


4X270MW BHADRADRI TPS

**TECHNICAL SPECIFICATION
FOR
BONDED MINERAL (ROCK) WOOL MATTRESSES)**

**SPECIFICATION NO. PE-TS-411-169-M032
Rev. No.: 00**



**BHARAT HEAVY ELECTRICALS LIMITED, POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, INDIA**

	TECHNICAL SPECIFICATION BONDED MINERAL (ROCK) WOOL MATTRESSES 4X270MW BHADRADRI TPS	SPECIFICATION NO. PE-TS-411-169-M032	
		REV. NO.: 00	DATE: 02.11.2021
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1.00.00 GENERAL

This specification covers the requirements of manufacture, physical & chemical properties, inspection & testing and packing for supply of bonded mineral (rock) wool mattresses having metallic hexagonal wire netting as facing on one or both side, suitable for service temperatures up to 750 deg C.

2.00.00 CODES AND STANDARDS

2.01.00 INDIAN STANDARD

- 2.01.01 The manufacture, physical & chemical properties, inspection and testing of the bonded mineral rock wool mattresses shall conform to the latest editions of the following appropriate standards.
- 2.01.02 IS: 8183 Specification for bonded mineral wool.
- 2.01.03 IS: 3144 Methods of test for mineral wool thermal insulation materials.
- 2.01.04 IS: 3346 Methods for the determination of thermal conductivity of thermal insulation materials (two slab, guarded hot plate method).
- 2.02.00 In case of any conflict between the above standards and this specification, the latter shall be final.

3.00.00 MANUFACTURE


- 3.01.00 The mattresses shall be made from rock processed from a molten state into fibrous form with minimum organic thermosetting binder, and shall be machine felted, baked and metallic stitched / faced with metallic hexagonal wire netting on one or both sides (as specified in the BOM).
- 3.02.00 The metallic hexagonal wire netting shall be of Galvanized steel (made from wire conforming to IS: 280 medium coated to IS: 4826) / Stainless steel (made from wire to IS: 6528) having wire size and aperture conforming to IS: 3150, as specified in the BOM.
- 3.03.00 The mattress shall be continuously stitched / tied on to the wire netting with minimum 0.4 mm dia. galvanized steel / stainless steel wire, as specified in the BOM. The spacing between the stitching / ties shall not be more than 250 mm along the width and 150 mm along the length.

4.00.00 DIMENSIONS AND DIMENSIONAL TOLERANCES

- 4.01.00 The length and width of the mattresses shall be 1520 mm x 1220 mm or 1640 mm x 1220 mm. Nominal thickness shall be 25, 40, 50, 60, 70, 75 or 80 mm.
- 4.02.00 The method of measuring the dimensions i.e. length, width and thickness shall be as prescribed in IS: 3144. Tolerance on length and width shall be as per IS:8183. Tolerance on thickness shall be +6mm/-2mm.

5.00.00 BULK DENSITY AND TOLERANCES ON DENSITY

- 5.01.00 The bulk density of the bonded mineral (rock) wool mattresses without the facings, shall be 150 / 100 kg/m³ unless otherwise specified. Tolerances on bulk density shall be +15 % and - 5% when tested as per method prescribed in IS: 3144.

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6.00.00 MATERIAL PROPERTIES

6.01.00 SHOT CONTENT:

The method for determination of shot content shall be as prescribed in IS: 3144. The maximum shot content shall be 5% by weight.

Any shot present in the materials shall not be greater than 5 mm in any dimension.

6.02.00 THERMAL CONDUCTIVITY

The thermal conductivity (k-value) of the bonded mineral wool mattresses shall not exceed the values given in IS: 8183 Latest when determined in accordance with the method prescribed in IS: 3346.

K' Value test (for minimum three mean temperatures i.e. 100°C, 200°C & 300°C) results to be provided to BHEL for acceptance in accordance with conditions given below: -

If 'K' Value test has been conducted against any BHEL order, on sample collected within 12 months prior to the date of present inspection, the related test results may be provided. Otherwise, the test will be carried out on samples identified and sealed by customer / BHEL authorized representative and related test results to be provided. The test will be carried out at govt. approved labs or test houses (at CBRI – Roorkee, IIT – Chennai, PIBCO R & D Centre - N. Delhi, NIRMA University, Ahmedabad) recognized by reputed customers.


6.03.00 HEAT RESISTANCE

When a sample of mattress is heated to the maximum recommended temperature of use (550 °C for 100 kg/m³ density and 750 °C for 150 kg/m³ density) as per method prescribed in IS:3144 (test for maximum recommended temp), the material shall not suffer visible deterioration of the fibrous structure, any fusion of fibers and shall not show any evidence of internal self-heating. Any colour change shall not be considered as visible deterioration in fibrous structure.

6.04.00 OTHER TESTS

The following tests are to be conducted as per IS:3144/IS:8183 and the acceptance norms shall be as per IS:8183.

- a. Moisture content
- b. Moisture Absorption
- c. Incombustibility
- d. Sulphur content
- e. Recovery after Compression
- f. Alkalinity
- g. Chloride Content

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- h. Fibre Diameter
- i. Resistance to vibration
- j. Resistance to jolting

7.00.00 PACKING AND MARKING

7.01.00 Stack of mattresses shall be packed in unfolded condition and sealed in polythene bags of at least 0.2mm thickness. Then the sealed bags shall be put inside the polythene lined HDPE or HDPP Woven netting bags and sealed by machine stitching.

To account for looseness in packing (if any) due to machine stitching, the bags shall be properly stacked and tightly fastened during transportation to avoid any possible damage due to relative movements. Sharp edges of wire netting shall be bent inwards to avoid damage to packing.

7.02.00 Each bag of mattresses shall be serial numbered. Also, printed sheets indicating the nominal thickness, density and wire netting details (i.e. material and size) shall be placed below the wire netting.

7.03.00 For easy identification of mattresses as per density & wire netting material, following colour codes for the HDPE bags is to be followed:


- a) Yellow bags with marking as shown in Fig 1 (Page 5 of 5) for 150 kg/m³ with Galvanized steel wire netting
- b) White bags with marking as shown in Fig 1 (Page 5 of 5) for 100 kg/m³ with Galvanized steel wire netting
- c) Yellow bags with marking as shown in Fig 1 (Page 5 of 5) for 150 kg/m³ with SS wire netting
- d) In case of both side SS/ GS wire meshing, additional marking "BOTH SIDE MESH" is to be provided.

7.04.00 Following details shall be legibly and indelibly marked on the packages.

- a) Project Name
- b) Vendor name:
- c) Purchase Order No. and Date
- d) Sl. No. of package/Batch No:
- e) Size of mattresses (Thickness x Length x Width)
- f) Density of mattresses
- f) Wire netting material and size
- g) Weight of the package
- h) No. of mattresses in the package
- i) A caution note "Always store under covered shed and on raised platforms"

8.00.00 INSPECTION AND TESTING

8.01.00 Bonded mineral wool mattresses to be supplied under this specification shall be of tested quality and workmanship. Inspection and testing of thermal insulation materials shall be

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as per this specification / quality plan enclosed. Manufacturer shall conduct all tests and stage inspections as per the approved quality plan to ensure that the material conforms to the requirements of this specification and of applicable standards. All shop tests shall be conducted in the presence of BHEL's / BHEL's customer's representative, on the samples identified by him / them.

8.02.00 The Quality Plan enclosed with this specification specifies minimum quality control requirement. During contract stage vendor shall furnish this Quality Plan duly signed & stamped for BHEL approval. Quality plan shall be approved by BHEL and customer. Inspection and testing shall be carried out as per Quality Plan by BHEL/ BHEL representative and customer (as applicable). In case inspection is by both BHEL and their customer, then the inspection can be carried out jointly or separately, which will be informed later. In case of the foreign bidder, inspection shall be carried out by reputed third party.

8.03.00 The charges for third party inspection (Lloyds, TUV or equivalent) for foreign bidders shall be included in the base price of the item by the bidder. This third party agency shall be approved by BHEL. Bidder to inform the same in the offer and mention the same in Quality Plan.

Note: There may be minor changes in quality plan depending on customer/consultant comments which will HAVE TO BE ACCOMMODATED BY VENDOR AT NO EXTRA COST.

9.00.00 DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT:

1. Quality plan duly signed and stamped.
2. Datasheet for Approval by BHEL/Customer.

Approval of Quality plan/ Data sheet shall be required for manufacturing clearance and the same shall be considered for delay analysis by BHEL.



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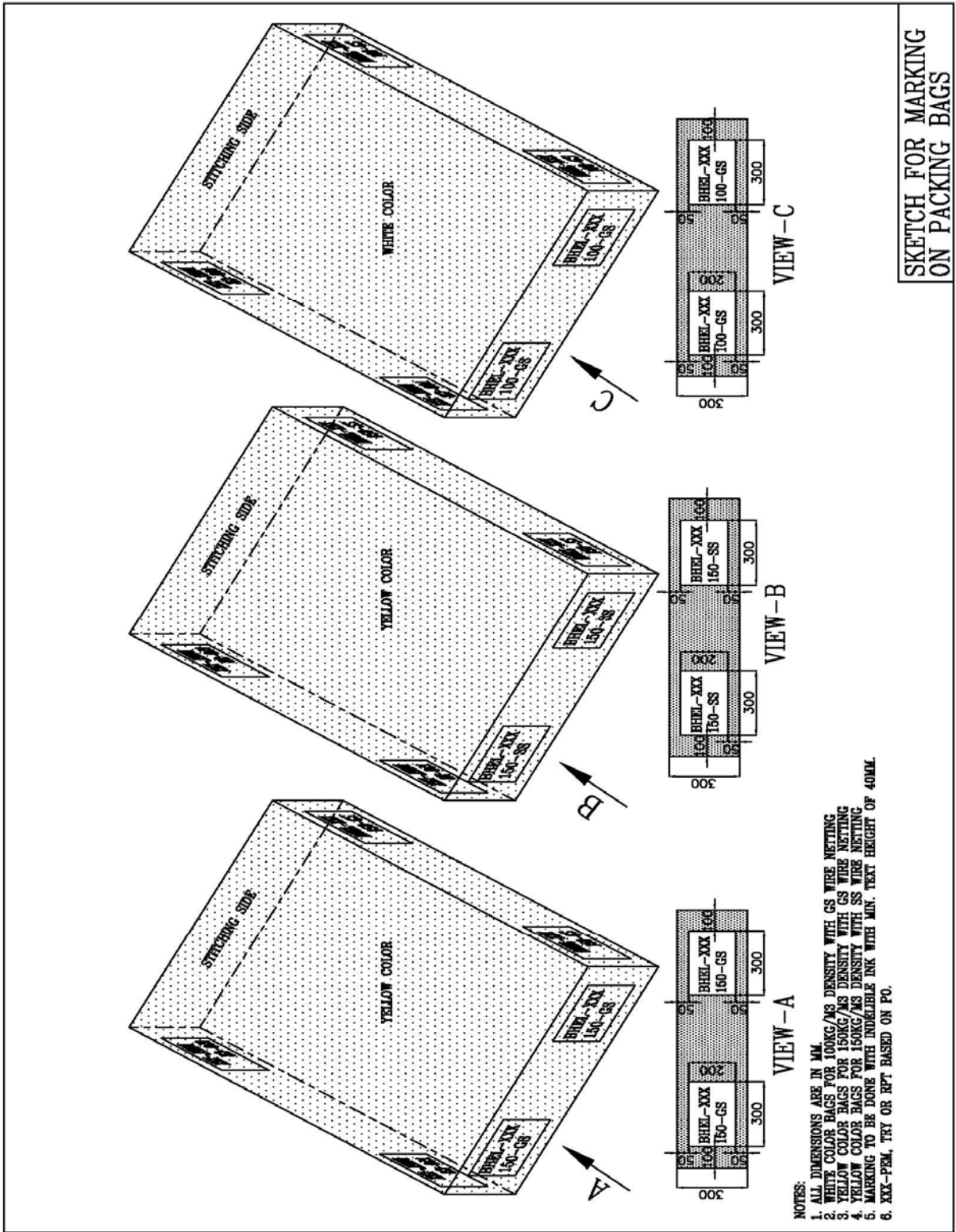



Fig 1: Sketch for marking on bags


	DATA SHEET- A	SPECIFICATION NO. PE-TS-411-169-M032	
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B.O.M.

S.No	MATERIAL	DENSITY(Kg/m3)	THK(mm)	Quantity (m2)
1	Bonded mineral (Rock) wool mattresses with one side GS wire netting of 13 mm x 0.56 mm size stitched with 0.4 mm GS wire	150	25	100
			40	700
			50	1200
			60	300
			75	100
3	Bonded mineral (Rock) wool mattresses with one side GS wire netting of 13 mm x 0.56 mm size stitched with 0.4 mm GS wire.	100	25	800
			40	2500
			50	500
			60	1100
			75	250


Note:

Quantity tolerance shall be (+)0/ (-)15 m² for each density/thickness.

	QUALITY PLAN		CUSTOMER: TSGENCO			PROJECT: BHADRADRI TPS, UNITS # 1 TO 4 (4X270 MW), MANUGURU, KHAMMAM DISTRICT			SPEC. NO : PE-TS-411-169-M032			
			VENDOR:			QP NO.: PE-QP-411-169-M032	REV. 00 DT: 22.02.2018		SPEC. TITLE : THERMAL INSULATION			
	SHEET 1 OF 2		SYSTEM			ITEM: THERMAL INSULATION – RESIN BONDED MINERAL (ROCK) WOOL MATTRESSES			CONTRACTOR : BHEL, PEM, NOIDA			
S.NO.	COMPONENT/ OPERATION	CHARACTERISTICS CHECKED	CATE GORY	TYPE OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	

1.	Bonded Mineral (Rock) wool mattresses	Chemical composition	MA	Chemical	1 / Lot	Vendor std.	Vendor std.	Test Certificate	3	-	-	Ref. Note "A"
		Bulk density	MA	Lab. Test	Sampling as per IS: 8183	IS: 3144 & spec	IS: 8183 & spec	-do-	3	2	1	
		Dimensions	MA	Physical	-do-	-do-	-do-	-do-	3	2	1	
		Shot content	MA	Lab. Test	-do-	-do-	-do-	-do-	3	2	1	
		Chloride content	MA	Chemical	-do-	-do-	-do-	-do-	3	2	1	
		Thermal Conductivity	MA	Lab. Test	-do-	IS: 3346 & spec	-do-	-do-	3	-	2, 1	
		Heat Resistance	MA	Physical	-do-	IS: 3144 & spec	-do-	-do-	3	-	2, 1	
		Moisture Content	MA	-do-	-do-	-do-	-do-	-do-	3	2	1	
		Moisture Absorption	MA	-do-	-do-	-do-	-do-	-do-	3	-	2, 1	
		Recovery after compression	MA	-do-	-do-	IS: 8183 & spec	-do-	-do-	3	-	2, 1	
		Resistance to vibration	MA	-do-	-do-	IS: 3144 & spec	-do-	-do-	3	-	2, 1	
		Resistance to jolting	MA	-do-	-do-	-do-	-do-	-do-	3	-	2, 1	
		Fibre diameter	MA	-do-	Sampling as per IS: 3144	-do-	Tech. spec	-do-	3	2	1	
		Incombustibility	MA	-do-	Sampling as per IS: 8183	-do-	IS: 8183 & Tech. spec	-do-	3	2	1	
		Sulphur Content	MA	Chemical	-do-	-do-	-do-	-do-	3	2	1	
		Alkalinity	MA	Chemical	-do-	IS: 8183 & spec	-do-	-do-	3	2	1	
		Appearance	MA	Visual	-do-	-----	To be free from Voids, Cracks	Inspection Report	3	2	1	

BHEL	PARTICULARS	BIDDER/VENDOR	
RAHUL KADAM	NAME		
<i>Rahul</i>	SIGNATURE		
22.02.2018	DATE		
			BIDDERS/VENDORS COMPANY SEAL

	QUALITY PLAN		CUSTOMER: TSGENCO			PROJECT: BHADRADRI TPS, UNITS # 1 TO 4 (4X270 MW), MANUGURU, KHAMMAM DISTRICT			SPEC. NO : PE-TS-411-169-M032			
			VENDOR:			QP NO.: PE-QP-411-169-M032		REV. 00 DT: 22.02.2018		SPEC. TITLE : THERMAL INSULATION		
	SHEET 2 OF 2		SYSTEM			ITEM: THERMAL INSULATION – RESIN BONDED MINERAL (ROCK) WOOL MATTRESSES			CONTRACTOR : BHEL, PEM, NOIDA			
S.NO.	COMPONENT/ OPERATION	CHARACTERISTICS CHECKED	CATE GORY	TYPE OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	

2.	Hexagonal wire netting & stitching wire	Dimension, Gauge dia, Coating test, Tensile test, Wrapping test, Bend test	MA	Physical	1 sample per lot	IS:4826, IS:3150, IS:280 & Tech. spec.	IS:4826, IS:3150, IS:280 & Tech. spec.	Test report	3	-	2, 1	} Ref. note "B"
			MA	Visual	Random	Tech. Spec.	Shall be bright & free from defects	Inspection Report	3	2	1	
	ii) SS Wire	Dimension, Gauge dia, Chemical analysis, Tensile test, Wrapping test, Reverse Bend test	MA	Physical	1 sample per lot	IS:6528 & Tech. spec.	IS:6528 & Tech. spec.	Test report	3	-	2, 1	} Ref. note "B"
			MA	Visual	Random	Tech. Spec.	Shall be bright & free from defects	Inspection Report	3	2	1	
3.	Packing and marking	Packing type and identification marking	MA	Visual	Random	Tech. Spec.	Tech. Spec.	(Soft copy of photographs)	3	-	2	Photographs of packed material to be verified by BHEL to obtain MDCC.

NOTES:


- A) A) 'K' Value test will be carried out for minimum three mean temperatures i.e. 100°C, 200°C and 300°C on samples identified and sealed by customer / BHEL Inspector once in twelve (12) months. The tests will be carried out at govt. approved labs (at CBRI - Roorkee, IIT - Chennai or PIBCO R & D Centre, N. Delhi).
- B) Manufacturer's / supplier's compliance certificate will be furnished.

LEGEND

MA	MAJOR CHARACTERISTIC	1	CUSTOMER
P	PERFORM	2	BHEL
W	WITNESS	3	VENDOR OR SUB-VENDOR
V	VERIFICATION		

BHEL	PARTICULARS	BIDDER/VENDOR	
RAHUL KADAM	NAME		
<i>Rahul</i>	SIGNATURE		
22.02.2018	DATE	BIDDERS/VENDORS COMPANY SEAL	

531941/2021/PS-PEM-MPL

	COMPLIANCE SHEET		SPECIFICATION NO. PE-TS-411-169-M032		
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I hereby comply/not comply (*) to all the requirements of this technical specification in totality.

* In case the bidder does not comply to the technical specification, the deviations shall be explicitly listed in the technical deviation sheet of GCC. Deviations listed in technical deviation sheet shall only be considered.

Name of Bidder / Authorized Representative :- -----

Designation :- -----

Signature :- -----

Company Seal :- -----

Date :- -----

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	
				COMPANY SEAL



Bharat Heavy Electricals Limited

(A Govt. Of India Undertaking)

PROJECT ENGINEERING MANAGEMENT

THERMAL INSUALTION - LRB (ROCKWOOL) MATTRESS/PIPESECTION for 4X270MW BHADRADRI TPS

Price Variation Clause:

Ex-works prices shall be variable as per PVC formula given below:

$$\text{Current Price} = \text{Order Price} * (0.15 + 0.4 * M1/M0 + 0.15 * F1/F0 + 0.05 * S1/S0 + 0.25 * L1/L0)$$

Where

M0 = INDICES AS PER RBI BULLETIN TABLE 21 SL NO.: 1.3.13.2 (REFRACTORY PRODUCTS) FOR MONTH OF ORDERING.

M1 = INDICES AS PER RBI BULLETIN TABLE 21 SL NO.: 1.3.13.2 (REFRACTORY PRODUCTS) FOR 1 MONTH PRIOR TO DESPATCH.

F0 = INDICES AS PER RBI BULLETIN TABLE 21 SL NO.: 1.2 (FUEL & POWER) FOR MONTH OF ORDERING.

F1 = INDICES AS PER RBI BULLETIN TABLE 21 SL NO.: 1.2 (FUEL & POWER) FOR 1 MONTH PRIOR TO DESPATCH

S0 = INDICES AS PER RBI BULLETIN TABLE 21 SL NO.: 1.3.14.4 – (MILD STEEL-LONG PRODUCTS) FOR MONTH OF ORDERING.

S1 = INDICES AS PER RBI BULLETIN TABLE 21 SL NO.: 1.3.14.4 – (MILD STEEL-LONG PRODUCTS) FOR 1 MONTH PRIOR TO DESPATCH

L0 = INDICES AS PER RBI BULLETIN TABLE 19 (CONSUMER PRICE INDEX FOR INDUSTRIAL WORKERS) FOR MONTH OF ORDERING.

L1 = INDICES AS PER RBI BULLETIN TABLE 19 (CONSUMER PRICE INDEX FOR INDUSTRIAL WORKERS) FOR 1 MONTH PRIOR TO DESPATCH

Total PVC shall be limited to ± 10% of Ex-Works Value.

Note: RBI Indices considered for refractory, Fuel & Power, Mild steel are as per base year 2011-12 and for Industrial worker as per base year 2016 of RBI Bulletin. The above PV Clause is subject to change based on latest RBI Bulletin.