

DATE: 4/08/2015

Page: 5

BID NO.: 50-00112843

BID FORM
Non Public Works**All Public Work Projects are required to use the Louisiana Uniform Public Work Bid Form**

All prices must be held firm unless an escalation provision is requested in this bid. Jefferson Parish will allow one escalation during the term of the contract, which may not exceed the U.S. Bureau of Labor Statistics National Index for all Urban Consumers, unadjusted 12 month figure. The most recently published figure issued at the time an adjustment is requested will be used. A request must be made in writing by the vendor, and the escalation will only be applied to purchases made after the request is made.

Are you requesting an escalation provision?

YES _____ NO ✓

MAXIMUM ESCALATION PERCENTAGE REQUESTED _____ %

INITIAL BID PRICES WILL REMAIN FIRM THROUGH THE DATE OF _____.

For the purposes of comparison of bids when an escalation provision is requested, Jefferson Parish will apply the maximum escalation percentage quoted by the bidder to the period to which it is applied in the bid. The initial price and the escalation will be used to calculate the total bid price. It will be assumed, for comparison of prices only, that an equal amount of material or labor is purchased each month throughout the entire contract.

DELIVERY: FOB JEFFERSON PARISH

INDICATE DELIVERY DATE ON EQUIPMENT AND SUPPLIES

30 days ARO

LOUISIANA CONTRACTOR'S LICENSE NO.: (if applicable)

N/A**THIS SECTION MUST BE COMPLETED BY BIDDER:**FIRM NAME: Irrigation Mart, Inc.ADDRESS: 200 South Service Rd. EastCITY, STATE: Baton Rouge, LA ZIP: 71270TELEPHONE: (318) 255-1832 FAX: (318) 255-7572EMAIL ADDRESS: rel.gray@irrigation-mart.com

In the event that addenda are issued with this bid, bidders MUST acknowledge all addenda on the bid form. Bidder must acknowledge receipt of an addendum on the bid form as indicated. Failure to acknowledge any addendum on the bid form will result in bid rejection.

Acknowledge Receipt of Addenda: NUMBER: 1

NUMBER: _____

NUMBER: _____

NUMBER: _____

TOTAL PRICE OF ALL BID ITEMS: \$ 187,310.05AUTHORIZED
SIGNATURE: Rel W. GrayTITLE: SalesmanRel W. Gray
Printed Name

SIGNING INDICATES YOU HAVE READ AND COMPLY WITH THE INSTRUCTIONS AND CONDITIONS.

NOTE: All bids should be returned with the BID NUMBER and BID OPENING DATE indicated on the outside of the envelope submitted to the Purchasing Department.

DATE: 4/08/2015

INVITATION TO BID FROM JEFFERSON PARISH - continued

Page 6

BID NO.: 50-00112843

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
			STORM DRAIN CULVERTS STEEL		
1	1.00	LF	0010 TWO YEAR CONTRACT FOR A SUPPLY OF STEEL STORM DRAIN CULVERTS AND RELATED ITEMS FOR JEFFERSON PARISH DEPARTMENT OF PUBLIC WORKS, ALL DEPARTMENTS EAST AND WEST BANKS		
2	.00		0010 - 12 in. pipe, 16 gauge	11.70	11.70
3	15.00	EA	0015 GROUP 1 LIFT LUG NUTS (SET OF TWO)	39.28	589.20
4	1.00	LF	0020 12 in. pipe, 14 gauge	13.75	13.75
5	1.00	EA	0030 HUGGER BAND, 16 GAUGE, (EA) 12 in.	11.70	11.70
6	110.00	LF	0040 15 in. pipe, 16 gauge	13.75	1,512.50
7	1.00	LF	0050 15 in. pipe, 14 gauge	17.25	17.25
8	5.00	EA	0060 Hugger band, 16 gauge (ea) 15 in.	11.70	58.50
9	90.00	LF	0070 18 in. pipe, 16 gauge	15.15	1,363.50
10	1.00	LF	0080 18 in. pipe, 14 gauge	20.65	20.65
11	5.00	EA	0090 Hugger band 16 gauge (ea) 18 in.	15.15	75.75
12	150.00	LF	0100 21 in. pipe , 16 gauge	19.55	2,932.50
13	1.00	LF	0110 21 in. pipe, 14 gauge	24.10	24.10
14	7.00	EA	0120 Hugger band, 16 in. gauge (ea) 21 in. pipe	19.50	136.50
15	250.00	LF	0130 24 in. pipe, 14 gauge	27.55	6,887.50

INVITATION TO BID FROM JEFFERSON PARISH - continued

BID NO.: 50-00112843

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
16	1.00	LF	0140 24 in. pipe, 12 gauge	37.90	37.90
17	10.00	EA	0150 Hugger band, 14 gauge (ea) 24 in.	27.60	276.00
18	440.00	LF	0160 30 in. pipe, 14 gauge	34.45	15,158.00
19	100.00	LF	0170 30 in. pipe, 12 gauge	47.00	4700.00
20	20.00	EA	0180 Hugger band, 14 gauge (ea) 30 in.	34.45	689.00
21	50.00	LF	0190 36 in. pipe, 14 gauge	41.35	2,067.50
22	200.00	LF	0200 36 in. pipe, 12 gauge	56.25	11,250.00
23	4.00	EA	0210 Hugger band, 14 gauge (ea) 36 in.	82.65	330.60
24	110.00	LF	0220 42 in. pipe, 14 gauge	52.10	5,731.00
25	1.00	LF	0230 42 in. pipe, 12 gauge	70.65	70.65
26	4.00	EA	0240 Hugger bank 14 gauge (ea) 42 in.	104.15	416.60
27	200.00	LF	0250 48 in. pipe, 14 gauge	59.50	11,900.00
28	1.00	LF	0260 48 in. pipe, 12 gauge	80.60	80.60
29	10.00	ONLY	0270 Hugger band 14 gauge (ea) 48 in.	119.00	1,190.00
30	1.00	LF	0280 54 in. pipe, 14 gauge	67.00	67.00
31	1.00	LF	0290 54 in. pipe, 12 gauge	90.50	90.50

DATE: 4/08/2015

INVITATION TO BID FROM JEFFERSON PARISH - continued

Page 8

BID NO.: 50-00112843

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
32	1.00	EA	0300 Hugger band , 14 gauge (ea) 54 in.	133.90	133.90
33	110.00	LF	0310 60 in. pipe, 14 gauge	83.00	9,130.00
34	1.00	LF	0320 60 in. pipe, 12 gauge	100.40	100.40
35	1.00	EA	0330 Hugger band, 14 gauge (ea) 60 in.	166.10	166.10
36	1.00	LF	0340 66 in. pipe, 14 gauge	95.15	95.15
37	1.00	LF	0350 66 in. pipe, 12 gauge	129.85	129.85
38	1.00	EA	0360 Hugger band, 14 gauge (ea) 66 in.	190.30	190.30
39	60.00	LF	0370 72 in. pipe, 14 gauge	104.15	6,249.00
40	1.00	LF	0380 72 in. pipe, 12 gauge	141.40	141.40
41	4.00	EA	0390 Hugger band, 14 gauge (ea) 72 in.	208.25	833.00
42	1.00	LF	0400 78 in. pipe, 14 gauge	111.85	111.85
43	1.00	LF	0410 78 in. pipe, 12 gauge	153.00	153.00
44	1.00	EA	0420 Hugger band, 14 gauge (ea) 78 in.	223.75	223.75
45	1.00	LF	0430 84 in. pipe, 14 gauge	120.85	120.85
46	1.00	LF	0440 84 in. pipe, 12 gauge	164.60	164.60
47	1.00	LF	0450 84 in. pipe, 10 gauge	210.85	210.85

INVITATION TO BID FROM JEFFERSON PARISH - continued

BID NO.: 50-00112843

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
48	1.00	EA	0460 HUGGER BAND, 14 GAUGE (EA) 84 IN.	241.70	241.70
49	1.00	LF	0470 90 in. pipe, 14 gauge	128.55	128.55
50	1.00	LF	0480 90 in. pipe, 12 gauge	176.15	176.15
51	1.00	LF	0490 90 in. pipe, 10 gauge	225.00	225.00
52	1.00	EA	0500 Hugger band, 14 gauge (ea) 90 in.	257.15	257.15
53	1.00	EA	0510 Rod and lug band 14 gauge(ea)90 in	514.00	514.00
54	1.00	LF	0520 96 in. pipe, 12 gauge	189.00	189.00
55	110.00	LF	0530 96 in. pipe, 10 gauge	240.45	26,449.50
56	3.00	EA	0540 Hugger band, 14 gauge (ea) 96 in.	273.75	821.25
			GROUP 2 ARCH PIPE		
57	1.00	EA	0550 17 in. x 13 in. pipe 16 gauge 15 in. equivalent	14.90	14.90
58	1.00	EA	0560 Angle and bolt type band 16 gauge (ea) for 17 in. x 13 in. pipe	14.90	14.90
59	1.00	LF	0570 21 in. x 15 in. pipe 16 gauge 18 in. or equivalent	18.60	18.60
60	1.00	EA	0580 Angle and bolt type band 16 gauge (ea) for 21 in. x 15 in. pipe	18.60	18.60
61	1.00	LF	0590 24 in. x 18 in. pipe 16 gauge 21 in. equivalent	21.10	21.10

DATE: 4/08/2015

Page 10

INVITATION TO BID FROM JEFFERSON PARISH - continued

BID NO.: 50-00112843

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
62	1.00	EA	0600 Angle and bolt type band 16 gauge (ea) for 24 in. x 18 in. pipe	21.10	21.10
63	1.00	LF	0610 28 in. x 20 in. pipe 14 gauge 24 in equivalent	29.75	29.75
64	1.00	EA	0620 Angle and bolt type band 14 gauge (ea) for 28 in. x 20 in. pipe	29.75	29.75
65	55.00	LF	0630 35 in. x 24 in. pipe 14 gauge 30 in. equivalent	37.20	2,046.00
66	1.00	EA	0640 Angle and bolt type band 14 gauge (ea) for 35 in. x 24 in. pipe	37.25	37.25
67	1.00	LF	0650 42 in. x 29 in. pipe, 14 gauge 36 in. equivalent	44.65	44.65
68	1.00	EA	0660 Angle and bolt type band 14 gauge (ea) for 42 in. x 29 in. pipe	89.25	89.25
69	1.00	LF	0670 49 in. x 33 in. pipe, 14 gauge 42 in. equivalent	56.25	56.25
70	1.00	EA	0680 Angle and bolt type band 14 gauge (ea) for 49 in. x 33 in. pipe	112.45	112.45
71	10.00	LF	0690 57 in. x 38 in. pipe, 12 gauge 48 in. equivalent	87.00	870.00
72	1.00	EA	0700 Angle and bolt type band 12 gauge (ea) for 57 in. x 38 in. pipe	174.00	174.00
73	100.00	LF	0710 64 in. x 43 in. pipe, 12 gauge 54 in. equivalent	97.75	9,775.00
74	1.00	EA	0720 Angle and bolt type band 14 gauge (ea) for 64 in. x 43 in. pipe	155.15	155.15

INVITATION TO BID FROM JEFFERSON PARISH - continued

BID NO.: 50-00112843

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
75	1.00	LF	0730 66 in. x 51 in. pipe, 14 gauge 60 in. equivalent	89.70	89.70
76	1.00	EA	0740 Angle and bolt type band 14 gauge (ea) for 66 in. x 51 in. pipe	179.40	179.40
77	1.00	LF	0750 73 in. x 55 in. pipe, 14 gauge 66 in. equivalent	102.75	102.75
78	1.00	EA	0760 Angle and bolt type band 14 gauge (ea) for 73 in. x 55 in. pipe	205.50	205.50
79	1.00	LF	0770 81 in. x 59 in. pipe 14 gauge 72 in. equivalent	112.45	112.45
80	1.00	EA	0780 Angle and bolt type band 14 gauge, (ea) for 81 in. x 59 in. pipe	224.90	224.90
81	1.00	LF	0790 87 in. x 63 in. pipe, 14 gauge 78 in. equivalent	120.80	120.80
82	1.00	EA	0800 Angle and bolt type band 14 gauge (ea) for 87 in. x 63 in. pipe	240.60	240.60
83	1.00	LF	0810 95 in. x 67 in. pipe, 14 gauge 84 in. equivalent	130.50	130.50
84	1.00	EA	0820 Angle and bolt type band 12 gauge (ea) for 95 in. x 67 in. pipe	355.45	355.45
85	1.00	LF	0830 103 in. x 71 in. pipe, 12 gauge 90 in. equivalent	140.25	140.25
86	5.00	EA	0840 Angle and bolt type band 12 gauge (ea) for 103 in. x 71 in. pipe	380.45	1,902.25

INVITATION TO BID FROM JEFFERSON PARISH - continued

BID NO.: 50-00112843

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
			GROUP 3 OUTFALL		
			Polymer coated steel pipe (canal outfall pipe) 26 foot section with ban		
87	1.00	EA	0860 RCP Dia. 12 in. CSP Dia. 16.56.5 gauge 14	617.50	617.50
88	1.00	EA	0860 RCP Dia. 15 in. CSP Dia. 20.0 in. 12 gauge	788.50	788.50
89	1.00	EA	0870 RCP Dia. 18 in. CSP Dia. 23.5 in. 12 gauge	1,134.00	1,134.00
90	1.00	EA	0880 RCP Dia. 21 in. CSP Dia. 27.0 in. 12 gauge	1,288.00	1,288.00
91	1.00	EA	0890 RCP Dia. 24 in. CSP Dia. 30.5 in. 12 gauge	1,429.80	1,429.80
92	1.00	EA	0900 RCP Dia 27 in. CSP Dia 34.0 in. 12 gauge	1,680.00	1,680.00
93	1.00	EA	0910 RCP Dia. 30 in. CSP Dia. 37.5 in. 12 gauge	1,780.00	1,780.00
94	1.00	EA	0920 RCP Dia. 36 in. CSP Dia. 44.5 in. 12 gauge	2,237.00	2,237.00
95	1.00	EA	0930 RCP Dia. 42 in. CSP Dia. 51.0 in. 12 gauge	2,550.00	2,550.00
96	1.00	EA	0940 RCP Dia. 48 in. CSP Dia. 58.0 in. 12 gauge	2,915.00	2,915.00
97	1.00	EA	0950 RCP Dia. 54 in. CSP Dia 65.5 in. 12 gauge	3,398.25	3,398.25
98	1.00	EA	0960 RCP Dia. 60 in. CSP Dia. 72.5 in 12 gauge	4,210.00	4,210.00

INVITATION TO BID FROM JEFFERSON PARISH - continued

BID NO.: 50-00112843

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
99	1.00	EA	0970 RCP Dia. 72 in. CSP Dia. 86.5 in. 12 gauge	4,895.00	4,895.00
100	1.00	EA	0980 RCP Dia. 84 in. CSP Dia 100.5 in. 12 gauge	5,910.00	5,910.00
101	1.00	EA	0990 RCP Dia. 96 in. CSP Dia 114.5 in. 12 gauge	6,641.00	6,641.00
			GROUP 4 GATES Flip Gates, Sluice Gates and Hand Wheel Lifts (Waterman)		
102	1.00	ONLY	1000 Flap Gate (model F-10 S.B. or equal) 18 in	979.00	979.00
103	1.00	ONLY	1010 Flap Gate 24 in.	1376.00	1376.00
104	1.00	ONLY	1020 Flap Gate 30 in. Spigotbak	1857.00	1857.00
105	1.00	ONLY	1030 Flap Gate 36 in	2,122.00	2,122.00
106	1.00	ONLY	1040 Sluice ate (model C-10 S.B. or equal) 18 in.	1,019.00	1,019.00
107	1.00	ONLY	1050 Sluice Gate 24 in.	1,384.00	1,384.00
108	1.00	ONLY	1060 Sluice Gate 30 in.	2,128.00	2,128.00
109	1.00	ONLY	1070 Sluice Gate 36 in.	2,475.00	2,475.00
110	1.00	ONLY	1080 Handwheel Lift 14 in.	72.00	72.00
111	1.00	ONLY	1090 Hand Wheel Lift 18 in.	87.00	87.00

BID NO.: 50-00112843

INVITATION TO BID FROM JEFFERSON PARISH - continued

Page 14

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
112	1.00	ONLY	1100 Hand Wheel Lift 24 in.	87.00	87.00
			GROUP 5 TOUCH UPO		
113	1.00	GL	1110 Grundy 5-X grush grade repair coating compound (for polymer coated pipe)		
114	1	Ea	For line items 1-101 orders less than \$5,000.00 Freight will be added.	150.00	150.00

CORPORATE RESOLUTION

EXCERPT FROM MINUTES OF MEETING OF THE BOARD OF DIRECTORS OF
Robbins Association / Irrigation - Mart
INCORPORATED.

AT THE MEETING OF DIRECTORS OF Robbins Association / Irrigation - Mart, Inc.
INCORPORATED, DULY NOTICED AND HELD ON April 21st 2015,
A QUORUM BEING THERE PRESENT, ON MOTION DULY MADE AND SECONDED. IT
WAS:

RESOLVED THAT Re/ W. Gray, BE AND IS HEREBY
APPOINTED, CONSTITUTED AND DESIGNATED AS AGENT AND ATTORNEY-IN-
FACT OF THE CORPORATION WITH FULL POWER AND AUTHORITY TO ACT ON
BEHALF OF THIS CORPORATION IN ALL NEGOTIATIONS, BIDDING, CONCERNS
AND TRANSACTIONS WITH THE PARISH OF JEFFERSON OR ANY OF ITS AGENCIES,
DEPARTMENTS, EMPLOYEES OR AGENTS, INCLUDING BUT NOT LIMITED TO, THE
EXECUTION OF ALL BIDS, PAPERS, DOCUMENTS, AFFIDAVITS, BONDS, SURETIES,
CONTRACTS AND ACTS AND TO RECEIVE ALL PURCHASE ORDERS AND NOTICES
ISSUED PURSUANT TO THE PROVISIONS OF ANY SUCH BID OR CONTRACT, THIS
CORPORATION HEREBY RATIFYING, APPROVING, CONFIRMING, AND ACCEPTING
EACH AND EVERY SUCH ACT PERFORMED BY SAID AGENT AND ATTORNEY-IN-
FACT.

I HEREBY CERTIFY THE FOREGOING TO BE
A TRUE AND CORRECT COPY OF AN
EXCERPT OF THE MINUTES OF THE ABOVE
DATED MEETING OF THE BOARD OF
DIRECTORS OF SAID CORPORATION, AND
THE SAME HAS NOT BEEN REVOKED OR
RESCINDED.



SECRETARY-TREASURER

4/21/15

DATE

Non-Public Works Bid Affidavit Instructions

- Affidavit is supplied as a courtesy to Affiants, but it is the responsibility of the affiant to insure the affidavit they submit to Jefferson Parish complies, in both form and content, with federal, state and parish laws.
- Affidavit must be signed by an authorized representative of the entity or the affidavit will not be accepted.
- Affidavit must be notarized or the affidavit will not be accepted.
- Notary must sign name, print name, and include bar/notary number, or the affidavit will not be accepted.
- Affiant **MUST** select either A or B when required or the affidavit will not be accepted.
- Affiants who select choice A must include an attachment or the affidavit will not be accepted.
- If both choice A and B are selected, the affidavit will not be accepted.
- Affidavit marked N/A will not be accepted.
- It is the responsibility of the Affiant to submit a new affidavit if any additional campaign contributions are made after the affidavit is executed but prior to the time the council acts on the matter.

Instruction sheet may be omitted when submitting the affidavit

Non-Public Works Bid

AFFIDAVIT

STATE OF LouisianaPARISH/COUNTY OF Jefferson

BEFORE ME, the undersigned authority, personally came and appeared: _____

Paul H. Long, (Affiant) who after being by me duly sworn, deposed and said that he/she is the fully authorized representative of Robbins Association / Irrigation-Mert, Inc. (Entity), the party who submitted a bid in response to Bid Number 50-001128A3, to the Parish of Jefferson.

Affiant further said:

Campaign Contribution Disclosures

(Choose A or B, if option A is indicated please include the required attachment):

Choice A _____ Attached hereto is a list of all campaign contributions, including the date and amount of each contribution, made to current or former elected officials of the Parish of Jefferson by Entity, Affiant, and/or officers, directors and owners, including employees, owning 25% or more of the Entity during the two-year period immediately preceding the date of this affidavit or the current term of the elected official, whichever is greater. Further, Entity, Affiant, and/or Entity Owners have not made any contributions to or in support of current or former members of the Jefferson Parish Council or the Jefferson Parish President through or in the name of another person or legal entity, either directly or indirectly.

Choice B ✓ there are NO campaign contributions made which would require disclosure under Choice A of this section.

Debt Disclosures

(Choose A or B, if option A is indicated please include the required attachment):

Choice A _____ Attached hereto is a list of all debts owed by the affiant to any elected or appointed official of the Parish of Jefferson, and any and all debts owed by any elected or appointed official of the Parish to the Affiant.

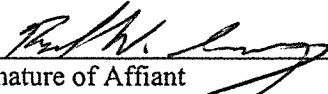
Choice B ✓ There are NO debts which would require disclosure under Choice A of this section.

Affiant further said:

That Affiant has employed no person, corporation, firm, association, or other organization, either directly or indirectly, to secure the public contract under which he received payment, other than persons regularly employed by the Affiant whose services in connection with the construction, alteration or demolition of the public building or project or in securing the public contract were in the regular course of their duties for Affiant; and

[The remainder of this page is intentionally left blank.]

That no part of the contract price received by Affiant was paid or will be paid to any person, corporation, firm, association, or other organization for soliciting the contract, other than the payment of their normal compensation to persons regularly employed by the Affiant whose services in connection with the construction, alteration or demolition of the public building or project were in the regular course of their duties for Affiant.

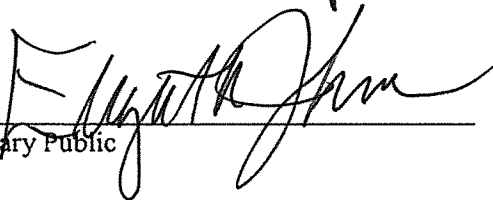


Signature of Affiant

Re/ W. Gray

Printed Name of Affiant

SWORN AND SUBSCRIBED TO BEFORE ME
ON THE 21st DAY OF April, 2015



Notary Public

Printed Name of Notary **Elizabeth K. Johnson, Notary Public**

Lincoln Parish, Louisiana

Notary/Bar Roll Number

My Commission is for life

Notary No. 056040

My commission expires _____.

A TWO YEAR CONTRACT FOR SUPPLY OF STEEL STORM DRAIN CULVERTS, AND RELATED ITEMS FOR THE JEFFERSON PARISH DEPARTMENT OF PUBLIC WORKS, ALL DISTRICTS EAST AND WEST BANK.

GENERAL SPECIFICATIONS

THESE SPECIFICATIONS ARE PREPARED FOR A TWO YEAR SUPPLY OF STEEL STORM DRAIN CULVERTS AND RELATED ITEMS USED BY THE DEPARTMENT OF PUBLIC WORKS, ALL DRAINAGE DISTRICTS

PARISH RESERVES THE RIGHT TO PURCHASE ANY QUANTITY OF UNITS AS NEEDED DURING THE ANNUAL CONTRACT PERIOD.

BIDDER IS NOT TO PRE SHIP ANY QUANTITY UNTIL AUTHORIZED BY PURCHASE ORDER.

TECHNICAL SPECIFICATIONS FOR CORRUGATED STEEL PIPE AND PIPE ARCHES (GROUP 1)

SPECIFICATIONS FOR ROUND AND ARCH PIPE (GROUP 1 AND 2)

PIPE AND PIPE ARCHES SHALL BE GALVANIZED STEEL, POLYMER COATED (10 MIL. /10MIL.) IN ACCORDANCE WITH AASHTO DESIGNATIONS M-218, M-245, AND M-246. HELICAL PIPE SHALL HAVE UNIVERSAL RE-ROLLED ENDS WITH (40 CORRUGATIONS AND LIFTING LUGS FOR HANDLING ALL PIPE 30 INCHES AND EQUIVALENT OR LARGER).

SPECIFICATION FOR CANAL OUTFALL PIPE (GROUP 3)

CANAL OUTFALL PIPE (SECTION EXTENDED INTO CANAL) SHALL BE SUPPLIED IN 26 FEET SECTIONS. THE REQUIRED CSP(CORRUGATED STEEL PIPE) SIZES TO FIT OVER STANDARD SIZE ROUND RCP(REINFORCED CONCRETE PIPE) ARE SHOWN IN THE FOLLOWING TABLE.

SINCE CORRUGATED STEEL ARCH PIPE IS NOT COMPATIBLE WITH REINFORCED CONCRETE ARCH PIPE, THESE BID DOCUMENTS CONTAIN NO PROVISIONS FOR ARCH TYPE OUTFALL PIPES.

CONNECTING BANDS FOR OUTFALL PIPES SHALL BE 24 INCH WIDE WITH FOUR (4) INCH WIDE WITH FOUR (4) RODS AND LUGS AND HAVE TWO (2) PIECE CONSTRUCTION.

RCP NOM. DIA	WALL THICKNESS	RCP O.D.
12 IN.	2 IN.	16 IN.
15 IN.	2.25 IN.	19.5 IN.
18 IN.	2.5 IN.	23 IN.
21 IN.	2.75 IN.	26.5 IN.
24 IN.	3 IN.	30 IN.
27 IN.	3.25 IN.	33.5 IN.
30 IN.	3.50 IN.	37 IN.
36 IN.	4 IN.	44 IN.
42 IN.	4.5 IN.	51 IN.
48 IN.	5 IN.	58 IN.
54 IN.	5.5 IN.	65 IN.
60 IN.	6 IN.	72 IN.
72 IN.	7 IN.	86 IN.
84 IN.	8 IN.	100 IN.
96 IN.	9 IN.	114 IN.

RCP NOM. DIA	REQ'D CSP I.D.
12 IN.	16.5 IN.
15 IN.	20 IN.
18 IN.	23.5 IN.
21 IN.	27 IN.
24 IN.	30.5 IN.
27 IN.	34 IN.
30 IN.	37.5 IN.
36 IN.	44.5 IN.
42 IN.	51.5 IN.
48 IN.	58.5 IN.
54 IN.	65.5 IN.
60 IN.	72.5 IN.
72 IN.	86.5 IN.
84 IN.	100.5 IN.
96 IN.	114.5 IN.

NOTE: ALL PIPE SECTIONS FOR ALL TYPES OF PIPE PROVIDED WITH TWO LIFTING LUGS PER SECTION OF PIPE SIZES 30 INCHES AND LARGER.

2-2/3 INCH X 1/2 INCH CORRUGATIONS APPLY TO 2 INCH – 60 INCH ROUND PIPE.

3 INCH X 1 INCH CORRUGATIONS APPLY TO 66 INCH AND LARGER ROUND PIPE.

SPECIFICATIONS FOR BANDS FOR ALL TYPES AND SIZES OF PIPE.

- A. O RING GASKETS SHALL BE PROVIDED FOR HUGGER TYPE BANDS
- B. FLEXIBLE PLASTIC GASKETS SHALL BE PROVIDED FOR ANGLE AND BOLT OR ROD AND LUG TYPE BANDS. TWO(2) RODS AND LUGS FOR ROUND PIPE AND FOUR(4) RODS AND LUGS FOR CANAL OUTFALL PIPE.
- C. ANGLE AND BOLT TYPE BANDS SHALL BE PROVIDED FOR PIPE ARCH AND TWO(2) PIECE BANDS SHALL BE PROVIDED FOR PIPE ARCH SIZES 42 INCH X 29 INCH AND LARGER.
- D. D.BAND WIDTHS SHALL BE 12 INCHES FOR PIPE SIZE UP TO 30 INCH EQUIVALENT AND 24 INCH FOR PIPE SIZE 36 INCH EQUIVALENT AND LARGER.
- E. CONNECTING BANDS FOR OUTFALL PIPE SHALL BE 24 INCH WIDE WITH FOUR (4) RODS AND LUGS AND HAVE TWO (2) PIECE CONSTRUCTION.

STANDARD SPECIFICATION

FOR

STEEL SHEET, ZINC-COATED (GALVINIZED), FOR CORRUGATED STEEL PIPE

AASHTO DESIGNATION: M 218M-96

1 SCOPE

- 1.1 THIS SPECIFICATION COVERS STEEL SHEET USED IN THE MANUFACTURE OF CORRUGATED STEEL PIPE (CSP) FOR STORM SEWERS, CULVERTS, DRAINS, AND SIMILAR USES. THE SHEET IS ZINC-COATED (GALVANIZED) BY THE HOT-DIP PROCESS, AND IS PRODUCED IN ONE COATING MASS ONLY. MATERIAL FOR THIS USE IS FURNISHED IN COILS, FLAT IN CUT LENGTHS, AND CORRUGATED IN CUT LENGTHS.

2 REFERENCED DOCUMENTS

2.1 AASHTO STANDARDS:

M 120 ZINC METAL (SLAB ZINC)
T 65 THE MASS OF COATING ON IRON AND STEEL ARTICLES WITH ZINC OR ZINC-ALLOY COATINGS
R 11 USING SIGNIFICANT DIGITS IN TEST DATA TO DETERMINE CONFORMANCE WITH SPECIFICATIONS

2.2 ASTM STANDARDS

A 754 COATING THICKNESS BY X-RAY FLUORESCENCE
A 902 TERMINOLOGY RELATING TO METALLIC COATED STEEL PRODUCTS.
A 924/A 924/M GENERAL REQUIREMENTS FOR STEEL SHEET, METALLIC COATED BY THE HOT-DIP PROCESS.
E 376 MEASURING COATING THICKNESS BY MAGNETIC-FIELD OR EDDY-CURRENT (ELECTRO-MAGNETIC) TEST METHODS

3. TERMINOLOGY

- 3.1 DEFINITIONS – FOR DEFINITIONS OF TERMS USED IN THIS STANDARD, REFER TO ASTM A 902. THE FOLLOWING DEFINITIONS ARE AS STATED IN THAT STANDARD.

- 3.1.1 FABRICATOR, N—AS RELATED TO CORRUGATED METAL PIPE, (1) THE ORGANIZATION THAT PRODUCES THE FINISHED PIPE, OR (2) FOR STRUCTURAL PLATE PIPE, THE ORGANIZATION THAT PROCESSES FLAT SHEETS AND OTHER ITEMS NEEDED FOR THE FIELD ASSMEBLY OF THE FINISHED PRODUCTS.

- 3.1.2 MANUFACTURER,---AS RELATED TO CORRUGATED METAL PIPE, THE ORGANIZATION THAT PRODUCES THE METAL SHEET FROM WHICH PIPE IS MADE.
- 3.1.3 PURCHASER, N---AS RELATED TO CORRUGATED METAL PIPE, THE PERSON OR AGENCY THAT PURCHASES THE FINISHED PIPE.

NOTE 1 ---WITH REGARD TO THIS SPECIFICATION FOR SHEET FOR CORRUGATED STEEL PIPE, THE FABRICATOR MAY ALSO BE CONSIDERED AS THE "PURCHASER" OF THE SHEET, WHERE THAT TERM IS USED IN THIS SPECIFICATION. SUCH INTERPRETATION WOULD NOT RESTRICT THE PURCHASER OF THE FINISHED PIPE FROM ENFORCING ANY PROVISIONS OF THIS SPECIFICATION.

4. ORDERING INFORMATION

- 4.1 ALL SHEET, BOTH FLAT AND FORMED, COVERED BY THIS SPECIFICATION SHALL BE ORDERED ONLY TO THE SPECIFIED THICKNESSES LISTED IN TABLE 4.
- 4.2 UNLESS OTHERWISE SPECIFIED IN THE PURCHASE ORDER, ALL MATERIAL FURNISHED TO THIS SPECIFICATION SHALL BE CHEMICALLY TREATED.
- 4.3 ORDERS FOR MATERIAL TO THIS SPECIFICATION SHALL INCLUDE THE FOLLOWING INFORMATION, AS NECESSARY, TO ADEQUATELY DESCRIBE THE DESIRED PRODUCT.
 - 4.3.1 NAME OF MATERIAL(GALVANIZED STEEL SHEET FOR CSP)
 - 4.3.2 AASHTO DESIGNATION AND YEAR OF ISSUE AS M 218-YY,
 - 4.3.3 QUANTITY AND DIMENSIONS:
 - 4.3.3.1 CUT LENGTHS--SHOW NUMBER OF SHEETS; THICKNESS; WIDTH; EITHER FLAT OR OVERALL CORRUGATED; LENGTH; PITCH AND DEPTH OF CORRUGATIONS; IF CORRUGATED;
 - 4.3.3.2 COILED SHEET---SHOW TOTAL MASS; THICKNESS; WIDTH; COIL REQUIREMENTS (MAXIMUM OUTSIDE DIAMETER, ACCEPTABLE INSIDE DIAMETER, AND MAXIMUM MASS OF INDIVIDUAL COILS)
 - 4.3.3.3 CERTIFICATION, IF REQUIRED (SEE SECTION 11.1) AND
 - 4.3.3.4 SPECIAL REQUIREMENTS.

NOTE 2---A TYPICAL ORDERING DESCRIPTION IS AS FOLLOWS:
GALVANIZED STEEL SHEET FOR CSP IN ACCORDANCE WITH AASHTO M 218-YY, 45000 KG, 2.77 BY 700 MM BY COIL, 1500MM MAX OD, 66MM ID, 7000KG MAX, CERTIFIED

5. CHEMICAL COMPOSITION

- 5.1 BASE METAL ANALYSIS---THE BASE METAL CAST OR PRODUCT ANALYSES SHALL CONFORM TO THE CHEMICAL REQUIREMENTS OF TABLE 1.
- 5.2 COATING BATH COMPOSITION (ZINC-COATING)---THE COATING BATH METAL SHALL CONTAIN NOT LESS THAN 99 PER CENT ZINC.

TABLE 1 CHEMICAL COMPOSITION

	CAST ANALYSIS	PRODUCT ANALYSIS
SULFUR, MAX, PERCENT	0.05	0.06
SUM OF CARBON, MANGANESE, PHOSPHOROUS, SILICON, AND SULFUR, MAX. PERCENT	0.70	0.74

TABLE 2: MECHANICAL REQUIREMENTS (PROPERTIES OF FLAT SHEET PRIOR TO FABRICATION)

TENSILE STRENGTH MIN. MPa	310
YIELD POINT, MIN. MPa	230
ELONGATION IN 50 mm. min. PERCENT	20

A TO DETERMINE CONFORMANCE WITH THIS SPECIFICATION, ROUND EACH VALUE FOR TENSILE STRENGTH AND FOR YIELD STRENGTH IN THE NEAREST 1 MPa AND EACH VALUE FOR ELONGATION TO THE NEAREST 1 PERCENT BOTH IN ACCORDANCE WITH THE ROUNDING METHOD OF AASHTO R 11.

B YIELD POINT AND TENSILE STRENGTH ARE BASED ON THICKNESS OF THE BASE METAL. IF TESTS ARE MADE AFTER COATING, DETERMINE THE BASE METAL THICKNESS AFTER STRIPPING THE COATING FROM THE ENDS OF THE SPECIMEN CONTACTING THE GRIPS OF THE TENSION TESTING MACHINE PRIOR TO TENSILE TESTING.

C ELONGATION REQUIREMENT DOES NOT APPLY TO MATERIAL TESTED AFTER ELONGATING.

TABLE 3: COATING MASS REQUIREMENTS

COATING MASS, TOTAL BOTH SIDES		EQUIVALENT COATING THICKNESS TOTAL BOTH SIDES	
TRIPLE SPOT AVERAGE, MIN	SINGLE SPOT, MIN	TRIPLE SPOT AVERAGE, MIN	SINGLE SPOT, MIN
g/m ²	g/m ²	p.m	p.m

610	550	86	78
-----	-----	----	----

COATING THICKNESSES ARE APPROXIMATE, FOR INFORMATION ONLY (SEE 9.5.1). CONVERSION IS BASED ON THE FOLLOWING RELATIONSHIP: $1 \text{ g/m}^2 = 0.1415 \text{ p.m.}$

TABLE. 4 COATED STEEL SHEET THICKNESS REQUIREMENTS

NOTE----THICKNESS IS MEASURED NOT LESS THAN 10 mm FROM AN EDGE. ON CORRUGATED SHEET, THICKNESS IS MEASURED ON THE TANGENTS OF CORRUGATIONS.

SPECIFIED THICKNESS	MINIMUM THICKNESS
mm	mm
1.02	0.91
1.32	1.17
1.63	1.45
2.01	1.83
2.77	2.57
3.51	3.28
4.27	4.04

6. MECHANICAL PROPERTIES

- 6.1 THE GALVANIZED STEEL SHEET SHALL CONFORM TO THE MECHANICAL REQUIREMENTS IS TABLE 2.
- 6.2 TWO TENSION TESTS SHALL BE MADE ON RANDOM SAMPLES OF FINISHED MATERIAL FROM EACH CAST OR HEAT. WHEN THE FINISHED MATERIAL FROM SAID CAST OR HEAT IS LESS THAN 45 Mg, ONE TEST IS SUFFICIENT. WHEN MATERIAL ROLLED FROM ONE CAST OR HEAT DIFFERS 1.25 MM OR MORE IN THICKNESS, ONE TENSION TEST SHALL BE MADE FROM BOTH THE THICKEST AND THINNEST MATERIAL ROLLED REGARDLESS OF THE MASS REPRESENTED. THE SAMPLES SHALL BE PREPARED AND TESTED IN ACCORDANCE WITH THE METHOD SPECIFIED IN ASTM A 924M.

TABLE. 5 FLATNESS TOLERANCES (CUT LENGTHS ONLY)

NOTE: ----THIS TABLE ALSO APPLIES TO SHEETS CUT TO LENGTH FROM COILS BY THE FABRICATOR WHEN ADEQUATE FLATTENING MEASURES ARE PERFORMED.

SPECIFIED THICKNESS,mm	SPECIFIED WIDTH,mm	FLATNESS TOLERANCE (MAXIMUM DEVIATION FROM A HORIZONTAL FLAT SURFACE).mm
------------------------	--------------------	--

AND THICKER	TO 1500.INCL	13	1.63
1.32 AND THINNER	TO 900, INCL	13	
	OVER 900 TO 1500, INCL	19	

TABLE 6 CORRUGATION SIZE

NOMINAL SIZE	MAXIMUM PITCHmm	MINIMUM DEPTHmm	RADIUS OF CURVATURE, mm	
			NOMINAL	MINIMUM
68 BY 13	73	12	17	12
75 BY 25	83	24	14	12
125 BY 25	135	24	40	36

PITCH IS MEASURED FROM CREST TO CREST OF CORRUGATIONS, AT 90 DEGREES TO THE DIRECTION OF THE CORRUGATIONS.

DEPTH IS MEASURED AS THE VERTICAL DISTANCE FROM A STRAIGHT EDGE RESTING ON THE CORRUGATION CREST TO THE BOTTOM OF THE INTERVENING VALLEY.

7. COATING REQUIREMENTS

7.1 THE MASS OF ZINC COATING SHALL CONFORM TO THE REQUIREMENTS IN TABLE 3. THE MASS OF COATING IS THE TOTAL AMOUNT ON BOTH SURFACES OF THE SHEET EXPRESSED IN g/m² OF SHEET.

7.2 ADHESION OF THE COATING SHALL BE SUCH THAT NO PEELING OR FLAKING OCCURS WHILE THE COATED SHEET IS BEING CORRUGATED AND FORMED INTO PIPE.

8. DIMENSIONS AND TOLERANCES

8.1 THICKNESS---SHEET THICKNESS SHALL CONFORM TO DIMENSIONS PRESCRIBED IN TABLE 4. THE THICKNESS OF THE SHEET INCLUDES BOTH THE BASE STEEL AND THE ZINC COATING.

8.2 LENGTH---PERMISSIBLE VARIATIONS IN LENGTH OF CUT-LENGTH SHEETS, BOTH FLAT AND CORRUGATED, SHALL BE IN ACCORDANCE WITH ASTM A 924M.

8.3 FLAT SHEET---PERMISSIBLE VARIATIONS IN WIDTH AND CAMBER OF FLAT MATERIALS SHALL BE IN ACCORDANCE WITH ASTM A 924M.

8.4 CORRUGATED SHEET:

8.4.1 CORRUGATIONS---CORRUGATIONS SHALL FORM SMOOTH CONTINUOUS CURVES AND TANGENTS. THE DIMENSIONS OF THE CORRUGATIONS SHALL BE IN ACCORDANCE WITH TABLE 6.

8.4.2 COVERING WIDTH AND LIP DIMENSION---COVERING WIDTH OF CORRUGATED SHEET SHALL BE IN ACCORDANCE WITH TABLE 7. COVERING WIDTH IS THE DISTANCE BETWEEN THE CRESTS OF THE EXTREME CORRUGATIONS. THE LIP DIMENSIONS OF CORRUGATED SHEET SHALL BE IN ACCORDANCE WITH TABLE 8. AND IS MEASURED ALONG THE RADIAL CURVATURE FROM THE CREST OF THE CORRUGATION TO THE EDGE OF THE SHEET. THERE IS NO ESTABLISHED TOLERANCE FOR OVERALL WIDTH SINCE THE COVERING WIDTH AND LIP DIMENSIONS ARE THE GOVERNING FACTORS FOR THE FORMED PRODUCT.

TABLE 7 COVERING WIDTH TOLERANCE FOR CORRUGATED SHEET

COVERING WIDTH, mm	TOLERANCE OVER AND UNDER mm
TO 600, INCLUSIVE	6
OVER 600 TO 900, INCLUSIVE	10
OVER 900 TO 1200, INCLUSIVE	13

9. TESTING

9.1 THE MANUFACTURER SHALL MAKE EACH TESTS AND MEASUREMENTS AS DEEMED NECESSARY TO ENSURE THAT THE COATED SHEET PRODUCED COMPLIES WITH THIS SPECIFICATION.

9.2 THE PURCHASER MAY MAKE TESTS AND MEASUREMENTS AS DETERMINED TO BE NECESSARY TO CONFIRM CONFORMANCE WITH THIS SPECIFICATION.

- 9.3 CHEMICAL ANALYSIS OF STEEL---CAST ANALYSIS (BY THE MANUFACTURER) AND PRODUCT ANALYSIS (BY THE PURCHASER) SHALL BE IN ACCORDANCE WITH ASTM A 924M.
- 9.4 MECHANICAL TESTING---MECHANICAL PROPERTY TESTS SHALL BE CONDUCTED ON THE SHEET PRIOR TO CORRUGATING OR OTHER FABRICATION, WHEN POSSIBLE, AND SHALL BE IN ACCORDANCE WITH ASTM A 924M. IF TESTS ARE MADE AFTER CORRUGATING, SPECIMENS SHALL BE TAKEN ON THE TANGENTS OF CORRUGATIONS AND USED FOR DETERMINATION OF TENSILE AND YIELD STRENGTHS ONLY.
- 9.5 COATING MASS:
- 9.5.1 SAMPLING FOR COATING MASS DETERMINATIONS SHALL BE IN ACCORDANCE WITH ASTM A 924M. THE MASS OF COATING SHALL BE DETERMINED ACCORDING TO AASHTO T 65.
- 9.5.2 THE MASS MAY BE CONVERTED FROM THE SUM OF READINGS ON BOTH SURFACES OF THE SHEET BY A MAGNETIC THICKNESS GAGE SUITABLY CHECKED AND DEMONSTRATED FOR ACCURACY (NOTE 3) $1 \text{ p.m.} = 7.1 \text{ g/m}^2$ EACH SURFACE. WHEN A MAGNETIC THICKNESS GAGE IS USED AND A DISPUTE ARISES, THE MASS SHALL BE DETERMINED BY THE STRIPPING TEST IN AASHTO T 65.
- 9.5.3 THE MASS OF COATING MAY BE DETERMINED FROM THE COATING THICKNESS MEASURED BY THE X-RAY FLUORESCENCE METHOD, ACCORDING TO ASTM A 754, WHEN THIS METHOD IS USED AND A DISPUTE ARISES, THE MASS SHALL BE DETERMINED BY THE STRIPPING TEST IN AASHTO T 65.

NOTE 3-----SEVERAL MAGNETIC AND ELECTRO-MAGNETIC TYPES OF COATING THICKNESS GAGES ARE COMMERCIALY AVAILABLE AND ARE A SATISFACTORY BASIS FOR ACCEPTANCE WHEN PROPERLY CALIBRATED JUST PRIOR TO INSPECTION USE (SEE ASTM E 376).

10. REJECTION AND REHEARING

- 10.1 MATERIAL TESTED BY THE PURCHASER AND FOUND NOT CONFORMING TO THIS SPECIFICATION MAY BE REJECTED SUBJECT TO THE REJECTION AND REHEARING PROVISIONS OF ASTM A 924M.

11. CERTIFICATION

- 11.1 WHEN SPECIFIED IN THE PURCHASE ORDER OR CONTRACT, A MANUFACTURER'S CERTIFICATION SHALL BE FURNISHED TO THE PURCHASER. THE CERTIFICATION SHALL BE IN ACCORDANCE WITH THE PROVISIONS OF ASTM A 924M AND SHALL INCLUDE REFERENCE TO THIS PRODUCT SPECIFICATION DESIGNATION.

- 11.2 TEST RESULTS INCLUDING CHEMICAL COMPOSITION, MECHANICAL PROPERTIES, AND MASS OF COATING FOR EACH HEAT AND COATING LOT SHALL BE MAINTAINED BY THE SHEET MANUFACTURER FOR 7 YEARS AND SHALL BE MADE AVAILABLE TO THE FABRICATOR AND PURCHASER UPON REQUEST.

12. PRODUCT MARKING

- 12.1 EACH 1.5 TO 1.5 m OF SHEET IN COILS OR CUT LENGTHS SHALL BE IDENTIFIED BY SHOWING THE FOLLOWING:
- 12.1.1 NAME OF MANUFACTURER,
 - 12.1.2 BRAND NAME,
 - 12.1.3 SPECIFIED THICKNESS,
 - 12.1.4 SPECIFIED COATING MASS,
 - 12.1.5 IDENTIFICATION SYMBOLS RELATING TO A SPECIFIC HEAT NUMBER AND COATING LOT NUMBER, AND
 - 12.1.6 AASHTO DESIGNATION NUMBER.
- 12.2 THE BRAND SHALL BE REMOVED, OBLITERATED, OR REBRANDED "NON-SPECIFICATION" ON EACH 0.5 TO 1.5m OF SHEET IN A COATING LOT OR HEAT WHERE CONTROL TESTS SHOW AS PRESCRIBED HEREIN, NONCONFORMANCE TO THIS SPECIFICATION.

STANDARD SPECIFICATION
FOR
CORRUGATED STEEL PIPE, POLYMER PRECOATED,
FOR SEWERS AND DRAINS

ASSHTO DESIGNATION: M 245m-91 (1995)
(ASTM DESIGNATION: A 762/A 762M-95a)

1.. SCOPE

- 1.1 THIS SPECIFICATION COVERS POLYMER PRECOATED CORRUGATED STEEL PIPE INTENDED FOR USE FOR STORM WATER DRAINAGE, UNDER-DRAINS, THE CONSTRUCTION OF CULVERTS, AND SIMILAR USES. PIPE COVERED BY THIS SPECIFICATION IS NOT NORMALLY USED FOR THE CONVEYANCE OF SANITARY OR INDUSTRIAL WASTES. THE STEEL SHEET USED IN FABRICATION OF THE PIPE HAS A POLYMER PROTECTIVE COATING OVER A METALLIC COATING OF ZINC (GALVANIZING), 55 ALUMINUM-ZINC ALLOY, OR ZINC-5 PERCENT ALUMINUM-MISCHMETAL ALLOY.
- 1.2 THE POLYMER COATING PROVIDES A DEGREE OF EXTRA PROTECTION FOR THE PIPE AGAINST ABRASION AND CORROSION AS COMPARED TO METALLIC-COATED PIPE WITHOUT POLYMER COATING. SOME SEVERE ENVIRONMENTS MAY CAUSE CORROSION PROBLEMS TO ACCESSORY ITEMS SUCH AS RIVETS OR COUPLING BAND HARDWARE THAT DOES NOT HAVE A POLYMER COATING. ADDITIONAL PROTECTION FOR POLYMER PRECOATED CORRUGATED STEEL PIPE CAN BE PROVIDED BY USE OF COATINGS APPLIED AFTER FABRICATION OF THE PIPE AS DESCRIBED IN M 190M.
- 1.3 THIS SPECIFICATION DOES NOT INCLUDE REQUIREMENTS FOR BEDDING BACKFILL, OR THE RELATIONSHIP BETWEEN EARTH COVER LOAD AND SHEET THICKNESS OF THE PIPE. EXPERIENCE HAS SHOWN THAT THE SUCCESSFUL PERFORMANCE OF THIS PRODUCT DEPENDS UPON THE PROPER SELECTION OF SHEET THICKNESS, TYPE OF BEDDING AND BACKFILL, CONTROLLED MANUFACTURE IN THE PLANT, AND CARE IN THE INSTALLATION. THE INSTALLATION PROCEDURE IS DESCRIBED IN AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, DIVISION II, SECTION 26.

2. REFERENCED DOCUMENTS

2.1 AASHTO STANDARDS:

SPECIFICATIONS FOR HIGHWAY BRIDGES M 190M BITUMINOUS-COATED CORRUGATED METAL CULVERT PIPE AND PIPE ARCHES
M 198 JOINTS FOR CIRCULAR CONCRETE SEWER AND CULVERT PIPE USING FLEXIBLE WATERTIGHT GASKETS.

M 218M STEEL SHEET, ZINC-COATED (GALVANIZED) FOR CORRUGATED STEEL PIPE.

M 232 ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE

M 243M FIELD APPLIED COATING OF CORRUGATED METAL STRUCTURAL PLATE FOR PIPE, PIPE-ARCHES, AND ARCHES

M 246M STEEL SHEET, METALLIC-COATED AND POLYMER PRECOATED FOR CORRUGATED STEEL PIPE

M 289M ALUMINUM-ZINC ALLOY COATED STEEL SHEET FOR CORRUGATED STEEL PIPE

M 291M CARBON AND ALLOY STEEL NUTS (METRIC)

M 298 COATINGS OF ZINC MECHANICALLY DEPOSITED ON IRON AND STEEL.

T 65 MASS OF COATING ON ZINC-COATED (GALVANIZED) IRON OR STEEL ARTICLES.

T 249M HELICAL LOCK SEAM CORRUGATED PIPE

2.2 ASTM STANDARDS

A 493 STAINLESS AND HEAT-RESISTING STEEL FOR COLD HEADING AND COLD FORGING BAR AND WIRE

A 780 REPAIR OF DAMAGED HOT-DIP GALVANIZED COATINGS

A 796 STRUCTURAL DESIGN OF CORRUGATED STEEL PIPE, PIPE-ARCHES, AND ARCHES FOR STORM AND SANITARY SEWERS

A 916M SHEET STEEL, ZINC- 5 PERCENT ALUMINUM-MISCHMETAL ALLOY-COATED BY THE HOT-DIP PROCESS FOR STORM SEWER AND DRAINAGE PIPE

B 633 ELECTRODEPOSITED COATINGS OF ZINC ON IRON AND STEEL

D 1005 MEASUREMENT OF DRY FILM THICKNESS OF ORGANIC COATINGS USING MICROMETERS

D 1056 FLEXIBLE CELLULAR MATERIALS---SPONGE OR EXPANDED RUBBER

F 568 CARBON AND ALLOY STEEL EXTERNALLY THREADED METRIC FASTENER.

3. DESCRIPTIONS OF TERMS SPECIFIC TO THIS STANDARD

3.1 FABRICATOR---IN THIS SPECIFICATION, THE PRODUCER OF THE PIPE.

- 3.2 MANUFACTURER---IN THIS SPECIFICATION, THE PRODUCER OF THE SHEET.
- 3.3 PURCHASER---IN THIS SPECIFICATION, THE PURCHASER OF THE FINISHED PRODUCT.

4. CLASSIFICATION

- 4.1 THE CORRUGATED STEEL PIPE COVERED BY THIS SPECIFICATION IS CLASSIFIED AS FOLLOWS
 - 4.1.1 TYPE I---THIS PIPE SHALL HAVE A FULL CIRCULAR CROSS-SECTION, WITH A SINGLE THICKNESS OF CORRUGATED SHEET, FABRICATED WITH ANNULAR (CIRCUMFERENTIAL) OR HELICAL CORRUGATIONS.
 - 4.1.2 TYPE 1A---THIS PIPE SHALL HAVE A FULL CIRCULAR CROSS-SECTION WITH AN OUTER SHELL OF CORRUGATED SHEET FABRICATED WITH HELICAL CORRUGATIONS AND INNER LINER OF SMOOTH (UNCORRUGATED) SHEET ATTACHED TO THE SHELL AT HELICAL LOCK SEAMS.
 - 4.1.3 TYPE IR---THIS PIPE SHALL HAVE A FULL CIRCULAR CROSS SECTION, WITH A SINGLE THICKNESS OF SMOOTH SHEET, FABRICATED WITH HELICAL RIBS PROJECTING OUTWARDLY.
 - 4.1.4 TYPE II---THIS PIPE SHALL BE A TYPE I PIPE WHICH HAS BEEN REFORMED INTO A PIPE-ARCH, HAVING AN APPROXIMATELY FLAT BOTTOM.
 - 4.1.5 TYPE IIA---THIS PIPE SHALL BE A TYPE IA PIPE WHICH HAS BEEN REFORMED INTO A PIPE-ARCH, HAVING AN APPROXIMATELY FLAT BOTTOM.
 - 4.1.6 TYPE IIR---THIS PIPE SHALL BE A TYPE IR PIPE WHICH HAS BEEN REFORMED INTO A PIPE-ARCH, HAVING AN APPROXIMATELY FLAT BOTTOM.
 - 4.1.7 TYPE III---THIS PIPE, INTENDED FOR USE AS UNDERDRAINS OR FOR UNDERGROUND DISPOSAL OF WATER, SHALL BE A TYPE I PIPE WHICH HAS BEEN PERFORATED TO PERMIT THE IN-FLOW OR OUT-FLOW OF WATER.
 - 4.1.8 TYPE IIIA---THIS PIPE, INTENDED FOR USE AS UNDERDRAINS, SHALL CONSIST OF A SEMI-CIRCULAR CROSS-SECTION, HAVING A SMOOTH (UNCORRUGATED) BOTTOM WITH A CORRUGATED TOP SHIELD.
- 4.2 PERFORATION IN TYPE III PIPE ARE INCLUDED IN TWO CLASSES AS DESCRIBED IN SECTION 8.3.2.

5. ORDERING INFORMATION

- 5.1 ORDERS FOR MATERIAL TO THIS SPECIFICATION SHALL INCLUDE THE FOLLOWING INFORMATION AS NECESSARY, TO ADEQUATELY DESCRIBE THE DESIRED PRODUCT.

- 5.1.1 NAME OF MATERIAL (POLYMER-COATED CORRUGATED STEEL PIPE);
- 5.1.2 GRADE OF POLYMER COATING INDICATING THICKNESS ON INSIDE AND OUTSIDE (SECTION 6.1.1);
- 5.1.3 TYPE OF METALLIC COATING (ZINC OR ALUMINUM-ZINC ALLOY) (SECTION 6.1.2);
- 5.1.4 AASHTO DESIGNATION AND DATE OF ISSUE;
- 5.1.5 TYPE OF PIPE (SECTION 4.1);
- 5.1.6 DIAMETER OF CIRCULAR PIPE (TABLE 6), OR SPAN AND RISE OF PIPE-ARCH SECTION (TABLES 8, 9, OR 10);
- 5.1.7 LENGTH, EITHER TOTAL LENGTH OR LENGTH OF EACH PIECE AND NUMBER OF PIECES;
- 5.1.8 DESCRIPTION OF CORRUGATIONS (SECTION 7.2);
- 5.1.9 SHEET THICKNESS (SECTION 8.1.2);
- 5.1.10 FOR TYPE I AND TYPE II PIPE, THE PIPE FABRICATION METHOD, WHETHER WITH ANNULAR CORRUGATIONS OR HELICAL CORRUGATIONS (SECTION 7.1.1) (NOTE 1);
- 5.1.11 COUPLING BANDS, NUMBER, AND TYPE (SECTION 9.1) IF SPECIAL TYPE IS REQUIRED;
- 5.1.12 GASKETS FOR COUPLING HANDS, IF REQUIRED (SECTION 9.3);
- 5.1.13 FOR TYPE III PIPE, CLASS OF PERFORATIONS, IF OTHER THAN CLASS I (SECTION 8.3.2);
- 5.1.14 CERTIFICATION, IF REQUIRED (SECTION 14.1); AND
- 5.1.15 SPECIAL REQUIREMENTS

NOTE 1---PIPE MANUFACTURED WITH ANNULAR CORRUGATIONS MAY HAVE AN ELEMENT OF WEAKNESS IN THE LONGITUDINAL SEAMS AS COMPARED TO PIPE WITH HELICAL CORRUGATIONS. THEREFORE, CONSIDERATION OF THE METHOD OF FABRICATION IS IMPORTANT WHEN PIPE IS INSTALLED UNDER CERTAIN CONDITIONS OF LOADING.

6. MATERIALS

- 6.1 STEEL SHEET FOR PIPE---ALL PIPE FABRICATED UNDER THIS SPECIFICATION SHALL BE FORMED FROM POLYMER PRECOATED SHEET CONFORMING TO M 246M.
 - 6.1.1 THE GRADE OF COATING SHALL BE STATED IN THE ORDER, AND THE POLYMER COATING THICKNESS ON BOTH INSIDE AND OUTSIDE OF THE PIPE. THE POLYMER COATING IS CLASSIFIED BY GRADE CORRESPONDING TO THE THICKNESS IN MICROMETERS ON EACH SIDE IN SI UNITS. THE FOLLOWING GRADES ARE USUALLY AVAILABLE (SEE TABLE ENTITLED "GRADES").

- 6.1.1.1 ANY COMBINATION OF POLYMER COATING THICKNESSES OR OTHER THAN SHOWN ABOVE IS SUBJECT TO AGREEMENT BETWEEN THE MANUFACTURER AND PURCHASER OR FABRICATOR.
- 6.1.2 THE POLYMER COATING IS APPLIED TO STEEL SHEET HAVING A METALLIC COATING OF ZINC OR ALUMINUM-ZINC ALLOY, AS DESCRIBED IN M 218M, M 289M, OR ASTM A 916M, RESPECTIVELY. THE TYPE OF METALLIC COATING SHOULD BE STATED IN THE ORDER, CONSISTENT WITH THICKNESS AVAILABILITY AS SHOWN IN TABLE 7. IF THE TYPE OF METALLIC COATING IS NOT STATED, ZINC-COATED SHEET CONFORMING TO M 218M SHALL BE USED. ALL PIPE FURNISHED ON THE ORDER SHALL HAVE THE SAME METALLIC COATING UNLESS OTHERWISE SPECIFIED.
- 6.2 STEEL SHEET FOR COUPLING BANDS---THE SHEET USED IN FABRICATING COUPLING BANDS SHALL CONFORM TO M 246M WITH THE SAME POLYMER COATING GRADE AS THAT USED FOR FABRICATON OF THE PIPE FURNISHED UNDER THE ORDER, AND HAVING THE SAME METALLIC COATING.
 - 6.2.1 AS AN ALTERNATE, THE STEEL SHEET FOR COUPLING BANDS SHALL CONFORM TO M 218M, M 289M, OR ASTM 916M (WITH THE SAME METALLIC COATING AS THE PIPE), WITH THE SHEET HAVING A BITUMINOUS COATING ACCORDING TO M 190M, EXCEPT THE THICKNESS REQUIREMENTS SHALL NOT APPLY.
 - 6.2.2 WHEN SPECIFICALLY PERMITTED BY THE PURCHASER, COUPLING BANDS SHALL BE MADE OF STEEL SHEET CONFORMING TO THE SPECIFICATION LISTED OR SECTION 6.2.1 HAVING THE SAME METALLIC COATING AS THE PIPE, BUT WITHOUT BITUMINOUS COATINGS.
- 6.3 RIVETS---THE RIVETS USED IN RIVETED PIPE SHALL BE OF THE SAME MATERIAL AS THE BASE MATERIAL SPECIFIED FOR THE CORRUGATED SHEETS. THEY SHALL BE THOROUGHLY GALVANIZED OR SHERARDIZED. IF BOLTS AND NUTS ARE SUBSTITUTED FOR RIVETS (SEE SECTION 7.3.1), THEY SHALL MEET THE FOLLOWING REQUIREMENTS (SEE TABLE ENTITLED "BOLTS AND NUTS").
 - THE BOLTS AND NUTS SHALL BE HOT-DIP GALVANZIED IN CONFORMANCE WITH M 232, OR BE MECHANICALLY GALVANIZED IN CONFORMANCE WITH M 298 CLASS 40.
 - 6.3.1 WHEN SPECIFIED IN THE ORDER, RIVETS USED IN RIVETED PIPE TO BE INSTALLED IN SEVERELY CORROSIVE ENVIRONMENTS SHALL BE MADE OF STAINLESS STEEL CONFORMING TO ANY OF THE S3XXXX DESIGNATIONS IN ASTM A 493. STAINLESS STEEL

RIVETS MAY BE SUBSTITUTED FOR THOSE DESCRIBED IN SECTION 6.3 AT THE FABRICATOR'S OPTION.

NOTE 2---SOME POLYMER PRECOATED PIPE IN A SEVERE ENVIRONMENT IS REPORTED TO HAVE FAILED DUE TO CORROSION OF RIVETS CONFORMING TO SECTION 6.3, WHILE THE SHEET WAS ESSENTIALLY UNAFFECTED. THE USE OF STAINLESS STEEL RIVETS IS RECOMMENDED TO OVERCOME SUCH PROBLEMS.

GRADES		
GRADE	PREVIOUS DESIGNATION	COATING THICKNESS p.m
	TYPE A	250/0
250/75	TYPE B	250/75
250/250		250/250

BOLTS AND NUTS		
	BOLTS	NUTS
FOR PIPE FABRICATION FOR M 245M PIPE	F 568. CI. 8.8	M 291M CI. 12
FOR COUPLING BANDS FOR M 245M PIPE	F 568. CI. 4.6	M 291M CI. 5

6.4 HARDWARE FOR COUPLING BANDS---

BOLTS AND NUTS FOR COUPLING BANDS SHALL CONFORM TO THE FOLLOWING REQUIREMENTS (SEE TABLE ENTITLED "BOLTS AND NUTS"). BOLTS, NUTS, AND OTHER THREADED ITEMS USED WITH COUPLING BANDS SHALL BE ZINC COATED BY ONE OF THE FOLLOWING PROCESSES: HOT-DIP PROCESS AS PROVIDED IN AASHTO M 232; ELECTROPLATING PROCESS AS PROVIDED IN ASTM B 633, CLASS Fe/Zn 8; OR MECHANICAL PROCESS AS PROVIDED IN M 298, CLASS 8. OTHER HARDWARE ITEMS USED WITH COUPLING BANDS SHALL BE ZINC COATED BY ONE OF THE FOLLOWING PROCESSES; HOT-DIP PROCESS AS PROVIDED IN M 232; ELECTROPLATING PROCESS AS

PROVIDED IN ASTM B 633, CLASS Fe/Zn 25; OR MECHANICAL PROCESS AS PROVIDED IN AASHTO M 298, CLASS 25.

- 6.5 GASKETS---IF GASKETS ARE USED IN COUPLINGS, THEY SHALL BE A BAND OF EXPANDED RUBBER MEETING THE REQUIREMENTS OF ASTM D 1056 FOR THE "RE" CLOSED CELL GRADES, OR O-RINGS MEETING THE REQUIREMENTS OF M 198.

7. FABRICATION

- 7.1 GENERAL REQUIREMENTS---PIPE SHALL BE FABRICATED IN FULL CIRCULAR CROSS SECTION EXCEPT FOR "TYPE IIIA WHICH IS DESCRIBED IN SECTION 8.4.
- 7.1.1 TYPE I PIPE SHALL HAVE ANNULAR CORRUGATIONS WITH LAP JOINTS FASTENED WITH RIVETS OR SHALL HAVE HELICAL CORRUGATIONS WITH A CONTINUOUS LOCK SEAM EXTENDING FROM END TO END OF EACH LENGTH OF PIPE. THE TYPE OF FABRICATION USED SHALL BE THE OPTION OF THE FABRICATOR UNLESS OTHERWISE SPECIFIED.
- 7.1.2 TYPE IA PIPE SHALL BE FABRICATED WITH A SMOOTH LINER AND HELICALLY CORRUGATED SHELL INTEGRALLY ATTACHED AT HELICAL LOCK SEAMS EXTENDING FROM END TO END OF EACH LENGTH OF PIPE. THE SHELL SHALL HAVE CORRUGATIONS OF NOMINAL 68 OR 75 mm PITCH.
- 7.1.3 TYPE IR PIPE SHALL BE FABRICATED WITH HELICAL RIBS PROJECTING OUTWARD WITH A CONTINUOUS LOCK SEAM EXTENDING FROM END TO END OF EACH LENGTH OF PIPE.
- 7.2 CORRUGATIONS---THE CORRUGATIONS SHALL BE EITHER ANNULAR OR HELICAL AS PROVIDED IN SECTION 7.1. THE DIRECTION OF THE CRESTS AND VALLEYS OF HELICAL CORRUGATIONS SHALL NOT BE LESS THAN 60 DEGREES FROM THE AXIS OF THE PIPE FOR PIPE DIAMETERS LARGER THAN 500 mm AND NOT LESS THAN 45 DEGREES FROM THE AXIS FOR PIPE DIAMETERS OF 500 mm AND SMALLER.
- 7.2.1 FOR TYPE I AND IA PIPE, CORRUGATIONS SHALL FORM SMOOTH CONTINUOUS CURVES AND TANGENTS. THE DIMENSIONS OF THE CORRUGATIONS SHALL BE IN ACCORDANCE WITH TABLE 1 FOR THE SIZE INDICATED IN THE ORDER, EXCEPT IF THE DEPTH MEASUREMENT OF ONE OR MORE CORRUGATIONS IS LESS THAN THE MINIMUM DEPTH IN TABLE 1, THE DEPTH OF ALL CORRUGATIONS BETWEEN ADJACENT SEAMS SHALL BE MEASURED AND THE VALUES OF TABLE 1 FOR MINIMUM AVERAGE DEPTH AND MINIMUM CORRUGATION DEPTH SHALL APPLY.

NOTE 3---INSPECTION FREQUENTLY CONSISTS OF MEASUREMENT OF DEPTH OF ONE OR A FEW CORRUGATIONS. IF SUCH MEASUREMENT INDICATES INSUFFICIENT DEPTH, APPLICATION OF THE REQUIREMENTS IN TABLE 2 PROVIDES FOR ACCEPTANCE WHERE GREATER DEPTH OF SOME CORRUGATIONS COMPENSATES FOR LACK OF DEPTH OF OTHERS. THESE MEASUREMENTS WOULD NORMALLY BE MADE AT ONE LOCATION BETWEEN SEAMS ON A LENGTH OF PIPE.

- 7.2.2 FOR TYPE IR PIPE, THE CORRUGATIONS SHALL BE ESSENTIALLY RECTANGULAR RIBS PROJECTING OUTWARD FROM THE PIPE WALL. THE DIMENSIONS-AND SPACING OF THE RIBS SHALL BE IN ACCORDANCE WITH TABLE 3 FOR THE SIZE INDICATED ON THE ORDER. FOR THE 292 mm RIB SPACING, IF THE SHEET BETWEEN THE RIBS DOES NOT INCLUDE A LOCK SEAM, A STIFFENER SHALL BE INCLUDED MIDWAY BETWEEN THE RIBS. THIS STIFFENER SHALL HAVE A NOMINAL RADIUS OF 6.4 mm AND A MINIMUM HEIGHT OF 5.1 mm TOWARD THE OUTSIDE OF THE PIPE.

NOTE 4---THE NOMINAL DIMENSIONS AND PROPERTIES FOR SMOOTH CORRUGATIONS AND FOR RIBS ARE GIVEN IN AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, DIVISION I, SECTION 12, AND IN ASTM A 796.

- 7.3 RIVETED SEAMS---THE LONGITUDINAL SEAMS SHALL BE STAGGERED TO THE EXTENT THAT NO MORE THAN THREE THICKNESSES OF SHEET ARE FASTENED BY ANY RIVET. PIPE TO BE REFORMED INTO PIPE-ARCH SHAPE SHALL HAVE SEAMS MEETING THE LONGITUDINAL SEAM REQUIREMENTS OF SECTION 8.2.2.

NOTE 5---FABRICATION OF PIPE WITHOUT LONGITUDINAL SEAMS IN 120 DEGREES OF ARC, SO THAT THE PIPE MAY BE INSTALLED WITHOUT LONGITUDINAL SEAMS IN THE INVERT, IS SUBJECT TO NEGOTIATION BETWEEN THE PURCHASER AND FABRICATOR.

- 7.3.1 THE SIZE OF RIVETS, NUMBER PER CORRUGATION, AND WIDTH OF LAP AT THE LONGITUDINAL SEAM SHALL BE AS STATED IN TABLE 4, DEPENDING ON SHEET THICKNESS, CORRUGATION SIZE, AND DIAMETER OF PIPE. FOR PIPE WITH 25 mm DEEP CORRUGATIONS, M 12 DIAMETER BOLTS AND NUTS MAY BE USED IN LIEU OF RIVETS ON A ONE-FOR-ONE REPLACEMENT RATIO. CIRCUMFERENTIAL SEAMS SHALL BE RIVETED USING RIVETS OF THE SAME SIZE AS FOR LONGITUDINAL SEAMS AND SHALL HAVE A MAXIMUM RIVET, SPACING OF 150 mm,

MEASURED ON CENTERS, EXCEPT THAT SIX RIVETS WILL BE SUFFICIENT IN 300 mm DIAMETER PIPE.

TABLE 1 CORRUGATION REQUIREMENTS FOR TYPE I, IA, II, IIA, AND III PIPE

NOMINAL SIZE	MAXIMUM PITCH	MINIMUM DEPTH	INSIDE RADIUS	
			NOMINAL	MINIMUM
ALL VALUES IN MILLIMETERS				
38 BY 6.5	48	6.0	1	6.5
68 BY 13	73	12	17	12
75 BY 25	83	24	14	12
125 BY 25	135	24	40	36

TABLE 2 REFEREE REQUIREMENTS FOR CORRUGATION DEPTH

NOMINAL SIZE	DIAMETER	MINIMUM AVERAGE DEPTH	MINIMUM CORRUGATION DEPTH
ALL VALUES IN MILLIMETERS			
38 BY 6.5	ALL	6.1	5.0
68 BY 13	300 THRU 525	12.1	10.0
68 BY 13	OVER 525	12.4	11.0
75 BY 25	ALL	24.9	23.0
125 BY 25	ALL	24.9	23.0

*SEE SECTION 7.2.1 FOR APPLICATION OF TABLE 2

7.3.2 ALL RIVETS SHALL BE DRIVEN COLD IN SUCH A MANNER THAT THE SHEETS SHALL BE DRAWN TIGHTLY TOGETHER THROUGHOUT THE ENTIRE LAP. THE CENTER OF A RIVET SHALL BE NO CLOSER THAN TWICE ITS DIAMETER FROM THE EDGE OF THE SHEET. ALL RIVETS SHALL HAVE NEAT, WORKMANLIKE, AND FULL HEMISPHERICAL HEADS OR HEADS OF A FORM ACCEPTABLE TO THE PURCHASER, SHALL BE DRIVEN WITHOUT BENDING, AND SHALL COMPLETELY FILL THE HOLE.

7.4 HELICAL LOCK SEAMS---THE LOCK SEAM FOR TYPE I PIPE SHALL BE FORMED IN THE TANGENT ELEMENT OF THE CORRUGATION PROFILE WITH ITS CENTER NEAR THE NEUTRAL AXIS OF THE CORRUGATION PROFILE. THE LOCK SEAM FOR TYPE IA PIPE SHALL BE IN THE VALLEY OF THE CORRUGATION, SHALL BE SPACED NOT MORE THAN 760 mm APART, AND SHALL BE FORMED FROM BOTH THE LINER AND

THE SHELL IN THE SAME GENERAL MANNER AS TYPE I HELICAL LOCK SEAM PIPE. THE LOCK SEAM FOR TYPE IR PIPE SHALL BE FORMED IN THE FLAT ZONE OF THE PIPE WALL, MIDWAY BETWEEN TWO RIBS.

- 7.4.1 THE EDGES OF THE SHEETS WITHIN THE CROSS-SECTION OF THE LOCK SEAM SHALL LAP AT LEAST 4.0 mm FOR PIPE 250 mm IN DIAMETER, WITH AN OCCASIONAL TOLERANCE OF MINUS 10 PERCENT OF LAP WIDTH ALLOWABLE. THE LAPPED SURFACES SHALL BE IN TIGHT CONTACT, THE PROFILE OF THE SHEET SHALL INCLUDE A RETAINING OFFSET ADJACENT TO THE 180-DEGREE FOLD (AS DESCRIBED IN T 249M) OF ONE SHEET THICKNESS ON ONE SIDE OF THE LOCK SEAM, OR ONE-HALF SHEET THICKNESS ON BOTH SIDES OF THE LOCK SEAM, AT THE FABRICATOR'S OPTION. THERE SHALL BE NO VISIBLE CRACKS IN THE METAL, LOSS OF METAL-TO-METAL CONTACT, OR EXCESSIVE ANGULARITY ON THE INTERIOR OF THE 180-DEGREE FOLD OF METAL AT THE COMPLETION OF FORMING THE LOCK SEAM.
- 7.4.2 SPECIMENS CUT FROM PRODUCTION PIPE NORMAL TO AND ACROSS THE LOCK SEAM SHALL DEVELOP THE TENSILE STRENGTH AS PROVIDED IN TABLE 5, WHEN TESTED ACCORDING TO AASHTO T 249M. FOR TYPE IA PIPE, THE LOCK SEAM STRENGTH SHALL BE AS TABULATED BASED ON THE THICKNESS OF THE CORRUGATED SHELL.
- 7.4.3 WHEN THE ENDS OF HELICALLY CORRUGATED LOCK SEAM PIPE HAVE BEEN RE-ROLLED TO FORM ANNULAR CORRUGATIONS, EITHER WITH OR WITHOUT A FLANGED END FINISH, THE LOCK SEAM IN THE REROLLED END SHALL NOT CONTAIN ANY VISIBLE CRACKS IN THE BASE METAL AND THE TENSILE STRENGTH OF THE LOCK SEAM SHALL BE NOT LESS THAN 60 PERCENT OF THAT REQUIRED IN SECTION 7.4.2.

7.5 END FINISH:

- 7.5.1 TO FACILITATE FIELD JOINTING, THE ENDS OF THE INDIVIDUAL PIPE SECTIONS WITH HELICAL CORRUGATIONS MAY BE REROLLED TO FORM ANNULAR CORRUGATIONS EXTENDING AT LEAST TWO CORRUGATIONS FROM THE PIPE END, OR TO FORM AN UPTURNED FLANGE MEETING THE REQUIREMENTS IN SECTION 7.5.2, OR BOTH. THE DIAMETER OF ENDS SHALL NOT EXCEED THAT OF THE PIPE BARREL BY MORE THAN THE DEPTH OF THE CORRUGATION. ALL TYPES OF PIPE ENDS, WHETHER REROLLED OR NOT, SHALL BE MATCHED IN A JOINT SUCH THAT

THE MAXIMUM DIFFERENCE IN THE DIAMETER OF ABUTTING PIPE ENDS IS 13 mm.

7.5.1.1 WHEN PIPE WITH ANY SIZE HELICAL CORRUGATION OR RIB IS REROLLED TO FORM ANNULAR CORRUGATIONS IN THE ENDS, THE USUAL SIZE OF THE ANNULAR CORRUGATIONS IS 68 BY 13 mm.

7.5.2 IF A FLANGED FINISH IS USED ON THE ENDS OF INDIVIDUAL PIPE SECTIONS TO FACILITATE FIELD JOINTING, THE FLANGE SHALL BE UNIFORM IN WIDTH, BE NOT LESS THAN 13 mm WIDE, AND SHALL BE SQUARE TO THE LONGITUDINAL AXIS OF THE PIPE.

7.5.3 THE ENDS OF ALL PIPE WHICH WILL FORM THE INLET AND OUTLET OF CULVERTS, FABRICATED OF SHEETS HAVING NOMINAL THICKNESSES OF 2.01 mm AND LESS, SHALL BE REINFORCED IN A MANNER APPROVED BY THE PURCHASER, WHEN SPECIFIED.

TABLE 3 RIB REQUIREMENTS FOR TYPES IR AND IIR PIPE

NOMINAL SIZE	RIB			INSIDE RADIUS	
	MINIMUM WIDTH	MINIMUM DEPTH	MAXIMUM SPACING	MINIMUM	MAXIMUM
MILLIMETERS					
19 X 19 X 190	17	18	197	2.5	4.3
19 X 25 X 292	17	24	298	2.5	4.3

WIDTH IS A MEASUREMENT OF THE INSIDE OF THE RIB. ALTERNATELY, IT CAN BE MEASURED OUTSIDE OF THE RIB AND SHALL MEET OR EXCEED THE MINIMUM WIDTH PLUS 2 WALL THICKNESSES--- $2t + 17\text{mm}$.

DEPTH IS MEASURED AS THE MINIMUM VERTICAL DISTANCE FROM A STRAIGHTEDGE RESTING ON THE TOPS OF THE RIBS PARALLEL TO THE AXIS OF THE PIPE TO THE OUTSIDE SURFACE OF THE FLAT.

SPACING IS MEASURED CENTER TO CENTER OF THE RIBS, AT 90 DEGREES TO THE DIRECTION OF THE RIBS.

TABLE 4 RIVETED LONGITUDINAL SEAMS

NOMINAL CORRUGATION SIZE			
SPECIFIED SHEET THICKNESS	68 X 13 mm	75 X 25 mm	125 X 25 mm
RIVET DIAMETERS, MINIMUM			
mm	mm	mm	mm
1.32	8.0	---	---
1.63	8.0	9.5	9.5
2.01	8.0	9.5	9.5
2.77	9.5	11.0	11.0
3.51	9.5	11.0	11.0
4.27	9.5	11.0	11.0

ONE RIVET EACH VALLEY FOR PIPE DIAMETERS 900 mm AND SMALLER. TWO RIVETS EACH VALLEY FOR PIPE DIAMETERS 1000 mm AND LARGER.

TWO RIVETS EACH VALLEY FOR ALL PIPE DIAMETERS.

TWO RIVETS EACH CREST AND VALLEY FOR ALL PIPE DIAMETERS

MINIMUM WIDTH OF LAP: 38mm FOR PIPE DIAMETERS 900mm AND SMALLER, AND 75mm FOR PIPE DIAMETERS 1050mm AND LARGER.

MINIMUM WIDTH OF LAP: 75mm FOR ALL PIPE DIAMETERS.

TABLE 5 LOCK SEAM TENSILE STRENGTH

SPECIFIED SHEET THICKNESS mm	LOCK SEAM TENSILE STRENGTH PER UNIT WIDTH, MINIMUM kN/m
1.02	30
1.32	42
1.63	60
2.01	91
2.77	122
3.50	154

4.27

210

FOR TYPE 1A PIPE, THE THICKNESS SHALL BE THAT OF THE CORRUGATED SHELL.

8. PIPE REQUIREMENTS

8.1 TYPE I, TYPE 1A, AND TYPE IR PIPE.

8.1.1 PIPE DIMENSIONS---THE NOMINAL DIAMETER OF THE PIPE SHALL BE AS STATED IN THE ORDER, SELECTED FROM THE SIZES LISTED IN TABLE 6. THE SIZE OF CORRUGATIONS WHICH ARE STANDARD FOR EACH SIZE OF PIPE ARE ALSO SHOWN IN TABLE 6. THE AVERAGE INSIDE DIAMETER OF CIRCULAR PIPE AND PIPE TO BE REFORMED INTO PIPE-ARCHES SHALL NOT VARY MORE THAN 1 PERCENT OR 13 mm WHICHEVER IS GREATER, FROM THE NOMINAL DIAMETER WHEN MEASURED ON THE INSIDE DIAMETER REQUIREMENT MAY BE DETERMINED BY MEASURING THE OUTSIDE CIRCUMFERENCE, FOR WHICH MINIMUM VALUES ARE GIVEN IN TABLE 6.

NOTE 6---THE OUTSIDE CIRCUMFERENCE OF HELICALLY CORRUGATED PIPE IS INFLUENCED BY THE CORRUGATION SIZE AND THE ANGLE OF THE CORRUGATIONS, AFFECTING THE NUMBER OF CORRUGATIONS CROSSED, THEREFORE NO MINIMUM CIRCUMFERENTIAL MEASUREMENT CAN BE SPECIFIED.

8.1.2 SHEET THICKNESS---SHEET THICKNESS SHALL BE SPECIFIED BY THE PURCHASER FROM THE SPECIFIED SHEET THICKNESSES LISTED IN TABLE 7 (NOTES 7 AND 8). FOR TYPE 1A PIPE, THE THICKNESS OF BOTH THE SHELL AND THE LINER SHALL BE GIVEN; THE THICKNESS OF THE CORRUGATED SHELL SHALL NOT BE LESS THAN 60 PERCENT OF THE THICKNESS OF THE EQUIVALENT TYPE I PIPE; THE LINER SHALL HAVE A NOMINAL THICKNESS OF AT LEAST 1.02mm AND THE SUM OF THE SPECIFIED THICKNESSES OF SHELL AND LINER SHALL EQUAL OR EXCEED THE SPECIFIED THICKNESS OF AN EQUIVALENT PIPE OF IDENTICAL CORRUGATIONS AS THE SHELL ACCORDING TO THE DESIGN CRITERIA IN AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES.

NOTE 7---THE SHEET THICKNESSES INDICATED IN TABLE 7 ARE THE THICKNESSES LISTED AS AVAILABLE IN M 246M. THE SPECIFIED THICKNESS IS BASED ON THE THICKNESS OF THE METALLIC COATED SHEET, NOT INCLUDING THE THICKNESS OF POLYMER COATING.

NOTE 8---THE PURCHASER SHOULD DETERMINE THE REQUIRED THICKNESS FOR EACH OF THE TYPES OF PIPE DESCRIBED IN SECTION 4.1.1 THROUGH 4.1.6, ACCORDING TO THE DESIGN CRITERIA IN AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, DIVISION 1, SECTION 12, OR OTHER APPROPRIATE GUIDELINES.

- 8.1.3 WHEN SPECIFIED BY THE PURCHASER, THE FINISHED PIPE SHALL BE FACTORY ELONGATED TO THE EXTENT SPECIFIED. THE ELONGATIONS SHALL BE ACCOMPLISHED BY THE USE OF A MECHANICAL APPARATUS WHICH WILL PRODUCE A UNIFORM DEFORMATION THROUGHOUT THE LENGTH OF THE SECTION.

8.2 TYPE II, IIA, AND IIR PIPE:

- 8.2.1 PIPE-ARCH DIMENSIONS---PIPE FURNISHED AS TYPE II, IIA, OR IIR SHALL BE MADE FROM TYPE I, IA OR IR PIPE RESPECTIVELY, AND SHALL BE REFORMED TO PROVIDE A PIPE-ARCH SHAPE. ALL APPLICABLE REQUIREMENTS FOR TYPES I, IA, AND IR PIPE SHALL BE MET BY FINISHED TYPES II, IIA, AND IIR PIPE, RESPECTIVELY. PIPE-ARCHES SHALL CONFORM TO THE DIMENSIONAL REQUIREMENTS OF TABLES 8, 9, OR 10. ALL DIMENSIONS SHALL BE MEASURED FROM THE INSIDE CRESTS OF CORRUGATIONS FOR TYPE II PIPE OR FROM THE INSIDE LINER OR SURFACE FOR TYPES IIA OR IIR PIPE, RESPECTIVELY.
- 8.2.2 LONGITUDINAL SEAMS ---LONGITUDINAL SEAMS OF RIVETED PIPE ARCHES SHALL NOT BE PLACED IN THE CORNER RADIUS.
- 8.2.3 REFORMING TYPE IR INTO TYPE IIR PIPE SHALL BE DONE IN SUCH A MANNER AS TO AVOID DAMAGE TO THE EXTERNAL RIBS.

8.3 TYPE III PIPE;

- 8.3.1 TYPE III PIPE SHALL HAVE A FULL CIRCULAR CROSS-SECTION AND SHALL CONFORM TO THE REQUIREMENTS FOR TYPE I PIPE, AND IN ADDITION SHALL CONTAIN PERFORATIONS CONFORMING TO ONE OF THE CLASS DESCRIBED IN SECTION 8.3.2.
- 8.3.2 PERFORATIONS---THE PREFORATIONS SHALL CONFORM TO THE REQUIREMENTS FOR CLASS I, UNLESS OTHERWISE SPECIFIED IN THE ORDER. CLASS I PERFORATIONS ARE FOR PIPE INTENDED TO BE USED FOR SUBSURFACE DRAINAGE. CLASS 2 PERFORATIONS ARE FOR PIPE INTENDED TO BE USED FOR SUBSURFACE DISPOSAL OF WATER, BUT PIPE CONTAINING CLASS 2 PERFORATIONS MAY ALSO BE USED FOR SUBSURFACE DRAINAGE.
 - 8.3.2.1 CLASS 1 PERFORATIONS---THE PERFORATIONS SHALL BE APPROXIMATELY CIRCULAR AND CLEANLY CUT, SHALL HAVE NOMINAL DIAMETERS OF NOT LESS THAN 4.8 mm NOR

GREATER THAN 9.5mm AND SHALL BE ARRANGED IN ROWS PARALLEL TO THE AXIS OF THE PIPE. THE PERFORATIONS SHALL BE LOCATED ON THE INSIDE CRESTS OR ALONG THE NEUTRAL AXIS OF THE CORRUGATIONS, WITH ONE PERFORATION IN EACH ROW FOR EACH CORRUGATION. PIPE CONNECTED BY COUPLINGS OR BANDS MAY BE UNPERFORATED WITHIN 100mm OF EACH END OF EACH LENGTH OF PIPE. THE ROWS OF PERFORATIONS SHALL BE ARRANGED IN TWO EQUAL GROUPS PLACED SYMMETRICALLY ON EITHER SIDE OF A LOWER UNPERFORATED SEGMENT CORRESPONDING TO THE FLOW LINE OF THE PIPE. THE SPACING OF THE ROWS SHALL BE UNIFORM. THE DISTANCE BETWEEN THE CENTER LINES OF ROWS SHALL BE NOT LESS THAN 25mm. THE MINIMUM NUMBER OF LONGITUDINAL ROWS OF PERFORATIONS, THE MAXIMUM HEIGHTS OF THE CENTER LINES OF THE UPPERMOST ROWS ABOVE THE BOTTOM OF THE INVERT, AND THE INSIDE CHORD LENGTHS OF THE UNPERFORATED SEGMENTS ILLUSTRATED IN FIGURE 1 SHALL BE AS SPECIFIED IN TABLE II.

NOTE 9---PIPE WITH CLASS 1 PERFORATIONS IS GENERALLY AVAILABLE IN DIAMETERS FROM 100 TO 525mm INCLUSIVE, ALTHOUGH PERFORATED PIPE IN LARGER SIZES MAY BE OBTAINED.

SPECIFICATIONS FOR MATERIALS

TABLE 6 PIPE SIZES

NOMINAL INSIDE DIAMETER mm	CORRUGATION SIZES				MINIMUM OUTSIDE CIRCUMFERENCE	
	38 BY 6.5mm	68 BY 13mm	75 BY 25mm	125 By 25MM	RIBBED PI PE	mm
100	X					284
150	X					441
200	X					598
250	X					755
300	X	X				912
375	X	X				1148
450	X	X			X	1383
525		X			X	1620

600	X			X	1854
675	X			X	2091
750	X			X	2483
825	X			X	2561
900	X	X		X	2797
1050	X	X		X	3269
1200	X	X		X	3739
1350	X	X		X	4209
1500	X	X		X	4675
1650	X	X		X	5142
1800	X	X		X	5609
1950	X	X		X	6075
2100	X	X		X	6542
2250		X		X	7008
2400		X		X	7475
2550		X		X	7941
2700		X		X	8408
2850		X			8874
3000		X			9341
3150		X			9807
3300		X			10274
3450		X			10740
3600		X			11207

AN "X" INDICATES STANDARD CORRUGATION SIZES FOR EACH NOMINAL DIAMETER OF PIPE.

MEASURED IN VALLEY OF ANNULAR CORRUGATIONS. NOT APPLICABLE TO HELICALLY CORRUGATED PIPE.

RIB SIZES 19 X 19 X 190mm AND 19 X 25 X 292mm

TABLE 7 THICKNESSES OF METALLIC COATED STEEL SHEET

SPECIFIED THICKNESS	SPECIFICATION DESIGNATION		
	ASTM A 916M Zn-5A1 MM ALLOY COATED	M 218M ZINC COATED	M 289M 55 ALUMINUM-ZINC ALLOY COATED
mm			
1.02	X	X	X
1.32	X	X	X
1.63	X	X	X
2.01	X	X	X
2.77	X	X	X
3.51	X	X	X
4.27	X	X	

AN "X" INDICATES SHEET THICKNESS INCLUDED IN THE APPLICABLE SPECIFICATION WHICH ARE REFERENCED IN M 246M. THE SPECIFIED THICKNESS

IS THE THICKNESS OF THE METALLIC-COATED STEEL SHEET AND DOES NOT INCLUDE THE THICKNESS OF THE POLYMER COATING.

8.3.2.2 CLASS 2 PERFORATIONS---THE PERFORATIONS SHALL BE CIRCULAR HOLES WITH NOMINAL DIAMETERS OF 8.0 TO 9.5mm OR SLOTS WITH NOMINAL WIDTH OF 4.8 TO 8.0 mm AND NOT TO EXCEED 13 mm IN LENGTH. THE PERFORATIONS SHALL BE UNIFORMLY SPACED AROUND THE FULL PERIPHERY OF THE PIPE. THE PERFORATIONS SHALL PROVIDE AN OPENING AREA OF NOT LESS THAN 230 SQUARE CENTIMETERS PER SQUARE METER OF PIPE SURFACE BASED ON NOMINAL DIAMETER AND LENGTH OF PIPE.

NOTE 10---323 PERFORATIONS, 9.5mm DIAMETER, PER SQUARE METER SATISFIES THIS REQUIREMENT.

8.4 TYPE IIIA PIPE:

8.4.1 TYPE IIIA PIPE SHALL BE FABRICATED OF AN UNPERFORATED SEMICIRCULAR BOTTOM SECTION WITH A TOP SHIELD OF CORRUGATED STEEL, BOTH OF NOMINAL 1.32mm THICKNESS OR GREATER. THE SMOOTH SEMICIRCULAR BOTTOM SECTION SHALL BE APPROXIMATELY 120mm IN DIAMETER AND SHALL HAVE A CONTINUOUS LIP EXTENDING OUTWARD ALONG EACH SIDE; THE CORRUGATED TOP SHIELD SHALL BE APPROXIMATELY 160mm WIDE INCLUDING A 19mm SLOPING OVERHANG ON EACH SIDE AND SHALL BE SECURED TO THE LIP OF THE BOTTOM SECTION BY INTEGRAL TABS SPACED AT ABOUT 90mm CENTER TO CENTER. THE TOP SHIELD SHALL HAVE CORRUGATIONS APPROXIMATELY 22mm CENTER TO CENTER AND APPROXIMATELY 8.0mm DEPTH

9. COUPLING BANDS

9.1 TYPES OF COUPLING BANDS---FIELD JOINTS FOR EACH TYPE OF CORRUGATED STEEL PIPE SHALL MAINTAIN PIPE ALIGNMENT DURING CONSTRUCTION AND PREVENT INFILTRATION OF FILL MATERIAL DURING THE LIFE OF THE INSTALLATION. COUPLING BANDS MAY BE OF THE FOLLOWING TYPES:

BANDS WITH ANNULAR CORRUGATIONS,
BANDS WITH HELICAL CORRUGATIONS,
BANDS WITH PROJECTIONS (DIMPLES),
CHANNEL BANDS FOR UPTURNED FLANGES, WITH OR WITHOUT ANNULAR CORRUGATIONS.
FLAT BANDS, AND

SMOOTH SLEEVE-TYPE COUPLERS.

EXCEPT AS PROVIDED IN SECTIONS 9.1.1 THROUGH 9.1.4, THE TYPE OF COUPLING FURNISHED SHALL BE AT THE OPTION OF THE FABRICATOR UNLESS THE TYPE IS SPECIFIED IN THE ORDER.

NOTE 11----BANDS ARE CLASSIFIED ACCORDING TO THEIR ABILITY TO RESIST SHEAR, MOMENT, AND TENSILE FORCES AS DESCRIBED IN AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY RIDGES, DIVISION II, SECTION 23, AND IDENTIFIED AS "STANDARD JOINTS" AND "SPECIAL JOINTS." THE FIRST FOUR TYPES OF BANDS LISTED IN SECTION 9.1, AND MEETING THE REQUIREMENTS OF SECTION 9.2, ARE EXPECTED TO MEET THE REQUIREMENTS FOR "STANDARD JOINTS." SOME MAY ALSO BE ABLE TO MEET THE REQUIREMENTS FOR "SPECIAL JOINTS," BUT SUCH CAPABILITY SHOULD BE DETERMINED BY ANALYSIS OR TEST.

- 9.1.1 COUPLING BANDS WITH ANNULAR CORRUGATIONS SHALL BE USED ONLY WITH PIPE WITH ANNULAR CORRUGATIONS, OR HELICAL PIPE IN WHICH THE ENDS HAVE BEEN REROLLED TO FORM ANNULAR CORRUGATIONS. THE CORRUGATIONS IN THE BAND SHALL HAVE THE SAME DIMENSIONS AS THE CORRUGATIONS IN THE PIPE END, OR MAY BE OF A SPECIAL DESIGN TO ENGAGE ONLY THE FIRST OR SECOND CORRUGATION FROM THE END OF EACH PIPE. THE BAND MAY ALSO INCLUDE A U-SHAPED CHANNEL TO ACCOMMODATE UPTURNED FLANGES ON THE PIPE.
- 9.1.2 COUPLING BANDS WITH HELICAL CORRUGATIONS SHALL BE USED ONLY WITH PIPE WITH HELICALLY CORRUGATED ENDS. THE CORRUGATIONS IN THE BANDS SHALL BE DESIGNED TO PROPERLY MESH WITH THE CORRUGATIONS IN THE PIPE.
- 9.1.3 COUPLING BANDS WITH PROJECTIONS (DIMPLES) MAY BE USED WITH PIPE WITH EITHER ANNULAR OR HELICAL CORRUGATIONS. THE BANDS SHALL BE FORMED WITH THE PROJECTIONS IN ANNULAR ROWS WITH ONE PROJECTION FOR EACH CORRUGATION OF HELICAL PIPE. BANDS 265 OR 300 mm WIDE SHALL HAVE TWO ANNULAR ROWS OF PROJECTIONS, AND BANDS 415 OR 560 mm WIDE SHALL HAVE FOUR ANNULAR ROWS OF PROJECTIONS.
- 9.1.4 CHANNEL BANDS MAY BE USED ONLY WITH PIPE HAVING UPTURNED FLANGES ON THE PIPE ENDS.
- 9.1.5 SMOOTH SLEEVE-TYPE COUPLERS AND FLAT BANDS MAY BE USED ONLY WITH TYPE III AND TYPE IIIA PIPE OF 300 mm DIAMETER OR SMALLER.

- 9.2 REQUIREMENTS---COUPLING BANDS SHALL BE FABRICATED TO LAP ON AN EQUAL PORTION OF EACH OF THE PIPE SECTION TO BE CONNECTED. THE ENDS OF THE BANDS SHALL LAP OR BE FABRICATED TO FORM A TIGHTLY CLOSED JOINT UPON INSTALLATION. COUPLING BAND THICKNESS SHALL CONFORM TO THE REQUIREMENTS IN TABLE 12, BASED ON THE SHEET THICKNESS OF THE PIPE TO BE CONNECTED EXCEPT AS PROVIDED IN SECTIONS 9.2.1 AND 9.2.2 THE BAND WIDTH SHALL BE NOT LESS THAN AS SHOWN IN TABLE 13. THE BANDS SHALL BE CONNECTED IN A MANNER APPROVED BY THE PURCHASER WITH SUITABLE GALVANIZED DEVICES SUCH AS; ANGLES, OR INTEGRALLY OR SEPERATELY FORMED AND ATTACHED FLANGES, BOLTED WITH ZINC-COATED BOLTS; BARS AND STRAPS; WEDGE LOCK AND STRAPS; OR LUGS. COUPLING BANDS SHALL BE FASTENED WITH THE FOLLOWING SIZE OF BOLTS;

PIPE DIAMETERS 450 mm AND LESS---M 10 DIAMETER

PIPE DIAMETERS 525 mm AND GREATER---M 12 DIAMETER

TYPE IIIA PIPE---M 8 DIAMETER

- 9.2.1 IF FLANGES ARE PROVIDED ON THE PIPE ENDS, THE COUPLING MAY ALSO BE MADE BY INTERLOCKING THE FLANGES WITH A PREFORMED CHANNEL BAND OR OTHER BAND INCORPORATING A LOCKING CHANNEL NOT LESS THAN 19 mm IN WIDTH. THE DEPTH OF THE CHANNEL SHALL BE NOT LESS THAN 13 mm. THE CHANNEL BAND SHALL HAVE A MINIMUM NOMINAL THICKNESS OF 2.01 mm.
- 9.2.2 SMOOTH SLEEVE TYPE COUPLINGS AND FLAT BANDS SHALL BE STEEL HAVING A NOMINAL THICKNESS OF NOT LESS THAN 1.02 mm, OR AS AN OPTION, MAY BE A PLASTIC SLEEVE TO PROVIDE EQUIVALENT STRENGTH. THE COUPLING SHALL BE CLOSE-FITTING, TO HOLD THE PIPE FIRMLY IN ALIGNMENT WITHOUT THE USE OF SEALING COMPOUNDS OR GASKETS. THE COUPLING OR FLAT BAND SHALL CONTAIN A DEVICE SO THAT THE BAND OR COUPLING WILL LAP EQUALLY ON THE TWO PIPES BEING JOINED. THE OVERALL LENGTH OF THE COUPLING SHALL BE EQUAL TO OR GREATER THAN THE NOMINAL DIAMETER OF THE PIPE.
- 9.3 GASKETS---WHERE INFILTRATION OR EXFILTRATION IS A CONCERN, THE COUPLINGS MAY BE REQUIRED TO HAVE GASKETS. THE CLOSED-CELL EXPANDED RUBBER GASKETS SHALL BE A CONTINUOUS BAND, APPROXIMATELY 180 mm WIDE AND APPROXIMATELY 9.5 mm THICK. RUBBER O-RING GASKETS SHALL BE 20 mm DIAMETER FOR PIPE DIAMETERS OF 900 mm OR SMALLER, AND 22 mm DIAMETER FOR LARGER PIPE DIAMETERS, HAVING 13 mm DEEP END CORRUGATIONS. RUBBER O-RING GASKETS SHALL BE 15 mm DIAMETER FOR PIPE HAVING 25 mm DEEP END CORRUGATIONS.

NOTE 12---RIVETED PIPE IS NOT WATER TIGHT, HAVING SMALL OPENINGS AT THE INTERSECTION OF LONGITUDINAL AND CIRCUMFERENTIAL SEAMS. THEREFORE, THIS TYPE OF FABRICATION SHOULD NOT BE USED WHERE WATER TIGHTNESS IS A CONCERN UNLESS THE PIPE IS BITUMINOUS COATED OR LINED PRIOR TO INSTALLATIONS.

TABLE 8 PIPE ARCH REQUIREMENTS 68 BY 13 mm CORRUGATIONS

PIPE-ARCH SIZE, mm	EQUIVALENT DIAMETER, mm	SPAN mm	RISE mm	MINIMUM CORNER RADIUS mm	MAXIMUM B, mm
430 X 330	375	430	330	75	135
530 X 380	450	530	380	75	155
610 X 460	525	610	460	75	185
710 X 510	600	710	510	75	205
780 X 560	675	780	560	75	225
885 X 610	750	870	630	75	240
970 X 690	825	970	690	75	255
1060 X 740	900	1060	740	90	265
1240 X 840	1050	1240	840	100	290
1440 X 970	1200	1440	970	130	345
1620 X 1100	1350	1620	1100	155	380
1800 X 1200	1500	1800	1200	180	420
1950 X 1320	1650	1950	1320	205	460
2100 X 1450	1800	2100	1450	230	510

A TOLERANCE OF 25 mm OR 2 PERCENT OF EQUIVALENT DIAMETER, WHICHEVER IS GREATER, WILL BE PERMISSABLE IN SPAN AND RISE.

B IS DEFINED AS THE VERTICAL DIMENSION FROM A HORIZONTAL LINE ACROSS THE WIDEST PORTION OF THE ARCH TO THE LOWEST PORTION OF THE BASE.

TABLE 9 PIPE-ARCH REQUIREMENTS 75 BY 25 mm OR 125 BY 25 mm CORRUGATIONS

PIPE-ARCH SIZE, mm	EQUIVALENT DIAMETER, mm	SPAN mm	RISE mm	MINIMUM CORNER RADIUS, mm
1010 X 790	900	1010 - 45	790 + 45	130
1160 X 920	1050	1160 - 55	920 + 55	155
1340 X 1050	1200	1340 - 60	1050 + 60	180
1520 X 1170	1350	1520 - 70	1170 + 70	205
1670 X 1300	1500	1670 - 75	1300 + 75	230
1850 X 1400	1650	1850 - 85	1400 + 85	305

2050 X 1500	1800	2050 - 95	1500 + 95	355
2200 X 1620	1950	2200 - 110	1620 + 110	355
2400 X 1720	2100	2400 - 120	1720 + 120	410
2600 X 1820	2250	2600 - 130	1820 + 130	410
2840 X 1920	2400	2840 - 145	1920 + 145	460
2970 X 2020	2550	2970 - 150	2020 + 150	460
3240 X 2120	2700	3240 - 165	2120 + 165	460
3470 X 2220	2850	3470 - 175	2220 + 175	460
3600 X 2320	3000	3600 - 180	2320 + 180	460

NEGATIVE AND POSITIVE NUMBERS LISTED WITH SPAN AND RISE DIMENSIONS ARE NEGATIVE AND POSITIVE TOLERANCES, NO TOLERANCE IN OPPOSITE DIRECTION.

TABLE 10 PIPE-ARCH REQUIREMENTS- 19 X 19 X 190 mm OR 19 X 25 X 292 mm RIB CORRUGATIONS

PIPE-ARCH SIZE, mm	EQUIVALENT DIAMETER, mm	SPAN	RISE	MINIMUM CORNER RADIUS, mm
500 X 400	450	500 - 25	410 + 25	130
580 X 490	525	580 - 25	490 + 25	130
680 X 540	600	680 - 40	540 + 40	130
750 X 620	675	750 - 40	620 + 40	130
830 X 670	750	830 - 40	670 + 40	130
900 X 750	825	900 - 45	750 + 45	130
1010 X 790	900	1010 - 45	790 + 45	130
1160 X 920	1050	1160 - 55	920 + 55	155
1340 X 1050	1200	1340 - 60	1050 + 60	180
1520 X 1170	1350	1520 - 70	1170 + 70	205
1670 X 1300	1500	1670 - 75	1300 + 75	230
1850 X 1400	1650	1850 - 85	1400 + 85	305
2050 X 1500	1800	2050 - 95	1500 + 95	355

NEGATIVE AND POSITIVE NUMBERS LISTED WITH SPAN AND RISE DIMENSIONS ARE NEGATIVE AND POSITIVE TOLERANCES, NO TOLERANCE IN OPPOSITE DIRECTION.

TABLE 11 ROWS OF PERFORATIONS, HEIGHT "H" OF THE CENTER LINE OF THE UPPERMOST ROWS ABOVE THE INVERT, AND CHORD LENGTH "L" OF UNPERFORATED SEGMENT, FOR CLASS I PERFORATIONS

INTERNAL DIAMETER OF PIPE mm	ROWS OF PERFORATIONS	H, MAXIMUM mm	L, MINIMUM mm
100	2	46	64

150	4	69	96
200	4	92	128
250	4	115	160
300	6C	138	192
375	6C	172	240
450	6C	207	288
525	6	241	338
600 and larger	8	D	D

MINIMUM NUMBER OF ROWS. A GREATER NUMBER OF ROWS FOR INCREASED INLET AREA SHALL BE SUBJECT TO AGREEMENT BETWEEN PURCHASER AND FABRICATOR. NOTE THAT THE NUMBER OF PERFORATIONS PER UNIT LENGTH IN EACH ROW (AND INLET AREA) IS DEPENDENT ON THE CORRUGATION PITCH. C-MINIMUM OF 4 ROWS PERMITTED IN PIPE WITH 38 BY 6.5 mm CORRUGATIONS. $D - H \text{ (MAX)} - 0.46D$; $L \text{ (MIN)} - 0.64D$, WHERE D = INTERNAL DIAMETER OF PIPE, MILLIMETERS OR INCHES AS APPROPRIATE.

TABLE 12 COUPLING BAND THICKNESS

NOMINAL PIPE THICKNESS mm	NOMINAL COUPLING BAND THICKNESS, MINIMUM mm
2.77 AND THINNER	1.32
3.51	1.63
4.27	2.01

- 9.4 OTHER TYPES OF COUPLING BANDS OR FASTENING DEVICES WHICH ARE EQUALLY EFFECTIVE AS THOSE DESCRIBED, AND WHICH COMPLY WITH THE JOINT PERFORMANCE CRITERIA OF AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, DIVISION II, SECTION 23 MAY BE USED WHEN APPROVED BY THE PURCHASER.

10. WORKMANSHIP

- 10.1 THE COMPLETED PIPE SHALL SHOW CAREFUL, FINISHED WORKMANSHIP IN ALL PARTICULARS. PIPE WHICH HAS BEEN DAMAGED, EITHER DURING FABRICATION OR IN SHIPPING, MAY BE REJECTED UNLESS REPAIRS ARE MADE WHICH ARE SATISFACTORY TO THE PURCHASER. AMONG OTHERS, THE FOLLOWING DEFECTS SHALL BE CONSIDERED AS CONSTITUTING POOR WORKMANSHIP.

VARIATION FROM A STRAIGHT CENTER LINE.
ELLIPTICAL SHAPE IN PIPE INTENDED TO BE ROUND.
DENTS OR BENDS IN THE METAL.

POLYMER COATING OR METALLIC COATING OR HANDLING WHICH HAS BEEN BRUISED, BROKEN, DISBONDED, OR OTHERWISE DAMAGED.

LACK OF RIGIDITY.

ILLEGIBLE MARKINGS ON THE STEEL SHEET.

RAGGED OR DIAGONAL SHEARED EDGES.

UNEVEN LAPS IN RIVETED PIPE.

LOOSE, UNEVENLY LINED, OR UNEVENLY SPACED RIVETS.

LOOSELY FORMED LOCKSEAMS.

11. REPAIR OF DAMAGED COATINGS

11.1 PIPE ON WHICH EITHER THE POLYMER COATING OR THE UNDERLYING METALLIC COATING HAS BEEN DAMAGED IN FABRICATION OR HANDLING SHALL BE REPAIRED. DAMAGE TO THE METALLIC COATING SHALL BE REPAIRED AS DESCRIBED IN SECTIONS 11.2 THROUGH 11.4. DAMAGE TO THE POLYMER COATING SHALL BE REPAIRED AS DESCRIBED IN SECTION 11.5. THE REPAIR SHALL BE DONE SO THAT THE COMPLETED PIPE SHALL SHOW CAREFUL FINISHED WORKMANSHIP IN ALL PARTICULARS. PIPE WHICH, IN THE OPINION OF THE PURCHASER, HAS NOT BEEN CLEANED OR COATED SATISFACTORILY MAY BE REJECTED. IF THE PURCHASER SO ELECTS, THE REPAIR SHALL BE DONE IN HIS PRESENCE.

11.2 DAMAGE TO THE METALLIC COATING SHALL BE REPAIRED AS PROVIDED IN ASTM A 780 (NOTE 13), EXCEPT AS DESCRIBED HEREIN. THE DAMAGED AREA SHALL BE CLEANED TO BRIGHT METAL BY BLAST CLEANING, POWERDISK SANDING, OR WIRE BRUSHING. THE CLEANED AREA SHALL EXTEND AT LEAST 12 mm INTO THE UNDAMAGED SECTION OF THE COATING. THE CLEANED AREA SHALL BE COATED WITHIN 24 HOURS AND BEFORE ANY RUSTING OR SOILING.

NOTE 13---WHILE ASTM A 780 SPECIFICALLY REFERS TO REPAIR OF DAMAGED ZINC COATINGS, THE SAME PROCEDURES ARE APPLICABLE TO REPAIR OF ALUMINUM-ZINC ALLOY COATINGS EXCEPT AS DESCRIBED IN THIS SECTION.

11.3 ZINC-RICH PAINT COATING---- ZINC-RICH PAINT SHALL BE APPLIED TO A DRY FILM THICKNESS OF AT LEAST 0.13 mm OVER THE DAMAGED SECTION AND SURROUNDING CLEANED AREA. ZINC-RICH PAINT SHALL BE USED FOR REPAIR OF DAMAGE TO BOTH ZINC AND ALUMINUM-ZINC ALLOY COATINGS.

TABLE 13 COUPLING BAND WIDTH REQUIREMENTS

COUPLING BAND WIDTH MINIMUM

NOMINAL CORRUGATIONS SIZE	NOMINAL PIPE INSIDE DIAMETER	ANNULAR CORRUGATED BANDS	HELICALLY CORRUGATED BANDS	BANDS WITH PROJECTIONS
ALL VALUES IN MILLIMETERS				
38 BY 6.5	100 TO 450	285	180	285
68 BY 13	300 TO 900	180	300	285
	1050 TO 1800	285	300	285
	1950 TO 2100C	285	300	415
75 BY 25	900 TO 1800	300	350	285
	1950 TO 3600	300	350	415
125 BY 25	900 TO 1800	500	560	300
	1950 TO 3600	500	560	560

A FOR HELICALLY CORRUGATED PIPE WITH REROLLED ENDS, THE NOMINAL CORRUGATION SIZE REFERS TO THE DIMENSIONS OF THE END CORRUGATIONS IN THE PIPE.

B EQUIVALENT DIAMETER FOR TYPE II, IIA, AND IIR PIPE.

C DIAMETERS THROUGH 3600 mm FOR ANNULAR CORRUGATED BANDS USED ON REROLLED ENDS OF HELICALLY CORRUGATED PIPE.

11.4 METALLIZING COATING----THE DAMAGED AREA SHALL BE CLEANED AS DESCRIBED IN SECTION 11.2, EXCEPT IT SHALL BE CLEANED TO THE NEAR-WHITE CONDITION. THE REPAIR COATING APPLIED TO THE CLEANED SECTION SHALL HAVE A THICKNESS OF NOT LESS THAN 0.13 mm OVER THE DAMAGED SECTION AND SHALL TAPER OFF TO ZERO THICKNESS AT THE EDGES OF THE CLEANED UNDAMAGED SECTION.

11.4.1 WHERE ZINC COATING IS TO BE METALLIZED, IT SHALL BE DONE WITH ZINC WIRE CONTAINING NOT LESS THAN 99.98 PERCENT ZINC.

11.4.2 WHERE ALUMINUM-ZINC ALLOY COATING IS TO BE METALLIZED, IT SHALL BE DONE USING ZINC WIRE CONTAINING NOT LESS THAN 99.98 PERCENT ZINC, ALUMINUM WIRE CONTAINING NOT LESS THAN 99 PERCENT ALUMINUM, OR AN ALLOY WIRE OF 55 PERCENT ALUMINUM AND 45 PERCENT ZINC BY MASS.

11.5 AREAS OF DAMAGED POLYMER COATING SHALL BE REPAIRED WITH A POLYMER COATING SIMILAR AND COMPATIBLE WITH RESPECT TO DURABILITY, ADHESION, AND APPEARANCE OF THE ORIGINAL POLYMER COATING.

11.5.1 POLYMER COATING DAMAGED DURING SHIPPING OR INSTALLATION MAY BE REPAIRED USING MATERIALS AS DESCRIBED IN 11.5 OR BY THE APPLICATION OF PROTECTIVE COATING MATERIAL CONFORMING TO M 243M.

12 INSPECTION

- 12.1 THE PURCHASER OR HIS REPRESENTATIVE SHALL HAVE FREE ACCESS TO THE FABRICATING PLANT FOR INSPECTION, AND EVERY FACILITY SHALL BE EXTENDED TO HIM FOR THIS PURPOSE. THIS INSPECTION SHALL INCLUDE AN EXAMINATION OF THE PIPE FOR THE ITEMS IN SECTION 10.1 AND THE SPECIFIC REQUIREMENTS OF THIS SPECIFICATION APPLICABLE TO THE TYPE OF PIPE AND METHOD OF FABRICATION.
- 12.2 ON A RANDOM BASIS, SAMPLES MAY BE TAKEN FOR CHEMICAL ANALYSIS AND METALLIC AND POLYMER COATING MEASUREMENTS FOR CHECK PURPOSES. THESE SAMPLES WILL BE SECURED FROM FABRICATED PIPE OR FROM SHEETS OR COILS OF THE MATERIAL USED IN FABRICATION OF THE PIPE. THE MASS OF METALLIC COATING SHALL BE DETERMINED IN ACCORDANCE WITH T 65 FOR ZINC AND THE DILUTE HYDROCHLORIC ACID METHOD OF T 65 FOR ALUMINUM-ZINC ALLOY. THE THICKNESS OF POLYMER COATING SHALL BE MEASURED ACCORDING TO ASTM D 1005.

13. REJECTION

- 13.1 PIPE FAILING TO CONFORM TO THE SPECIFIC REQUIREMENTS OF THIS SPECIFICATION, OR THAT SHOWS POOR WORKMANSHIP, MAY BE REJECTED. THIS REQUIREMENT APPLIES NOT ONLY TO THE INDIVIDUAL PIPE, BUT TO ANY SHIPMENT AS A WHOLE WHERE A SUBSTANTIAL NUMBER OF PIPE ARE DEFECTIVE. IF THE AVERAGE DEFICIENCY IN LENGTH OF ANY SHIPMENT OF PIPE IS GREATER THAN ONE PERCENT, THE SHIPMENT MAY BE REJECTED.

14. CERTIFICATION

- 14.1 WHEN SPECIFIED IN THE PURCHASE ORDER OR CONTRACT, A MANUFACTURER'S OR FABRICATOR'S CERTIFICATION, OR BOTH, SHALL BE FURNISHED TO THE PURCHASER STATING THAT SAMPLES REPRESENTING EACH LOT HAVE BEEN TESTED AND INSPECTED IN ACCORDANCE WITH THIS SPECIFICATION AND HAVE BEEN FOUND TO MEET THE REQUIREMENTS FOR THE MATERIAL DESCRIBED IN THE ORDER. WHEN SPECIFIED IN THE ORDER, A REPORT OF THE TEST RESULTS SHALL BE FURNISHED.

STANDARD SPECIFICATION
FOR
STEEL SHEET, METALLIC-COATED AND POLYMER
PRECOATED, FOR CORRUGATED STEEL PIPE

AASHTO DESIGNATION: M 246M-87 (1995)
(ASTM DESIGNATION: A 742/A 742M-93)

1. SCOPE

- 1.1 THIS SPECIFICATION COVERS POLYMER PRECOATED STEEL SHEET FOR CORRUGATED STEEL PIPE (CSP) WHICH IS COATED AFTER METALLIC COATING ON CONTINUOUS LINES BY COIL COATING (ROLLER COATING OR LAMINATING) PROCESSES. THE METALLIC COATING IS EITHER ZINC OR ALUMINUM-ZINC ALLOY. SHEET FOR THIS PURPOSE IS FURNISHED FLAT IN COILS, FLAT IN CUT LENGTHS, OR CORRUGATED IN CUT LENGTHS, ALL BEING PROTECTED BY A MILL-APPLIED POLYMER COATING ON ONE OR BOTH SIDES.

2. REFERENCED DOCUMENTS

2.1 AASHTO STANDARDS:

M 218M STEEL SHEET, ZINC-COATED (GALVANIZED) FOR CORRUGATED STEEL PIPE.

M 289M ALUMINUM-ZINC ALLOY COATED STEEL SHEET FOR CORRUGATED STEEL PIPE.

2.2 ASTM STANDARDS

A 916M ZINC-5 PERCENT ALUMINUM-MM ALLOY COATED STEEL PIPE
D 543 TEST METHOD FOR RESISTANCE OF PLASTICS TO CHEMICAL REAGENTS.

D 658 TEST METHOD FOR ABRASION RESISTANCE OF ORGANIC COATINGS BY THE AIR BLAST ABRASION TEST.

D 1005 MEASUREMENT BY DRY FILM THICKNESS OF ORGANIC COATINGS USING MICROMETERS.

D 2794 TEST METHOD FOR RESISTANCE OF ORGANIC COATINGS TO THE EFFECTS OF RAPID DEFORMATION (IMPACT)

G 22 PRACTICE FOR DETERMINING RESISTANCE OF PLASTICS TO BACTERIA

G 23 PRACTICE FOR OPERATING LIGHT AND WATER-EXPOSURE APPARATUS (CARBON-ARC TYPE) FOR EXPOSURE OF NONMETALLIC MATERIALS.

G 62 TEST METHODS FOR HOLIDAY DETECTION IN PIPELINE COATINGS.

3. CLASSIFICATION

3.1 THE POLYMER COATING IS CLASSIFIED BY GRADE CORRESPONDING TO THE THICKNESS MICROMETERS ON EACH SIDE IN SI UNITS, AND THE THICKNESS IN MILS ON EACH SIDE IN INCH-POUND UNITS. THE FOLLOWING GRADES ARE USUALLY AVAILABLE (SEE TABLE ENTITLED "POLYMER COATING").

3.2 ANY COMBINATION OF POLYMER COATING THICKNESSES OTHER THAN SHOWN ABOVE IS SUBJECT TO AGREEMENT BETWEEN THE MANUFACTURER AND PURCHASER OR FABRICATOR.

4. TERMINOLOGY

4.1 IN THIS SPECIFICATION MANUFACTURER REFERS TO THE PRODUCER OF THE SHEET, FABRICATOR REFERS TO THE PRODUCER OF THE PIPE, AND PURCHASER REFERS TO THE PURCHASER OF THE FINISHED PIPE.

5. ORDERING INFORMATION

5.1 THE POLYMER PRECOATED SHEET COVERED BY THIS SPECIFICATION SHALL BE ORDERED ONLY TO THE SPECIFIED THICKNESSES LISTED IN

TABLE 1. THE SPECIFIED THICKNESS IS BASED ON THE THICKNESS OF THE METALLIC-COATED STEEL SHEET, NOT INCLUDING THE THICKNESS OF THE POLYMER COATING.

5.2 ORDERS FOR MATERIAL TO THIS SPECIFICATION SHALL INCLUDE THE FOLLOWING INFORMATION, AS NECESSARY, TO ADEQUATELY DESCRIBE THE DESIRED PRODUCT..

5.2.1 NAME OF MATERIAL (POLYMER PRECOATED STEEL SHEET FOR CSP).

5.2.2 TYPE OF METALLIC COATING (SEE SECTION 6.1).

5.2.3 AASHTO DESIGNATION NUMBER AND DATE OF ISSUE.

5.2.4 CORRUGATION SIZE, IF CORRUGATED (SEE SECTION 6.3).

5.2.5 SUBSTRATE DIMENSIONS (SPECIFIED THICKNESS, WIDTH, EITHER FLAT OR OVERALL CORRUGATED; AND LENGTH, IF CUT LENGTH).

GRADE	POLYMER COATING	
	PREVIOUS DESIGNATION	COATING THICKNESS P.M.
250/0	TYPE A	250/0
250/75	TYPE B	250/75
250/250		250/250

TABLE 1 THICKNESSES OF METALLIC-COATED STEEL SHEET A
SPECIFICATION DESIGNATION

SPECIFIED THICKNESS		M 218M ZINC-COATED	M 289M 55 PERCENT ALUMINUM- ZINC-COATED	A 916M Zn-5 AL-MM ALLOY COATED
mm	INCH			
1.02	0.040	X	X	X
1.32	0.052	X	X	X
1.63	0.064	X	X	X
2.01	0.079	X	X	X
2.77	0.109	X	X	X
3.51	0.138	X	X	X
4.27	0.168	X		X

A AN "X" INDICATES SHEET THICKNESSES INCLUDED IN THE APPLICABLE SPECIFICATION.

- 5.2.6 GRADE OF POLYMER COATING (SEE SECTION 3), INDICATING THICKNESS ON EACH SIDE.
- 5.2.7 COIL SIZE REQUIREMENTS (SPECIFY MAXIMUM OUTSIDE DIAMETER (OD), ACCEPTABLE INSIDE DIAMETER (ID), AND MAXIMUM MASS).
- 5.2.8 CERTIFICATION, IF REQUIRED (SEE SECTION 11.1).
- 5.2.9 SPECIAL REQUIREMENTS.

NOTE 1----TYPICAL ORDERING DESCRIPTIONS ARE AS FOLLOWS: POLYMER PRECOATED STEEL SHEET, ALUMINUM-ZINC ALLOY COATED FOR CSP, CONFORMING TO AASHTO M 246M-_____, 2.77 BY 700 mm BY COIL, WITH GRADE 250/0 POLYMER COATING (0.25mm); COIL 1200 mm MAX od, 600 mm id, 1000 kg MAX COIL MASS (POLYMER PRECOATED STEEL SHEET, ZINC-COATED FOR CSP, CONFORMING TO AASHTO M 246-_____.)

6. GENERAL REQUIREMENTS

- 6.1 THE METALLIC COATED STEEL SUBSTRATE SHALL CONFORM TO ALL APPLICABLE REQUIREMENTS OF THE SPECIFICATIONS LISTED BELOW FOR THE KIND OF METALLIC COATING SPECIFIED. IF THE TYPE OF METALLIC COATING IS NOT STATED IN THE ORDER, ZINC-COATED SHEET AS DESCRIBED IN SECTION 6.1.1 SHALL BE FURNISHED.
 - 6.1.1 ZINC COATING----ZINC COATED STEEL SHEET SHALL CONFORM TO THE REQUIREMENTS OF M 218.
 - 6.1.2 ALUMINUM-ZINC ALLOY COATING 55---ALUMINUM-ZINC ALLOY COATED STEEL SHEET SHALL CONFORM TO THE REQUIREMENTS OF M 289m AND ZINC-5 ALUMINUM-mm ALLOY COATED STEEL SHEETS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A 916m.
- 6.2 THE POLYMER COATING SHALL BE CAPABLE OF BEING APPLIED TO THE SHEET SPECIFIED IN SECTION 6.1. AFTER APPLICATION, THE POLYMER COATING SHALL BE FREE OF HOLES, TEARS AND DISCONTINUITIES, AND SHALL BE SUFFICIENTLY FLEXIBLE SO THAT IT WILL WITHSTAND THE CORRUGATING, FORMING AND LOCKSEAMING OPERATIONS, AND PUNCHING OF HOLES FOR RIVETS OR PERFORATIONS.
- 6.3 IF THE POLYMER COATED SHEET IS TO BE FURNISHED WITH CORRUGATIONS, THE CORRUGATIONS SHALL CONFORM TO THE REQUIREMENTS STATED IN THE APPROPRIATE SPECIFICATION LISTED IN SECTION 6.1.

7. REQUIREMENTS FOR POLYMER COATINGS

- 7.1 ADHESION---THERE SHALL BE NO SPALLING OR CRACKING OF THE COATING WHEN TESTED IN ACCORDANCE WITH SECTION 9.1. THERE

SHALL BE NO DISBONDING OF THE COATING AT THE CUT TO BE MADE AS DESCRIBED IN SECTION 9.1.

- 7.2 IMPACT---THERE SHALL BE NO BREAK IN THE POLYMER COATING WHEN TESTED IN ACCORDANCE WITH SECTION 9.2.
- 7.3 THICKNESS OF COATING---THE THICKNESS OF THE POLYMER COATING SHALL MEET THE REQUIREMENTS OF SECTION 3, OR AS SPECIFIED IN THE PURCHASE ORDER, WHEN TESTED IN ACCORDANCE WITH SECTION 9.3.
- 7.4 HOLIDAYS---THE POLYMER COATING ON THE STEEL SHALL BE SUBSTANTIALLY FREE OF HOLIDAYS WHEN TESTED IN ACCORDANCE WITH SECTION 9.4. AN AVERAGE OF 22 HOLIDAYS PER SQUARE METER OF ACTUAL SURFACE AREA ON THE TEST SPECIMEN SHALL BE PERMITTED.

NOTE 2---HOLIDAYS ARE PINHOLES OR VOIDS IN THE POLYMER COATING THAT ARE NOT VISUALLY DISCERNIBLE.

- 7.5 ABRASION RESISTANCE---THE AVERAGE ABRASION COEFFICIENT, WHEN TESTED IN ACCORDANCE WITH SECTION 9.5, SHALL BE A MINIMUM OF 3.9 (EXPRESSED IN g/p.m. OF THICKNESS).
- 7.6 IMPERVIOUSNESS--- THERE SHALL BE NO LOOSENING OR SEPERATION OF THE POLYMER COATING FROM THE METALLIC-COATED STEEL SUBSTRATE WHEN TESTED IN ACCORDANCE WITH SECTION 9.6.
- 7.7 FREEZE-THAW RESISTANCE---THE SPECIMEN SHALL WITHSTAND 100 FREEZE-THAW CYCLES, AS DESCRIBED IN SECTION 9.7, WITHOUT SPALLING, DISBONDING, OR OTHER DETRIMENTAL EFFECTS.
- 7.8 WEATHERABILITY---THE SPECIMENS SHALL WITHSTAND 1000 HOURS OF WEATHERING WITH NO OBSERVABLE DELAMINATION OR CRACKING, WHEN TESTED IN ACCORDANCE WITH SECTION 9.8.
- 7.9 RESISTANCE TO MICROBIAL ATTACK---THERE SHALL BE NO EFFECT OF MICROBIAL ATTACK OF THE POLYMER COATING WHEN TESTED IN ACCORDANCE WITH SECTION 9.9.

NOTE 3---TESTS 7.1 THROUGH 7.4 ARE SUGGESTED AS QUALITY CONTROL TESTS. WHEN THESE TESTS ARE USED FOR QUALITY CONTROL, THEY MAY BE RUN AT ROOM TEMPERATURE ONLY. TESTS 7.5 THROUGH 7.9 ARE SUGGESTED AS QUALIFYING TESTS. HOWEVER, THE PURCHASER MAY USE ANY OF THE TESTS LISTED TO VERIFY COMPLIANCE.

8. SAMPLING AND TESTING

- 8.1 THE MANUFACTURER SHALL MAKE ADEQUATE TESTS AND MEASUREMENTS TO ENSURE THAT THE MATERIAL PRODUCED COMPLIES WITH THIS SPECIFICATION.
 - 8.1.1 TESTS RESULTS TO SHOW COMPLIANCE WITH THIS SPECIFICATION SHALL BE RETAINED BY THE MANUFACTURER

FOR 7 YEARS AND SHALL BE MADE AVAILABLE TO THE FABRICATOR AND PURCHASER UPON REQUEST.

- 8.2 THE PURCHASER OF THE SHEET (FABRICATOR), OR PURCHASER OF THE PIPE MADE FROM THE SHEET, MAY MAKE SUCH TESTS AS ARE DETERMINED NECESSARY TO DETERMINE THE ACCEPTABILITY OF THE MATERIAL OR TO VERIFY THE CORRECTNESS OF A CERTIFICATION.
- 8.3 FLAT SAMPLES OF POLYMER PRECOATED STEEL SHALL BE TAKEN BY THE MANUFACTURER FROM EACH COIL OR IN ACCORDANCE WITH THE SAMPLING PRECEDURE AS MUTUALLY AGREED BETWEEN MANUFACTURER AND PURCHASER. EACH SAMPLE SHALL BE AT LEAST 600 mm LONG BY THE COIL WIDTH AND SHALL CARRY AN IDENTIFICATION TO RELATE IT TO THE COIL FROM WHICH IT WAS TAKEN.

9. TEST METHODS FOR POLYMER COATINGS

9.1 ADHESION:

- 9.1.1 SCOPE---THIS PROCEDURE IS TO MEASURE THE ADHESION OF THE POLYMER COATING TO THE METALLIC-COATED SUBSTRATE.
- 9.1.2 SIGNIFICANCE AND USE----THIS TEST INDICATES THE ABILITY OF THE POLYMER TO WITHSTAND FORCES IN FABRICATON AND USE TENDING TO DISBOND THE COATING FROM THE SUBSTRATE.
- 9.1.3 PROCEDURE---CUT A 50 BY 200 mm COUPON FROM THE SAMPLE OF PRECOATED STEEL. BEND THE COUPON 180 DEGREES OVER A 12.5 mm DIAMETER MANDREL. THE SURFACE WITH THE POLYMER COATING TO BE TESTED SHALL BE ON THE OUTSIDE OF THE BEND. AFTER MAKING BEND, MAKE A CUT THROUGH THE POLYMER COATING ALONG AN ELEMENT ON THE OUTSIDE OF THE BEND TO CHECK FOR POLYMER COATING ADHESION. PERFORM THIS TEST AT -18, 25, AND 50+1C. CHECK FOR SPALLING OR CRACKING OF THE POLYMER COATING, OR FOR DISBONDING FROM THE METALLIC-COATED SUBSTRATE.
- 9.1.4 PRECISION AND BIAS---NO STATEMENT IS MADE ABOUT EITHER THE PRECISION OR THE BIAS OF THE PROCEDURE FOR MEASURING ADHESION SINCE THE RESULT MERELY STATES WHETHER THERE IS CONFORMANCE TO THE CRITERIA FOR SUCCESS SPECIFIED IN THE PROCEDURE.

9.2 IMPACT:

- 9.2.1 SCOPE---THIS PROCEDURE IS TO MEASURE THE ABILITY OF THE POLYMER COATING TO WITHSTAND IMPACT.
- 9.2.2 SIGNIFICANCE AND USE---THIS TEST PROVIDES A MEASURE OF THE ABILITY OF THE POLYMER COATING TO RESIST DAMAGE BY IMPACT, TO WHICH IT MAY BE SUBJECTED IN SERVICE, IN ORDER TO DETERMINE BRITTLINESS OF THE POLYMER COATING.

9.2.3 PROCEDURE---CUT A 150 mm COUPON FROM THE SAMPLE OF PRECOATED STEEL TO BE USED FOR FABRICATION OF THE PIPE. DIRECT IMPACT THE COATING WITH AN ENERGY OF 4.0 J USING AN IMPACT TESTER WITH A 15.88 mm DIAMETER PUNCH AND WITH THE SPECIMEN SET ON A 16.26 mm DIAMETER PUNCH DIE. TEST AT APPROXIMATELY 25 C (NOTE 4). CHECK FOR BREAKS IN THE POLYMER COATING.

1. THE GARDNER-IMPACT TESTER, VARIABLE, MODEL 1G 1120, AVAILABLE FROM PACIFIC SCIENTIFIC COMPANY, GARDNER/NEOTEC INSTRUMENT DIVISION, 2431 LINDEN LANE, SILVER SPRINGS, MD 20910, HAS BEEN FOUND SUITABLE FOR THIS PURPOSE.

NOTE 4---THIS TEST PROCEDURE IS DESCRIBED IN DETAIL IN ASTM D 2794.

9.2.4 PRECISION AND BIAS----NO STATEMENT IS MADE ABOUT EITHER THE PRECISION OR THE BIAS OF THE PROCEDURE FOR MEASURING IMPACT RESISTANCE SINCE THE RESULT MERELY STATES WHETHER THERE IS CONFORMANCE TO THE CRITERIA FOR SUCCESS SPECIFIED IN THE PROCEDURE.

9.3 THICKNESS OF COATING---MEASURE POLYMER COATING THICKNESS IN ACCORDANCE WITH ASTM D 1005.

9.4 HOLIDAYS---TEST A SPECIMEN THAT IS AT LEAST 300 mm LONG AND THE FULL COIL WIDTH IN ACCORDANCE WITH ASTM G 62, METHOD A, USING A NOMINAL VOLTAGE OF 67.5 VOLTS.

9.5 ABRASION

RESISTANCE---DETERMINE THE ABRASION CO-EFFICIENT IN ACCORDANCE WITH ASTM D 658 EXCEPT USE A SILICONE CARBIDE GRAIN PASSING A 106-p.m. SIEVE AND RETAINED ON A 90-p.m. SIEVE, AND AN AIR TEST PRESSURE OF 33.25 kPa (250 mm Hg).

9.5.1 THE MODIFICATIONS TO THE PROCEDURE IN ASTM D 658 ARE NOT EXPECTED TO HAVE AN EFFECT ON THE PRECISION AND BIAS AS INDICATED IN ASTM D 658.

9.6 IMPERVIOUSNESS---TEST THE POLYMER COATING FOR IMPERVIOUSNESS TO CHEMICAL REAGENTS IN ACCORDANCE WITH THE APPLICABLE SECTIONS OF ASTM D 543 USING A 10 PERCENT SOLUTION OF SODIUM CHLORIDE, A 10 PERCENT SOLUTION OF SODIUM HYDROXIDE, AND A 30 PERCENT SOLUTION OF SULFURIC ACID. HOLD EACH REAGENT IN A SEPARATE CONFINED AREA OF THE POLYMER PRECOATED SHEET FOR A PERIOD OF 48 HOURS. AVOID EXCESSIVE EVAPORATION OF THE TEST SOLUTIONS.

9.7 FREEZE-THAW RESISTANCE.

9.7.1 SCOPE---THIS PROCEDURE IS TO EVALUATE THE ABILITY OF THE POLYMER COATING TO RESIST FREEZE-THAW CYCLING.

- 9.7.2 SIGNIFICANCE AND USE---AS PIPE FABRICATED FROM POLYMER-COATED STEEL SHEET WILL BE EXPOSED TO FREEZE-THAW ACTION WHILE SATURATED, THE PROCEDURE WILL MEASURE ABILITY TO WITHSTAND SUCH ACTION WITHOUT DAMAGE TO THE POLYMER COATING.
- 9.7.3 PROCEDURE---CUT A MINIMUM OF THREE 150 BY 150 mm COUPONS FROM THE SAMPLE OF PRECOATED METAL. IMMERSE THE COUPONS IN WATER AT ROOM TEMPERATURE FOR 2 WEEKS AND THEN SUBJECT THEM TO FREEZE-THAW CYCLING. ONE(1) CYCLE SHALL CONSIST OF 8 HOURS AT -18C FOLLOWED IMMEDIATELY BY IMMERSION IN WATER AT ROOM TEMPERATURE FOR 16 HOURS. CYCLE TIME MAY BE INTERRUPTED OVER WEEKENDS AND HOLIDAYS, BUT THE SPECIMENS SHALL BE MAINTAINED IN WATER AT ROOM TEMPERATURE, AND SUCH INTERRUPTIONS SHOULD BE NOTED. MAKE OBSERVATIONS DURING THE CYCLING AND NOTE ANY VISIBLE CHANGES IN THE COATING, SUCH AS SPALLING, DISBONDING, ETC. AFTER 100 CYCLES, MAKE A FINAL EXAMINATION OF THE EFFECTS AS A RESULT OF FREEZING AND THAWING.
- 9.7.4 PRECISION AND BIAS---NO STATEMENT IS MADE ABOUT EITHER THE PRECISION OR THE BIAS OF THE PROCEDURE FOR MEASURING FREEZE-THAW RESISTANCE SINCE THE RESULT MERELY STATES WHETHER THERE IS CONFORMANCE TO THE CRITERIA FOR SUCCESS SPECIFIED IN THE PROCEDURE.
- 9.8 WEATHERABILITY---SUBJECT COUPONS OF THE PRECOATED METAL TO ACCELERATED WEATHERING IN ACCORDANCE WITH ASTM G 23 USING THE SPECIMEN SPRAY ARRANGEMENT FOR TYPE E, SINGLE OPEN-FLAME SUNSHINE CARBON-ARC LAMP APPARATUS. TEST CONDITIONS SHALL CONSIST OF A 2 HOUR CYCLE INCLUDING 18 MINUTES OF WATER SPRAY AND A MAXIMUM TEMPERATURE OF 60C,
- 9.9 RESISTANCE TO MICROBIAL ATTACK---SUBJECT TEST SPECIMENS OF THE POLYMER COATING TO CONDITIONS DESCRIBED IN ASTM G 22, PROCEDURE B. THERE SHALL BE NO VISIBLE EFFECTS OF BACTERIAL ATTACK ON THE POLYMER COATING AFTER THE PRESCRIBED INCUBATION PERIOD (21 DAYS MINIMUM).

10 REJECTION

- 10.1 MATERIAL TESTED BY THE PURCHASER AND FOUND NOT CONFORMING TO THIS SPECIFICATION MAY BE REJECTED.

11 CERTIFICATIONS

11.1 WHEN SPECIFIED IN THE PURCHASE ORDER OR CONTRACT, A MANUFACTURER'S CERTIFICATION SHALL BE FURNISHED TO THE PURCHASER OF THE SHEET (FABRICATOR) OR TO THE PURCHASER OF THE FINISHED PIPE STATING THAT SAMPLES REPRESENTING EACH LOT HAVE BEEN TESTED AND INSPECTED IN ACCORDANCE WITH THIS SPECIFICATION AND THE REQUIREMENTS HAVE BEEN MET. WHEN SPECIFIED IN THE PURCHASE ORDER OR CONTRACT, A REPORT OF THE TEST RESULTS SHALL BE FURNISHED. THE RESULTS OF TEST SUGGESTED IN SECTION 7 AS QUALIFYING TESTS MAY BE TYPICAL RESULTS RATHER THAN RESULTS OF TESTS ON THE SPECIFIC LOT OF MATERIAL.

12 MARKING

- 12.1 EACH 0.6 TO 1.5 mm OF SHEET IN COILS OR CUT LENGTHS SHALL BE IDENTIFIED BY MARKING AS FOLLOWS:
- 12.1.1 NAME OF SHEET PRODUCER,
 - 12.1.2 BRAND NAME
 - 12.1.3 SPECIFIED THICKNESS OF METALLIC-COATED SHEET
 - 12.1.4 TYPE OF METALLIC COATING.
 - 12.1.5 TYPE OR THICKNESS OF POLYMER COATING.
 - 12.1.6 IDENTIFICATION SYBOLS RELATING TO A SPECIFIC HEAT NUMBER AND COATING LOT NUMBER, AND
 - 12.1.7 AASHTO DESIGNATION NUMBER.
- 12.2 THE BRAND SHALL BE REMOVED , OBLITERATED, OR THE SHEET REBRANDED "NON-SPECIFICATION" ON EACH 0.6 TO 1.5 mm OF MATERIAL IN A COATING LOT OR HEAT WHERE CONTROL TESTS, AS PRESCRIBED HEREIN, SHOW NONCONFORMANCE TO THIS SPECIFICATION, OR WHERE THE METALLIC-COATED STEEL SUBSTRATE SHOWS NONCONFORMANCE TO THE APPROPRIATE SHEET SPECIFICATION.
-

COMMENTARY (NOT PART OF THE SPECIFICATION)

- XI. PRINCIPAL CHANGES IN THIS REVISION RECORDED FOR THE CONVENIENCE OF THE USER.
- XI.1 ALUMINUM-COATED STEEL SHEET HAS BEEN DELETED AS AN ACCEPTABLE MATERIAL SINCE IT IS NOT PRODUCED WITH POLYMER COATING.
 - XI.2 THE CLASSIFICATION BASED ON POLYMER COATING THICKNESS, HAS BEEN CHANGED FROM ARBITRARY TYPES A, B, AND C TO GRADES WITH THE NUMBERS EXPRESSING THE POLYMER THICKNESS (SECTION 3).

XI.3 THE POLYMER COATING THICKNESS REQUIREMENT HAS BEEN CLARIFIED (SECTION 7.3)

XI.4 TEST METHODS CONTAINED IN THE SPECIFICATION HAVE BEEN REVISED TO ADD SCOPE, SIGNIFICANCE AND USE, AND PRECISION STATEMENTS AS REQUIRED BY ASTM (SECTIONS 9.1, 9.2, 9.7). CLARIFYING DETAILS HAVE BEEN ADDED IN SECTIONS 9.4 AND 9.8.

XI.5 THE CERTIFICATION PROVISIONS HAVE BEEN REVISED IN ACCORDANCE TO THE FORM AND STYLE FOR ASTM STANDARDS.

INSURANCE REQUIREMENTS - BIDS

All insurance requirements shall conform to Jefferson Parish Resolution No. 113646 or No. 113647. The contractor shall not commence work under this contract until he has obtained all insurance and complied with the requirements of the specifications and said Parish Resolutions. Except as otherwise provided by law, the Parish Attorney's Office with the concurrence of the Director of Risk Management is authorized to omit in whole or part the insurance requirements of this section in connection with contracts. Vendors inquiring about this shall submit his written request to the Purchasing Department prior to the due date of the bid. Contractor must deliver and maintain such insurances as provided; failure to do so shall be grounds for suspension, discontinuation or termination of the contract.

Successful bidder will be required to procure standard insurance policies evidencing Parish mandated insurance requirements indicated below. The current certificate of insurance must be submitted by low bidder within 10 days after bid opening to the Purchasing Department. Failure to comply will cause bid to be rejected.

1. WORKER'S COMPENSATION INSURANCE

As required by Louisiana State Statute, exception; Employer's Liability, Section B shall be \$1,000,000 per occurrence when Work is to be over water and involves maritime exposures to cover all employees not covered under the State Worker's Compensation Act, otherwise this limit shall be no less than \$500,000 per occurrence.

2. COMMERCIAL GENERAL LIABILITY

Shall provide limits not less than the following: \$1,000,000.00 Combined Single Limit per Occurrence for bodily injury and property damage.

3. COMPREHENSIVE AUTOMOBILE LIABILITY

Bodily injury liability \$1,000,000.00 each person; \$1,000,000.00 each occurrence.
Property Damage Liability \$1,000,000.00 each occurrence.

DEDUCTIBLES

No insurance required shall include a deductible not greater than \$10,000.00. The cost of the deductible shall be borne by the contractor.

NOTE: If the vendor requires a change in deductibles, the request must be submitted in writing to the Purchasing Department prior to the due date of the bid. Such request shall be reviewed by the Parish Attorney's Office.

UMBRELLA LIABILITY COVERAGE

An umbrella policy or excess may be used to meet minimum requirements.

CONSTRUCTION AND RENOVATION PROJECTS:

Unless otherwise specified in the bid, these additional insurance is required. Such insurance is due upon contract execution.

OWNER'S PROTECTIVE LIABILITY

To be for the same limits of liability for bodily injury and property damage liability established for commercial general liability.

BUILDER'S RISK INSURANCE

The contractor shall maintain Builder's Risk Insurance at his own expense to insure both the owner (Parish of Jefferson) and contractor as their interest may appear.

NOTE for CERTIFICATE HOLDER:

All insurance certificates shall list the certificate holder as follows:

"The Parish of Jefferson, its Districts, Departments and Agencies under the direction of the Parish President and the Parish Council." Additionally, the address on the Certificates should reflect the department which is letting the bid and reference the respective bid number.

Revised 2.10.2014



WWW.JEFFPARISH.NET

JOHN F. YOUNG, JR.
PARISH PRESIDENT

JEFFERSON PARISH DEPARTMENT OF PURCHASING

BRENDA J. CAMPOS
DIRECTOR

April 10, 2015

ADDENDUM NO.1

Bid No.: 50-00112843

Bid Opening Date: April 23, 2015

**For: TWO YEAR CONTRACT FOR A SUPPLY OF STEEL STORM DRAIN CULVERTS AND RELATED
ITEMS FOR THE JEFFERSON PARISH DEPARTMENT OF PUBLIC WORKS**

- o The affidavit attached to this addendum was omitted from the original bid submission. Please add this document to the bid packet.

Sincerely,

A handwritten signature in cursive script, reading "Laniel L. Francis", is written over a horizontal line.

Laniel L. Francis, Buyer II
Jefferson Parish Purchasing Department

**Bidders must acknowledge all addenda on the bid form. Bidder acknowledges receipt of
this addendum on the bid form as indicated. Failure to do so will result in bid rejection.**

This addendum is a part of the contract documents and modifies the original bidding documents and specifications. The contents of this addendum shall be included in the contract documents. Changes made by this addendum shall take precedence over the documents of earlier date.



Bid Number 50 - 00112843

Two (2) Year Contract for a Supply Steel Storm Drain Culverts and Related Items for the Jefferson Parish Department of Public Works – All Departments East and West Banks

APRIL 23, 2015 for 2:00pm

ATTENTION VENDORS!!!

Please review all pages and respond accordingly, complying with all provisions in the technical specifications and Jefferson Parish Instructions for Bidders and General Terms and Conditions. All bids must be received in the Purchasing Department by the bid due date and time.

**Jefferson Parish Purchasing Department
200 Derbigny Street
General Government Building, Suite 4400
Gretna, LA 70053
Ms. Laniel L. Francis
lfrancis@jeffparish.net
504.364.2690**

DATE: 4/08/2015

INVITATION TO BID
THIS IS NOT AN ORDER

BID NO.: 50-00112843

JEFFERSON PARISH

PURCHASING DEPARTMENT
P.O. BOX 9
GRETNA, LA. 70054-0009
504-364-2678

Page: 1

BUYER: LFRANCIS@jeffparish.net

BIDS WILL BE RECEIVED IN THE PURCHASING DEPARTMENT, SUITE 4400, JEFFERSON PARISH GENERAL GOVERNMENT BUILDING, 200 DERBIGNY STREET, GRETNA, LA 70053 UNTIL 2:00 PM, 4/23/2015 AND PUBLICLY OPENED THEREAFTER.

LATE BIDS WILL NOT BE ACCEPTED

Unless submitting via online (see Page 3), each bid must be submitted in a sealed envelope bearing on the outside; the name of the Bidder, his address, and the name of the project for which the bid is submitted and the bid number.

NOTE: ONLY BIDS WRITTEN IN INK OR TYPEWRITTEN, AND PROPERLY SIGNED BY A MEMBER OF THE FIRM OR AUTHORIZED REPRESENTATIVE, WILL BE ACCEPTED. PENCIL AND/OR PHOTOSTATIC FIGURES OR SIGNATURES SHALL RESULT IN BID REJECTION.

INSTRUCTIONS FOR BIDDERS AND GENERAL CONDITIONS

THE FOLLOWING INSTRUCTIONS APPLY TO ALL BIDS

All bids submitted are subject to these instructions and general conditions and any special conditions and specifications contained herein, all of which are made part of this bid proposal reference. By submitting a bid, vendor agrees to comply with all provisions of Louisiana Law as well compliance with the Jefferson Parish Code of Ordinances, Louisiana Code of Ethics, applicable Jefferson Parish ethical standards and Jefferson Parish Resolution No. 113646 and/or Resolution No. 113647.

All vendors submitting bids must register as a Jefferson Parish vendor if not already yet registered. Bidders may be required to furnish current W-9 Forms and respective Tax Identification Numbers within 10 days after bid opening if such information is not on file or not up to date. Forms to register may be downloaded from www.purchasing.jeffparish.net and clicking on Vendor Information.

All quotations shall be based on F.O.B. Agency warehouse or job site, anywhere within the Parish as designated by the Purchasing Department. This provision does not apply to public works projects

JEFFERSON PARISH requires all products to be new (current) and all work must be performed according to standard practices for the project. Unless otherwise specified, no aftermarket parts will be accepted. Unless otherwise specified, all workmanship and materials must have at least one (1) year guaranty, in writing, from the date of delivery and/or acceptance of the project. Any deviations or alterations from the specifications must be indicated and/or supporting documentation supplied with bid submission.

Bidders should submit all questions in writing and fax them to the Purchasing Department at (504) 364-2693 no later than FIVE (5) working days prior to bid opening. Bid numbers should be mentioned in all requests. Questions may also be emailed to the buyer for this bid at the email address listed above. If submitting online, vendors may send questions via the E-Procurement site no later than Five (5) working days prior to the bid opening.

If this bid requires a pre-bid conference (see Additional Requirements section), bidders are advised that such conference will be held to allow bidders the opportunity to identify any discrepancies in the bid specifications and seek further clarification regarding instructions. The Purchasing Department will issue a written response to bidders' questions in the form of an Addendum. Please note that all official communication will be expressed in the form of an addendum.

All formal Addenda require written acknowledgement on the bid form by the bidder. Failure to acknowledge an Addendum on the bid form shall cause the bid to be rejected. JEFFERSON PARISH reserves the right to award bid to next lowest responsive and responsible bidder in this event.

The purpose and intention of this invitation to bid is to afford all suppliers an equal opportunity to bid on all construction, maintenance, repair, operating supplies and/or equipment listed in this bid proposal. JEFFERSON PARISH WILL ACCEPT ONE BID ONLY FROM EACH VENDOR. Items bid must meet specifications.

Visit our website at [HTTP://PURCHASING.JEFFPARISH.NET](http://PURCHASING.JEFFPARISH.NET)

DATE: 4/08/2015

BID NO.: 50-00112843

Page: 2

JEFFERSON PARISH will accept one price for each item unless otherwise indicated. Two or more prices for one item will result in bid rejection. Bidders are required to complete, sign and return the bid form and/or complete and return the associated line item pricing forms as indicated.

If the bid exceeds \$30,000.00 and the company is duly authorized to do business in the state of Louisiana, a corporate resolution must be submitted with the bid or the person signing the bid documents must be listed on the Louisiana Secretary of State's website as an officer of the corporation, unless bidder has otherwise complied with LSA-R.S. 38:2212(A)(1)(c) or LSA-R.S. 38:2212 (O). If the bid is in excess of \$30,000 and bidder is registered out of the state of Louisiana, a corporate resolution must be submitted with the bid, unless bidder has otherwise complied with LSA-R.S. 38:2212(A)(1)(c) or LSA-R.S. 38:2212 (O). Failure to comply will cause bid to be rejected; the Parish reserves the right to award bid to the next lowest responsive and responsible bidder in this event. Bids submitted by Owner or Sole Proprietorships must include certification that he or she owns the entity for which the bid is signed. Sole proprietors submitting bids for public works projects shall within 10 days after bid opening submit sole proprietorship certification.

NOTE: A sample corporate resolution can be downloaded from our website <http://purchasing.jeffparish.net> or you may provide your own document. A sample certification of sole proprietorship can also be downloaded from our website <http://purchasing.jeffparish.net> or you may provide your own document.

INSTRUCTIONS FOR BIDDERS AND GENERAL CONDITIONS

A. AWARD OF CONTRACT: JEFFERSON PARISH reserves the right to award contracts or place orders on a lump sum or individual item basis, or such combination, as shall in its judgment be in the best interest of JEFFERSON PARISH. Every contract or order shall be awarded to the LOWEST RESPONSIVE and RESPONSIBLE BIDDER, taking into consideration the CONFORMITY WITH THE SPECIFICATIONS and the DELIVERY AND/OR COMPLETION DATE. IN THE EVENT OF SPLIT AWARD, THE PURCHASING DEPARTMENT MAY CONTACT VENDORS TO REQUEST REQUIRED AFFIDAVITS. THOSE VENDORS WILL HAVE 10 DAYS FROM THE DATE OF NOTICE TO SUBMIT COMPLETE, SIGNED AND NOTARIZED AFFIDAVITS IN ORIGINAL FORMATS.

All bid prices shall remain valid for 45 days. Jefferson Parish and the lowest responsive and responsible bidder(s) by mutual written consent may mutually agree to extend the deadline for award by one (1) or more extensions of thirty (30) calendar days.

Preference is hereby given to materials, supplies, and provisions produced, manufactured or grown in Louisiana, quality being equal to articles offered by competitors outside the state. "LSA-R.S.38:2251-2261"

B. USE OF BRAND NAMES AND STOCK NUMBERS: Where brand names and stock numbers are specified, it is for the purpose of establishing certain minimum standards of quality. Bids may be submitted for products of equal quality, provided brand names and stock numbers are specified. Complete product data may be required prior to award.

C. CANCELLATION OF CONTRACT: JEFFERSON PARISH reserves the right to cancel all or any part if not shipped promptly. No charges will be allowed for parking or cartage unless specified in quotation. The order must not be filled at a higher price than quoted. JEFFERSON PARISH reserves the right to cancel any contract at anytime and for any reason by issuing a THIRTY (30) day written notice to the contractor.

For good cause and as consideration for executing a contract with Jefferson Parish, vendor conveys, sells, assigns and transfers to Jefferson Parish or its assigns all rights, title and interest in and to all causes of action it may now or hereafter acquire under the antitrust laws of the United States and the State of Louisiana, relating to the particular good or services purchased or acquired by Jefferson Parish.

D. PRICES: Jefferson Parish is exempt from paying sales tax under LSA-R.S. 47:301 (8)(c). All prices for purchases by Jefferson Parish of supplies and materials shall be quoted in the unit of measure specified and unless otherwise specified, shall be exclusive of state and Parish taxes. The price quoted for work shall be stated in figures. In the event there is a difference in unit prices and totals, the unit price shall prevail.

Quantities listed are for bidding purposes only. Actual requirements may be more or less than quantities listed.

Bidders are not to exclude from participation in, deny the benefits of, or subject to discrimination under any program or activity, any person in the United States on the grounds of race, color, national origin, or sex; nor discriminate on the basis of age under the Age Discrimination Act of 1975, or with respect to an otherwise qualified handicapped individual as provided in Section 504 of the Rehabilitation Act of 1973, or on the basis of religion, except that any exemption from such prohibition against discrimination on the basis of religion as provided in the Civil Rights Act of 1964, or Title VI and VII of the Act of April 11, 1968, shall also apply. This assurance includes compliance with the administrative requirements of the Revenue Sharing final handicapped discrimination provisions contained in Section 51.55 (c), (d), (e), and (k)(5) of the Regulations. New construction or renovation projects must comply with Section 504 of the 1973 Rehabilitation Act, as amended, in accordance with the American National Standard Institute's specifications (ANSI A17.1-1961).

DATE: 4/08/2015

BID NO.: 50-00112843

INSTRUCTIONS FOR BIDDERS AND GENERAL CONDITIONS

Page: 3

E. RESPONSE TO INVITATION: If your company is unable to bid on this request, please state your reason on bid form, and return to this office before bid opening date. Failure to do so may result in the removal of your company from Jefferson Parish's vendors list.

F. POSTING OF BIDS: A listing of bids will be posted on bulletin board in Suite 4400, Jefferson Parish General Government Building, Gretna, LA and will remain posted until close of respective bids.

Advertised bids will be tabulated and a copy of the tabulation will be forwarded to each responding bidder.

IN ACCORDANCE WITH STATE REGULATIONS JEFFERSON PARISH OFFERS ELECTRONIC PROCUREMENT TO ALL VENDORS

This Electronic Procurement System allows vendors the convenience of reviewing and submitting bids online. This is a secure site and authorized personnel have limited read access only. Please note requirements contained in this bid package for electronic bid submission.

Please visit the Purchasing Department webpage at <http://purchasing.jeffparish.net> to register and review Jefferson Parish solicitations.

The general specifications for construction projects and the purchase of materials, services and/or supplies are those adopted by the JEFFERSON PARISH Council by Resolution No. 113646 or 113647 dated 12/09/09. The general conditions adopted by this resolution shall be considered as much a part of this document as if they were written wholly herein. A copy may be obtained from the Office of the Parish Clerk, Suite 6700, Jefferson Parish General Government Building, 200 Derbigny Street, Gretna, LA 70053. You may also obtain a copy by visiting the Purchasing Department webpage at <http://purchasing.jeffparish.net> and clicking on Online Forms.

ADDITIONAL REQUIREMENTS FOR THIS BID

PLEASE MATCH THE NUMBERS PRINTED IN THIS BOX WITH THE
CORRESPONDING INSTRUCTIONS BELOW.

10,12,13,15

1. All bidders must attend the pre-bid conference in relation to this bid; attendance is mandatory. Failure to attend will prohibit a company from submitting a bid. Vendors arriving after the mandatory pre-bid conference begins will not be allowed to sign in as evidence of attendance.
2. Attendance to this pre-bid conference is optional. However, failure to attend the pre-bid conference shall not relieve the bidder of responsibility for information discussed at the conference. Furthermore, failure to attend the pre-bid conference and inspection does not relieve the successful bidder from the necessity of furnishing materials or performing any work that may be required to complete the work in accordance with the specification with no additional cost to the owner.
3. Contractor must hold current applicable JEFFERSON PARISH licenses with the Department of Inspection and Code Enforcement. Contractor shall obtain any and all permits required by the JEFFERSON PARISH Department of Inspection and Code Enforcement. The contractor shall be responsible for the payment of these permits. All permits must be obtained prior to the start of the project. Contractor must also hold any and all applicable Federal and State licenses. Contractor shall be responsible for the payment of these permits and shall obtain them prior to the start of the project.

DATE: 4/08/2015

BID NO.: 50-00112843

Page: 4

INSTRUCTIONS FOR BIDDERS AND GENERAL CONDITIONS

4. A LA State Contractor's License will be required in accordance with LSA R.S. 37-2150 et. seq. and such license number will be shown on the outside of the bid envelope. Failure to comply will cause the bid to be rejected. Additionally if submitting the bid electronically, then the license number must be entered in the appropriate field in the Electronic Procurement system. Failure to comply will cause the bid to be rejected.
5. It is the bidder's responsibility to visit the job site and evaluate the job before submitting a bid.
6. Job site must be clean and free of all litter and debris daily and upon completion of the contract. Passageways must be kept clean and free of material, equipment, and debris at all times. Flammable material must be removed from the job site daily because storage will not be permitted on the premises. Precautions must be exercised at all times to safeguard the welfare of JEFFERSON PARISH and the general public.
7. PUBLIC WORKS BIDS: All awards for public works in excess of \$5,000.00 will be reduced to a formal contract which shall be recorded at the contractor's expense with the Clerk of Court and Ex-Officio Recorder of Mortgages for the Parish of Jefferson. A price list of recordation costs may be obtained from the Clerk of Court and Ex-Officio Recorder of Mortgages for the Parish of Jefferson. All awards in excess of \$25,000.00 will require both a performance and a payment bond. Unless otherwise stated in the bid specifications, the performance bond requirements shall be 100% of the contract price. Unless otherwise state in the bid specifications, the payment bond requirements shall be 100% of the contract price. Both bonds shall be supplied at the signing of the contract.
8. NON-PUBLIC WORKS BIDS: A performance bond will be required for this bid. The amount of the bond will be 100% of the contract price unless otherwise indicated in the specifications. The performance bond shall be supplied at the signing of the contract.
9. NON-PUBLIC WORKS BIDS: A payment bond will be required for this bid. The amount of the bond will be 100% of the contract price unless otherwise indicated in the specifications. The payment bond shall be supplied at the signing of the contract.
10. Unless otherwise stated in the bid specifications, the successful bidder will be required to procure standard insurance policies evidencing Parish-mandated insurance requirements as indicted on the attached sheet. The current certificate of insurance must be submitted by low bidder within 10 days after bid opening to the Purchasing Department. Failure to comply will cause bid to be rejected. JEFFERSON PARISH reserves the right to award bid to the next lowest responsive and responsible bidder in this event.
11. A bid bond will be required with bid submission in the amount of 5% of the total bid, unless otherwise stated in the bid specifications. Acceptable forms shall be limited to cashier's check, certified check, or surety bid bond. If submitting a bid online, vendors must submit an electronic bid bond through the respective online clearinghouse bond management system(s) as indicated in the electronic bid Solicitation on Central Auction House. No scanned paper copies of any bid bond will be accepted as part of the electronic bid submission.
12. This is a requirements contract to be provided on an as needed basis. JEFFERSON PARISH makes no representations or warranties with regard to minimum guaranteed quantities unless otherwise stated in the bid specifications.
13. Freight charges should be included in total cost when quoting. If not quoted FOB DELIVERED, freight must be quoted as a separate item. Bid may be rejected if not quoted FOB DELIVERED or if freight charges are not indicated on bid form.
14. PUBLIC WORKS BIDS - Completed, Signed and Properly Notarized Affidavits (in Original Format) required; Non-Conviction Affidavit, Non-Collusion Affidavit, Campaign Contribution Affidavit and E-Verify Affidavit must be completed, signed, notarized and submitted by low bidder within 10 days after bid opening to the Purchasing Department on all solicitations for construction, alteration or demolition of public building or project, including but not limited to requirements found in LSA-RS 38:2212.9; LSA-RS 38:2212.10; LSA-RS 38:2224; Code of Ordinances, Jefferson Parish, Louisiana, Sec 2-923.1. Failure to comply will cause bid to be rejected; the Parish reserves the right to award bid to the next lowest responsive and responsible bidder in this event. For the convenience of vendors, all affidavits have been combined into one form entitled PUBLIC WORKS BID AFFIDAVIT. This affidavit must be submitted in its original format for the bid to be considered responsive.
15. NON PUBLIC WORK BIDS - Completed, Signed and Properly Notarized Affidavits (in Original Format) required; Non-Collusion Affidavit, and Campaign Contribution Affidavit must be completed, signed, notarized and submitted by low bidder with bid submission within 10 days after bid opening to the Purchasing Department. See LSA-RS 38:2212.10; LSA-RS 38:2224; Code of Ordinances, Jefferson Parish, Louisiana, Sec 2-923.1 Failure to comply will cause bid to be rejected; the Parish reserves the right to award bid to the next lowest responsive and responsible bidder in this event. For the convenience of vendors, all affidavits have been combined into one form entitled NON-PUBLIC WORKS BID AFFIDAVIT. This affidavit must be submitted in its original format for the bid to be considered responsive.

It shall be the duty of every parish officer, employee, department, agency, special district, board, and commission; and the duty of every contractor, subcontractor, and licensee of the parish, and the duty of every applicant for certification of eligibility for a parish contract or program, to cooperate with the Inspector General in any investigation, audit, inspection, performance review, or hearing pursuant to Jefferson Parish Code of Ordinances Section 2-155.10(19). By submitting a bid, vendor acknowledges this and will abide by all provisions of the referenced Jefferson Parish Code of Ordinances.