



ISO 9001:2015 Certified



ঢাকা পল্লী বিদ্যুৎ সমিতি-১
DHAKA PALLI BIDYUT SAMITY-1



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স্মারক নং-২৭.১২.২৬৭২.৫০১.০১.০২২.২২. ২০২২

তারিখঃ ২১/০৯/২০২২খ্রিঃ।

দরপত্র দলিল সংশোধনী (Section 5 & Section 7)

সংশ্লিষ্ট সকলের অবগতির জন্য জানানো যাচ্ছে যে, ঢাকা পবিস-১ এর দরপত্র আহবানের স্মারক নং-২৭.১২.২৬৭২.৫০১.০১.০২২.২২-২৭৫০, তাং-৩১/০৮/২০২২ খ্রিঃ এর বিপরীতে গত ০১/০৯/২০২২ খ্রিঃ তারিখে জাতীয় দৈনিক সমকাল ও The New Age পত্রিকায় ০৪(চার)টি প্যাকেজের মাধ্যমে CONDUCTOR, # 6 DUPLEX (ITEM NO. D-11) ক্রয়ের লক্ষ্যে দরপত্র বিজ্ঞপ্তি প্রকাশিত হয়েছে। তৎপ্রেক্ষিতে টেন্ডার ডকুমেন্টের Section 5 এর Specification Submission and Compliance Sheet(Form PG3-5) এবং Section 7 এর Technical Specifications BREB কর্তৃক সংশোধিত হওয়ায় সংশোধনী অনুযায়ী দরপত্র দাখিল করার জন্য অনুরোধ করা হলো। দরপত্র দলিলের অন্যান্য শর্তাবলী অপরিবর্তিত থাকবে।

সংযুক্তিঃ (১) Specification Submission and Compliance Sheet(Form PG3-5)- ০১ পৃষ্ঠা।
(২) Technical Specifications – ০৯ পৃষ্ঠা।

(মোঃ শাহজাহান কবীর)
সিনিয়র জেনারেল ম্যানেজার।

অনুলিপি(জ্যেষ্ঠতার ক্রমানুসারে নয়):-

- ০১। পরিচালক, পবিস মনিটরিং ও ব্যবস্থাপনা পরিচালন (কেঃ অঃ/উঃ অঃ/দঃ অঃ/পূঃ অঃ/ পঃ অঃ) পরিদপ্তর, বাপবিবো, ঢাকা।
- ০২। জেলা প্রশাসক, ঢাকা/গাজীপুর।
- ০৩। পুলিশ সুপার, ঢাকা/গাজীপুর।
- ০৪। তত্ত্বাবধায়ক প্রকৌশলী, ঢাকা উত্তর, বাপবিবো, ঢাকা।
- ০৫। নির্বাহী প্রকৌশলী, এলজিইডি/সড়ক ও জনপথ বিভাগ, ঢাকা।
- ০৬। সিনিয়র জেনারেল ম্যানেজার/জেনারেল ম্যানেজার -----পবিস-১/২/৩/৪।
- ০৭। নির্বাহী প্রকৌশলী, (এসওডি), ঢাকা উত্তর, বাপবিবো, ঢাকা।
- ০৮। ডিজিএম, (সদর-কারিগরী/শ্রীপুর/চন্দ্রা/জামগড়া/আশুলিয়া/মৌচাক/কালিয়াকৈর জোনাল অফিস, ঢাকা পবিস-১।
- ০৯। এজিএম (অর্থ-হিসাব/ অর্থ-রাজস্ব/ওএন্ডএম/সঃ সেবা/ইএন্ডসি/এইচআর), ঢাকা পবিস-১।
- ১০। মেসার্স
- ১১। এজিএম (আইটি): ওয়েব সাইটে প্রকাশের ব্যবস্থা গ্রহণের জন্য নির্দেশ প্রদান করা হলো।
- ১২। নোটিশ বোর্ড, ঢাকা পবিস-১/ ওয়েব সাইট Web: WWW.pbs01.dhaka.gov.bd
- ১৩। অফিস/মাষ্টার কপি।

সিনিয়র জেনারেল ম্যানেজার।

SPECIFICATION SUBMISSION AND COMPLIANCE SHEET (Form PG3-5)

(To be filled by the Tenderer)

Sub- Package No. :

Item: Insulated Conductor

Item No.	Technical Particulars	REB specification	Guaranteed Specification
	MANUFACTURER'S NAME :	To be mentioned	
D-11	a) Standard	ASTM B231,ASTMB232, ICEA S-66-524 (NEMA WC7)	
	b) Conductor type : D-11	Duplex: 6	
	c) No. of strands	7	
	i) Phase Conductor(AAC)		
	ii) Messenger Conductor (ACSR)	6/1	
	d) Diameter(Strand)		
	i) Phase Conductor : D-11	1.56 mm	
	ii) Messenger Conductor : D-11	1.68 mm	
	e) D.C Resistance at 20 deg.C		
	i) Phase Conductor(AL): D-11	2.17 ohm/km	
	ii) Messenger Conductor(ACSR)	2.157 ohm/km	
	f) Rated strength (Messenger): D-11	540kg	
	g) Insulation Material	Cross-link Polyethylene	
	h) Insulation Thickness	D-11=45 Mils(1.14mm)	
	i) Carbon black for unfilled insulation	(2.5+/- 0.5)%	
	j) Unaged T.S. of XLPE (min)	1.27 kg/sq.mm or 1800 lb/in.sq	
	k) Unaged E.L. of XLPE (min)	250%	
	l) Aged T.S. of XLPE (min)	0.9525 kg/sq.mm/1350 lb/in.sq	
	m) Aged E.L. of XLPE (min)	187.50%	
	n) Insulation resistance(min): D-11	525 Mohm.km	
	o) Set test(max)	175%	
	p) Heat distortion(max)	30%	
	q) Degree of cross-linking	(70-95)%	
	r) Lay diriction	Right-hand	
	s) Aluminum Wire lay factor	(10 to 16)xdia , Preferred -13.5	
	t) Messenger wire lay factor	(12 to 14.5)xdia , Preferred -13.5	
u) Formation of lay	Aluminium concentric lay		
v) Packing Length / reel : D-11	800 m		
w) Reel Size	NRX 30 : 22 (D-11) Given or Higher reel size which one is applicable can be used.		
x) manufacturers name	Manufacturer's name must be permanent LASER / wheel print on the insulated cable at an interval of every 2 meters.		
y) Test Report (Routine & type)	To be Furnished		
z) Test Laboratory	Report from an independent testing laboratory		

Note:-The bidders are required to submit all certified test reports as per above description. In the event of non-submission of any Test Report, the bid may be rejected.

Signature of Tenderer:

Name:

In the capacity of:

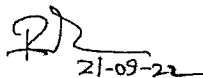


21.09.22

(মোঃ শাকিল হাসান)

সহকারী প্রকৌশলী

এমপিএসএস পরিদপ্তর, নারায়ণপুরা



(মোঃ রফিকুল ইসলাম)

উপ-পরিচালক (কারিগরী)

এমপিএসএস পরিদপ্তর, নারায়ণপুরা

PUBLICATION 224-1988
RURAL ELECTRIFICATION BOARD (REB)
PEOPLES REPUBLIC OF BANGLADESH
STANDARD FOR
PREASSEMBLED CROSS LINKED POLYETHYLENE-INSULATED
ALUMINUM CABLE WITH ACSR MESSENGER

1. SCOPE:

This standard establishes the physical and electrical characteristics of pre-assembled cross linked polyethylene (XLPE) - insulated aluminum cables supported by a bare ACSR messenger wire. These assemblies shall be used as aerial single-phase and three-phase service drop cables in the REB overhead 50 Hz, 600-volt distribution system. The insulated aluminum conductors shall be twisted around the messenger wire, which also serves as a neutral conductor. These cable assemblies shall be used in regions that have hot and humid tropical weather with high annual rainfall.

2. GENERAL:

Pre-assembled messenger-supported cables provided to REB shall conform to the physical and electrical requirements of this standard. These assemblies shall be identified as follows:

Assembly	Components	
	Aluminum Cable	ACSR Messenger
Duplex	1	1
Quadruplex	3	1

3. MATERIAL:

3.1. Aluminum Cable

a. Description

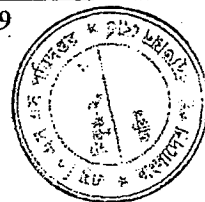
The aluminum cable shall be formed of seven concentric lay stranded wires which meet the chemical requirements of ASTM B231. The wires shall be either:

- i) Annealed, or an intermediate temper which meets the tensile and finish requirements of ASTM B609.
- ii) Hard-drawn, meeting the tensile, elongation, brittleness and finish requirements of ASTM B230.

b. Physical Characteristics

The wires shall be arranged with a right-hand lay. The preferred lay shall be 13.5 times the outside diameter of the wire, but the lay shall not exceed 16 times nor be less than 10 times the wire diameter.

The wires shall have a density of 0.0975 lb/in.³ at 20°C.



c. **Electrical Characteristics**

The wires shall have a volume resistivity constant of 17.002 ohm. cmil/ft and a minimum volume conductivity of 61.0% IACS at 20°C.

3.2. **Insulation:**

a. **General**

The aluminum cable shall be provided with only unfilled cross-linked polyethylene insulation. An unfilled insulation shall contain carbon black ranging (2.5± 0.5)% for cables up to 5.0 KV. The insulation shall be free from voids, contaminants or porosity detectable with less than five times magnification.

b. **Physical and Aging Requirements**

The insulation shall meet the requirements of ICEA 538 standards Publication no. S-66-524 (NEMA WC7)

The insulation shall exhibit the following performances:

i) **Unaged Condition**

Minimum tensile strength : 1800 lb/1n
Minimum elongation at rupture : 250%

ii) Aged condition after oven test at 121°C ± 1°C for 168 hours.

Minimum tensile strength a rupture (% of unaged value) 75%

iii) Elongation at rupture (% of unaged value) : 75%

iv) Heat distortion (% of unaged value)

4/0 AWG and smaller : 30%
Larger than 4/0 : 10%

c. **Insulation Thickness**

Insulation jacket thickness of REB pre-assembled cables are listed in Section 7 of this document.

d. **Electrical Properties**

i) **Insulation Resistance**

Cable insulation resistance is the resistance of the insulation to the radial flow of direct current from the conductor to the outer coverings of the cable. The test procedure shall conform to the methods outlined in section 6.15 of ICEA S-66-524, (NEMA WC7), at 60°F (15.6°C). The resistance shall not be less than the value calculated as follows:

$$R = K \log_{10} D/d$$



Where: R = Insulation resistance (meg-ohms per 1000 ft)
 K = Insulation constant
 D = Diameter over insulation
 d = Diameter under insulation

e. **Performance Requirement**

The cable shall be tested to demonstrate compliance with the requirements of Section 6 of ICEA S-66-524 (NEMA WC7).

The tests shall include:

i) **Wires**

- a. Dc resistance
- b. Cross sectional area determination
- c. Diameter determination

ii) **Insulation**

- a. Tensile strength and Elongation test (Aged and unaged)
- b. Set test
- c. Solvent extraction test
- d. Heat distortion
- e. Volume resistivity
- f. Ac/Dc voltage test
- g. Ac/Dc spark test (during production)
- h. Insulation resistance test
- i. Test of Carbon Black content

3.3. **Messenger Wire**

The messenger wire shall be a bare ACSR conductor (Class AA) which shall serve as the neutral conductor. This messenger shall have six round aluminum wires wrapped around central zinc coated round steel core wire. The ACSR conductor shall conform to the physical requirements of ASTM B232 and REB Publication 225.

a. The steel core wire shall be fabricated from steel obtained by the open-hearth, electric furnace or basic oxygen process and conforms to the chemical composition specified in Section 3 of ASTM B498 as follows:

Composition:

<u>Element</u>	<u>Percent (%)</u>
Carbon	0.50 to 0.85
Manganese	0.50 to 1.10
Phosphorus, max.	0.035
Sulfur, max.	0.045
Silicon	0.10 to 0.35



The steel core wire shall be coated with zinc to Class requirements of coating weight as described in Table 4 of ASTM B498.

This wire shall be tested in accordance with Sections 5, 6 and 10 of ASTM B498.

b. The aluminum wires shall be fabricated from material that conforms to the requirements of Table 2 of ASTM B233.

The aluminum wires shall have tensile strength depending on temper, as shown in Table 1 of ASTM B230. Diameter sizes and tolerances of the aluminum rods presented in Table 3 of ASTM B230 are as follows:

DIAMETER TOLERANCES

<u>Specified Diameters (Inclusive)</u>		Permissible variations of mean diameter from specified diameter+
<u>Inches</u>	<u>mm</u>	
0.02600 to 1.000	6.604 to 2.540	10%
Under 0.1000 to 0.03600	Under 2.540 to 0.914	0.0010 in. (0.025 mm)
Under 0.3600 to 0.0105	Under 0.914 to 0.267	0.0005 in. (0.013 mm)

- c. The lay factor of the aluminum wires shall be within range from 12 to 14.5 times the outside diameter of the ACSR conductor. The preferred lay factor is 13 times the diameter, with the lay in the right hand direction.
- d. The rated strength of the conductor shall be the aggregate strength of the steel and aluminum wires determined by the methods described in Section 9.1 of ASTM 232.
- e. Mechanical and electrical tests shall be conducted in accordance with Section 8 of ASTM B232.
- f. In accordance with Section 10 of ASTM B232, the density of aluminum wire is assumed to be 0.0975 lb/in.³ at 20°C on the basis of 99.50 percent purity. The density of galvanized steel wire is assumed to be 0.281 lb/in.³ at 20°C.

The weight and electrical resistance of the stranded conductor shall be determined by methods described in Section 11 of ASTM B232.

4. ASSEMBLY:

The insulated conductors shall be twisted around the messenger with a lay of 25 to 60 times the diameter of one of the insulated conductors. The direction of lay shall be the same as that of the messenger wire.

Manufacturer's name must be permanent LASER / wheel print on the insulated cable at an interval of every 2 meters.

5. MESSENGER SIZING:

The messenger shall be sized in accordance with Table 7-8 of ICEA S-66-524, NEMA WC-7, summarized below over the range of conductor sizes required by REB for duplex and quadruplex assemblies.



Aluminum Insulated Power
Cable Conductor Sizes
(AWG)

ACSR Neutral Sizes
(AWG)

6	6
4	4
3	3
1/0	1/0
4/0	4/0

6. INFORMATION REQUIRED:

The bidder shall provide the following information with the bid:

- 6.1 Resistance and density of the aluminum and ACSR conductors.
- 6.2 Insulation material type, thickness and electrical properties.
- 6.3 Manufacturer's catalog showing catalog number of proposed conductor assembly.
- 6.4 Exceptions to this REB standard should be clearly identified.
- 6.5 Test report on mechanical and electrical performance of aluminum cable, ACSR conductor and of insulation.

7. PACKAGING AND SHIPPING:

Conductor shall be shipped on **non-returnable** reels manufactured from "aluminum"; "steel" or export quality preservative treated "wood". All reels shall have preservative treated wood lagging. **Wood reels and all lagging** shall be constructed from new lumber which shall be square sawn, be of smooth surface, with no splits, warps, crooks, loose fibers, decay or insect infestation. The lumber used for wood reels and all lagging shall be preservative treated in accordance with "American Wood Preservers Associates Standards" and as stipulated below:

<u>Description</u>	<u>Requirements/Methods</u>	<u>AWPA Standards</u>
Lumber:	All softwood species	C1-82, C2-83 and C16-82
Preservatives: (any one)	Acid Copper Chromate (ACC) Ammoniacal Copper Arsenate (ACA) Chromated Copper Arsenate	P5-83, C1-82, C2-83 and C16-82 Type C CCA-C)
Treatment:	Pressure Treatment after all carpentry work.	C1-82, C2-83 and C16-82
Results of Treatment:		
Penetration:	Minimum 0.4 inches from the surface of any face.	C16-82



Assay Zone: 0-0.6 inch zone C16-82

Retention: 0.62 pcf for ACC, 0.40 pcf for ACA and C1-82, C2-83 and C16-82
 CCA. Copper shall be calculated as CuO,
 Chromium as CrO₃ and Arsenic as AS₂O₅

- Tests: 1) Wet ash analysis for oxides A7-75, A2-85 (Section 2, 5, 6)
 2) X-Ray A9-86
 3) Atomic Absorption A7-75 and A11-83

A typical reel shown in Figures IA and IB shall have dimensions as follows:

Reel Dimensions In Centimeters

Reel Designation	Flange Diameter	Drum Diameter	Width		Arbor Hole Diameter
			Inside	Outside	
NRX 30.22	76.2	45.8	55.8	64.8	7.62
NRX 42.28	106.7	53.3	71.1	80.0	7.62
NRX 60.28	152.4	71.1	71.1	80.0	7.62

Reel Dimensions In Inches

Reel Designation	Flange Diameter	Drum Diameter	Width		Arbor Hole Diameter
			Inside	Outside	
NRX 30.22	30	18	22	25.5	3
NRX 42.28	42	21	28	31.5	3
NRX 60.28	60	28	28	31.5	3

Given or Higher/Lower reel size which one is applicable can be used.

REB pre-assembled conductor types are:



Item No.	Conductor Assembly	AAC Phase Conductor		Messenger (ACSR)		Length Mtr.(Feet)	Nominal Insulation Thickness (mils)	Shipping Thickness (mils)
		Size (AWG)	Stranding	Stranding AWG	Al./Steel			
D-11	Duplex 6		7	6	6/1	800(2625)	45	
D-12	Duplex 3		7	3	6/1	500 (1640)	45	
D-14	Quadruplex	3	7	3	6/1	500 (1640)	45	
D-15	Quadruplex	1/0	7	1/0	6/1	350 (1148)	60	
D-20	Quadruplex	4	7	4	6/1	450 (1476)	45	
D-24	Quadruplex	4/0	7	4/0	6/1	300 (984)	60	
D-25	Quadruplex	6	7	6	6/1	600 (1968)	45	

The top layer shall be covered by a sheet of polyethylene or similar plastic material after the pre-assembled cable is wound on the reel. Paper liners and wrappings are prohibited.

The reel shall be prepared for shipping by:

- i) Nailing one inch (1") lagging strips to the flanges using two (2) eight-penny (8d) nails at each end.
- ii) Binding the lagging strips circumferentially with at least four (4) galvanized steel straps (Figure 1B).

Each reel shall contain one length of pre-assembled cable. Each drum should contain the same of length.

REB shall also allow an amount of conductor not exceeding ten percent (10%) of the total weight of the order to be shipped in random lengths none of which shall be shorter than fifty percent (50%) of the nominal shipping length.

Metal tags shall be attached to the outside of the reel containing the following information:

1. Gross and net weights.
2. Aluminum conductor size, number of strands, insulation type.
3. ACSR conductor size, stranding.
4. Actual length in meters.
5. Manufacturers name and/or identification symbol.
6. Shipping data.
7. REB item number.

Same information must be written on the flange of the drum by black ink.

8. TEST AND INSPECTION:

The manufacturer shall perform all the necessary tests in an independent laboratory to determine if the conductor assembly conforms to the requirements of this standard. REB reserves the right to witness factory tests and the bidder shall submit copies of all the test reports with his bid proposal. The manufacturer shall also conduct conductor reel tests and inspections and submit test reports before shipment to verify that the reels and lagging comply with the requirements of this standard.

REB shall also have the prerogative to inspect conductor reels at any time to insure compliance of this standard.

Non-conforming reels and lagging are unacceptable.

9. OTHER STANDARDS:



The performance requirements of pre-assembled aluminum cables, based on other internationally recognized standards, are acceptable only if the requirements of such standards are equivalent to or exceed the requirements quoted in this document.

10. BIBLIOGRAPHY OF REFERENCE STANDARDS: (Latest Edition)

1. NEMA Standards publication NO./WC 7-1982 cross-link thermosetting polyethylene insulated wire and cable for the transmission and distribution of electrical energy.
2. ASTM B231: Standard Specification for Concentric-Lay-Stranded Aluminum 1350 Conductor.
3. ASTM D1603: Standard test method for carbon black content.
4. ASTM D2765: Standard test method for solvent extraction
5. Servative Treatment By Pressure Process for Wood Used on Farms.
6. ASTM B232: Standard specification for concentric- Lay-stranded Aluminum conductors coated steel Reinforced (ACSR)
7. IEC 538: Standard specification for Carbon black Content in the XLPE insulation rated up to 5KV conductor.
8. Publication-225: Standard for bare ACSR conductors (class-A)
9. ASTM B498: Standard specification for zinc-coated (Galvanized) steel core wire for aluminium conductors Steel Reinforce (ACSR)
10. AWPA C1: "Standard for preservative treatment by pressure process all timber products"
11. AWPA P5: "Standard method for water-borne preservatives"
12. AWPA A2: "Standard method for analysis of water-borne preservatives and fire retardant formulation".
13. AWPA A7: "Wet Ashing procedures for preparing wood for chemical Analysis."
14. AWPA A9: "Standard method for Analysis of treated wood and treating solutions by X-Ray Emission spectroscopy."
15. AWPA A11: "Analysis of treated wood and treating solutions by atomic Absorption spectroscopy."
16. AWPA C2: "Pressure treatment by pressure process for lumber, timbers, bridge ties and mine ties.
17. AWPA C16: "Preservative treatment by pressure process for wood used on farms.



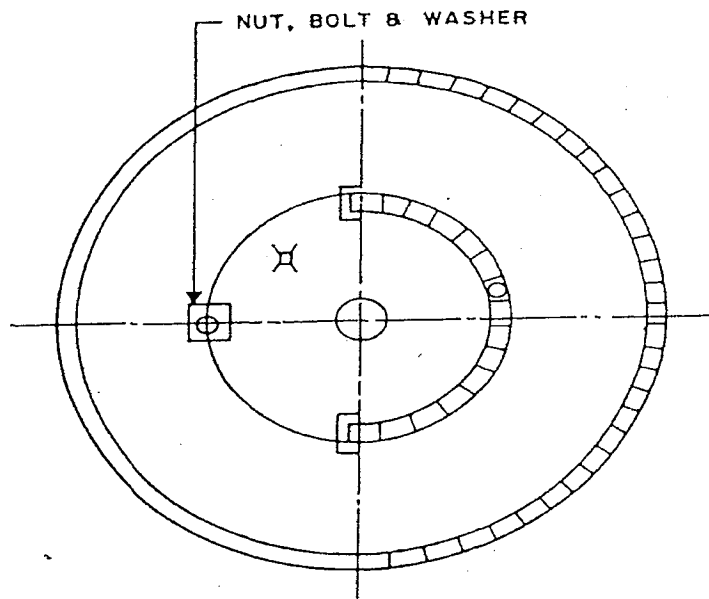


FIGURE 1A

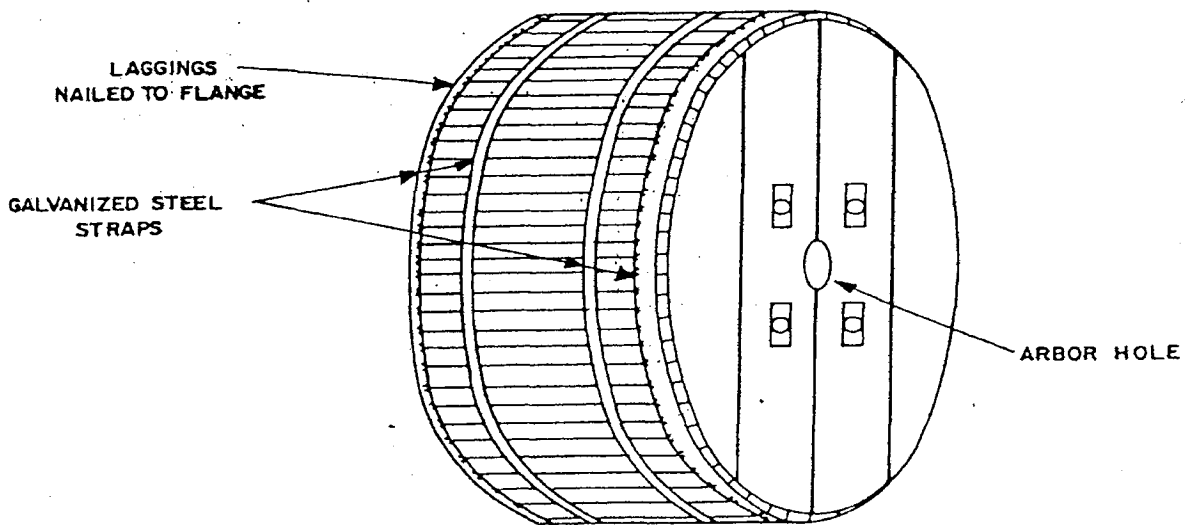


FIGURE 1B
REEL READY FOR SHIPPING

