SB074554C8\r”. In the event of a “SB” request failure the response will be “SBFailure~\r\r”.

- F. Retrieving and Setting the Baud Rate.** The baud rate shall be controllable for the 4 communication ports of the device: RS-232, RS-485, Expansion A (Internal CDPD Modem), and Expansion B. The rates are specified using a 4-character baud rate control substring as specified below. Each character of the substring represents the baud rate of one of the ports.

Format of Baud Control String

	1 st Character	2 nd Character	3 rd Character	4 th Character
Port	Expansion B	RS-232	Expansion A	RS-485
Default Code Value	‘1’	‘0’	‘1’	‘4’
Default Rate	19.2 Kbps	9600 bps	19.2 Kbps	115.2 Kbps

Baud Rate Encoding Table

ASCII Value	Rate
‘0’	9600 bps
‘1’	19.2 Kbps
‘2’	38.4 Kbps
‘3’	57.6 Kbps
‘4’	115.2 Kbps
‘5’	230.4 Kbps
‘6’	460.8 Kbps
‘7’	921.6 Kbps
‘8’-‘F’	Reserved

The baud rate control substring is retrieved using the “SJS0000970004\r” request message. If the baud rate control substring is “1414”, then the response will be “SJ141400CA~\r\r”. The baud rate control string is composed of the first 4 characters of the response following the “SJ”. A 4-character checksum substring and the terminator are appended after the baud rate control string. The checksum is the hex representation of the sum of the ASCII values of the baud rate control string.

To change the baud rate for a specific port, the baud rate control string should first be formulated. A four-character checksum is then appended. In this case, the checksum is calculated starting with the “S” following the “SK” at the beginning of the message. For example, to set the baud rate control string to “1014”, the command “SKS00009700041014030D~\r\r” would be sent. Here the checksum “030D “ is

calculated on the substring “S00009700041014”. In the event of a success the response will be “SKSuccess~\r\r”. In the event of a failure, the response will be “SKFailure~\r\r”.

- G. Retrieving and Setting the Classification Lengths.** Specify the classification lengths in feet or in decimeters. There are three classification bins: Class 0 (Small), Class 1 (Medium), Class 2 (Large). A classification bin is defined by specifying a minimum and maximum length of vehicles that will be lumped into that bin. Bins must not overlap each other, or the results will not be as expected.

The classification lengths are specified by a 40-character string. The format of this string is shown below:

Classification Lengths Specification String

	Class 0 Min	Class 0 Max	Reserved	Class 1 Min	Class 1 Max	Reserved	Class 2 Min	Class 2 Max
Length	4	4	8	4	4	8	4	4
Example	“0000”	“000A”	“00000000”	“000B”	“001E”	“00000000”	“001F”	“0032”

The classification length specification is requested using the “SJS0200000028\r” command. If the classification lengths are: Class 0 [0,10 ft], Class 1 [11,30 ft], Class 2 [31,50 ft], the response will be:

“SJ0000000A0000000000B001E00000000001F003207D5~\r\r”.

The first 40-characters of the response following the “SJ” is the classification lengths specification string. The string contains 6 hexadecimal numbers that are the minimum and maximum lengths in each classification bin. A four-character checksum is appended after the classification lengths specification string. The checksum is calculated on the characters in the classification lengths specification string.

To set the classification lengths, the specification string should first be formulated. A four-character checksum is then appended. For a set command, the checksum is calculated starting with the “S” following the “SK” at the beginning of the packet. In the following example the checksum “0A03” was calculated on the substring:

“S020000002800000016000000000017002800000000002903E8”.

Suppose the classification lengths need to be changed so that: Class 0 [0,22 ft], Class 1 [23,40 ft], Class 2 [41,1000 ft]. In this case, the request message

“SKS020000002800000016000000000017002800000000002903E80A03~\r\r”

should be sent. In the event of a success the response will be “SKSuccess~\r\r”. In the event of a failure, the response will be “SKFailure~\r\r”.

- 7. Measurement and Payment.** The work performed and materials furnished in accordance with this Item shall not be measured nor paid for directly, but shall be considered subsidiary to the governing specifications for the items of construction in which these materials are used.

INSTRUCTIONS FOR COMPLETION OF SF-LLL, DISCLOSURE OF LOBBYING ACTIVITIES

This disclosure form shall be completed by the reporting entity, whether subawardee or prime Federal recipient, at the initiation or receipt of a covered Federal action, or a material change to a previous filing, pursuant to title 31 U.S.C section 1352. The filing of a form is required for each payment or agreement to make payment to any lobbying entity for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a covered Federal action. Use the SF-LLL-A Continuation Sheet for additional information if the space on the form is inadequate. Complete all items that apply for both the initial filing and material change report. Refer to the implementing guidance published by the Office of Management and Budget for additional information.

1. Identify the type of covered Federal action for which lobbying activity is and/or has been secured to influence the outcome of a covered Federal action.
2. Identify the status of the covered Federal action.
3. Identify the appropriate classification of this report. If this is a follow-up report caused by a material change to the information previously reported, enter the year and quarter in which the change occurred. Enter the date of the last previously submitted report by this reporting entity or this covered Federal action.
4. Enter the full name, address, city, state and zip code of the reporting entity. Include Congressional District, if known. Check the appropriate classification of the reporting entity that designates if it is, or expects to be, a prime or subaward recipient. Identify the tier of the subawardee, e.g., the first subawardee of the prime is the 1st tier. Subawards include but are not limited to subcontracts, subgrants and contract awards under grants.
5. If the organization filing the report in item 4 checks "Subawardee", then enter the full name, address, city, state and zip code of the prime Federal recipient. Include Congressional District, if known.
6. Enter the name of the Federal agency making the award or loan commitment. Include at least one organizational level below agency name, if known. For example, Department of Transportation, United States Coast Guard.
7. Enter the Federal program name or description for the covered Federal action (item 1). If known, enter the full Catalog of Federal Domestic Assistance (CFDA) number for grants, cooperative agreements, loans, and loan commitments.
8. Enter the most appropriate Federal identifying number available for the Federal action identified in item 1 (e.g., Request for Proposal (RFP) number; Invitation for Bid (IFB) number; grant announcement number, the contract, grant, or loan award number; the application/proposal control number assigned by the Federal agency). Include prefixes, e.g., "RFP-DE-90-001."
9. For a covered Federal action where there has been an award or loan commitment by the Federal agency, enter the Federal amount of the award/loan commitment for the prime entity identified in item 4 or 5.
10. (a) Enter the full name, address, city, state and zip code of the lobbying entity engaged by the reporting entity identified in item 4 to influence the covered Federal action.
(b) Enter the full names of the individual(s) performing services, and include full address if different from 10(a). Enter Last Name, First Name, and Middle Initial (MI).
11. Enter the amount of compensation paid or reasonably expected to be paid by the reporting entity (item 4) to the lobbying entity (item 10). Indicate whether the payment has been made (actual) or will be made (planned). Check all boxes that apply. If this is a material change report, enter the cumulative amount of payment made or planned to be made.
12. Check the appropriate box(es). Check all boxes that apply. If payment is made through an in-kind contribution, specify the nature and value of the in-kind payment.
13. Check the appropriate box(es). Check all boxes that apply. If other, specify nature.
14. Provide a specific and detailed description of the services that the lobbyist has performed, or will be expected to perform, and the date(s) of any services rendered. Include all preparatory and related activity, not just time spent in actual contact with Federal officials. Identify the Federal official(s) or employee(s) contacted or the officer(s), employee(s), or Member(s) of Congress that were contacted.
15. Check whether or not a SF-LLL-A Continuation Sheet(s) is attached.
16. The certifying official shall sign and date the form, print his/her name, title, and telephone number.

Public reporting burden for this collection of information is estimated to average 30 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0046), Washington, D.C. 20503.

DISCLOSURE OF LOBBYING ACTIVITIES

Approved by OMB

0348-0046

CONTINUATION SHEET

Reporting Entity: _____ Page _____ of _____

CONTRACTOR'S ASSURANCE

(Subcontracts-Federal Aid Projects)

By signing this proposal the contractor is giving assurances that all subcontract agreements of \$10,000 or more on this project will incorporate the following:

- Special Provision “Certification of Nondiscrimination in Employment”
- Special Provision “Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity” (Executive Order 11246)
- Special Provision “Standard Federal Equal Employment Opportunity Construction Contract Specifications” (Executive Order 11246)
- Form FHWA 1273 “Required Contract Provisions Federal-aid Construction Contracts” (Form FHWA 1273 must also be physically attached to subcontracts and purchase orders of \$10,000 or more)
- Applicable “Wage Determination Decision”

Also, by signing this proposal the contractor is giving assurances that all subcontract agreements will incorporate the Standard Specification and Special Provisions to Section 9.6.B “Payment Provisions for Subcontractors”