

**Shenzhen BetterPower Battery Co.,Ltd**

Add: No.11Bldgs, Tongfucun Industrial zone, Shiao,Dalang,  
Longhua Town, Bao'an District,Shenzhen, China  
Tel: 0755-2807 8088 (50 Lines) Fax: 0755-2807 8588  
Websites: [www.betterpower.com.cn](http://www.betterpower.com.cn) [www.nizn.net](http://www.nizn.net)  
Global Service Hotline: 400-0667-800

**Jiangxi Better Power New Energy Co., Ltd.**

AAddress: Jiangxi Province Yichun Economic and  
Technological Development Zone Chunshun Road 999  
Tel: 0795-3282999 Fax: 0795-3175988  
Email: [betterpower@betterpower.com.cn](mailto:betterpower@betterpower.com.cn)

## SPECIFICATIONS OF NICKEL METAL HYDRIDE BATTERY

Customer P/N: 1020208

Model Name: Ni-MH AAA 3.6V 600mAh

Issued Date: 2019-01-23

APPROVED:

Customer		BPI	
Checked By		Audited By	Mr. Liu xiaoming
		Checked By	Mr. Li wenfeng
Approved By		Approved By	Mr. Ye kai
Signature & chop		Signature & chop	

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## Modification Record Table

NO:	version	Date	Modification description	Modification Manager
1	A	2019-01-23	New formulation	Mr. Liu xiaoming

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## Specification for Cylindrical Sealed Nickel Metal Hydride Batteries

**APPLICATION:** The applicable range: This specification is available only for the testing within one month since receipt of batteries. It's not a standard for stored goods.

### 1. Model: Ni-MH AAA 3.6V 600mAh

### 2. RATINGS:

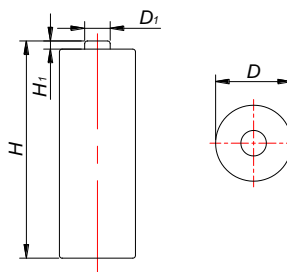
- ◇ Nominal Voltage 3.6 V
- ◇ Nominal 600mAh
- ◇ Minimum 550mAh/0.2C
- ◇ Standard charge rate 60mA×16hrs
- ◇ Rapid charge rate 300mA×140min (-ΔV= 5mV/pcs)
- ◇ Operating temperature range Humidity: +65% ±20%
  - Standard charge - 10~40°C (14~104°F)
  - Rapid charge - 10~40°C (14~104°F)
  - Floating charge - 10~40°C (14~104°F)
  - Discharge - 20~55°C (-4~131°F)
- ◇ Storage temperature range Humidity : +65% ±20%
  - Within 1 year -20°C~35°C (-4 to 95°F)
  - Within 6 months -20°C~45°C (-4 to 113°F)
  - Within 1 month -20°C~50°C (-4 to 122°F)

- Note:
- (1) All rapid charge methods should be discussed with our engineer.
  - (2) We stipulate to charge less than 50% fully power for delivery, if the charge is more than 50%, the battery has a certain latent risk. If the charge requirement is over 50% which caused quality problem, executed after the mutual consultation .
  - (3) During storage period the batch battery is requested by the 50% electric charge, the battery storage surpasses 3 months, the recommendations 0.2C discharge to 3.0V and then add 50% of the electricity storage.
  - (4) Our battery guarantee time: 12 months.

### 3. Measurement & Dimensions(cell)

to see the drawing:

D	9.8~10.2mm
H	42.0~43.0mm
D1	5.0±0.2mm
H1	≥0.4mm



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## 4. Performance Testing

### 4.1 TEST CONDITIONS

4.1.1 The battery to be tested is the product within one month after being received by customer.

4.1.2 Ambient conditions:

Temperature  $+20^{\circ}\text{C} \pm 5^{\circ}\text{C}$

Humidity  $+65\% \pm 20\%$

### 4.2 Testing Tools

4.2.1 Voltage meter 0.5 level or higher as required in IEC51/IEC485. Internal impedance exceeds 10K $\Omega$ /V.

4.2.2 Current meter 0.5 level or higher as required in IEC51/IEC485. Internal impedance should be less than 0.01 $\Omega$ /V(including wires).

4.2.3 Micrometer caliper With precision of 0.02mm.

4.2.4 Internal impedance meter Alternating current of 1000HZ, connector measuring equipment with sin wave of 4.

4.2.5 Impedance loaded meter Value of impedance is with  $\pm 5\%$  error allowed (including external wires).

### 4.3 Test methods and benchmarks

Item	Test Method	Benchmark
1. Appearance	◇ eyeballing	◇ batteries shall be free from any stains; scratches or deformations, which may reduce the commercial value when visually inspected
2. Size	◇ caliper measurement	◇ The size shall comply with the specified size as the attached drawing
3. Insulate impedance	◇ measured with a Megger overpack and battery electrode between the degree of insulation	◇ outer sleeve shall exceed <u>10</u> M $\Omega$
4. Weight	◇ using disk-scale measurement	◇ approximate <u>34</u> g
5. Charge Voltage	◇ Following a period of discharge at 0.2CmA down to a terminal voltage of 3.0V, standard charge, the cell or battery shall be checked at 5 minutes before finish charging	◇ The voltage shall be less than <u>4.8</u> V
6. Open circuit voltage: (O.C.V.)	◇ Following a standard charge period, the open circuit voltage of the cell or battery shall be checked within 1 hour.	◇ The O.C.V. shall exceed <u>3.75</u> V
7. Closed circuit voltage: (C.C.V.)	◇ Following a standard charge period, the closed circuit voltage of the cell or battery shall be checked with a <u>2.58</u> $\Omega$ load within	◇ The C.C.V. shall exceed <u>3.6</u> V

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	1 hour	
8. Internal impedance	<ul style="list-style-type: none"> <li>Following a standard charge period, the internal impedance of the cell or battery shall be checked at 1000Hz within 1 hour</li> </ul>	<ul style="list-style-type: none"> <li>The internal impedance shall not be more than <u>155 mΩ</u></li> </ul>
9. Capacity	<ul style="list-style-type: none"> <li>Following a standard charge period, the cell shall be stored for a period of 1 hour. The capacity shall be equal or more than minimum capacity when discharged at <u>0.2C</u> mA down to a terminal voltage of 3.0V;</li> <li>The capacity returned might not initially attain the specified value following the first charge –discharge cycle. In this event, the test may be repeated a further two or three times to attain the minimum capacity</li> </ul>	<ul style="list-style-type: none"> <li>The capacity is greater than or equal to the minimum capacity</li> </ul>
10. High Drain Discharge	<ul style="list-style-type: none"> <li>To discharge by <u>1.0 C</u> to 3.0V within 1 hour after standard charge</li> </ul>	<ul style="list-style-type: none"> <li>The Capacity is higher than or equal to <u>54 min</u></li> </ul>
11. Self discharge	<ul style="list-style-type: none"> <li>Following a period of discharge at <u>0.2C</u> mA down to a terminal voltage of 3.0V, standard charge and then the cell or battery shall be <b>stored for 28 days</b> below 20°C</li> </ul>	<ul style="list-style-type: none"> <li>The subsequent capacity shall not be less than <u>75%</u> of rated capacity when discharged at <u>0.2C</u> mA</li> </ul>
12. Over-charge	<ul style="list-style-type: none"> <li>Following a period of discharge at <u>0.2C</u> mA down to a terminal voltage of 3.0V, standard charge and then charge for 48hrs at <u>0.1C</u> mA. The capacity of the cell or battery shall not be less than the rated capacity when discharged at <u>0.2C</u> mA</li> </ul>	<ul style="list-style-type: none"> <li>It shall not be externally deformed and no leakage of electrolyte in liquid form shall be observed.</li> </ul>
13. Over-discharge	<ul style="list-style-type: none"> <li>Following a period of discharge at <u>0.2C</u> mA down to a terminal voltage of 3.0V, combine the cells with a <u>2.58 Ω</u> load. After stored for a period of 24 hours, standard charged and then discharge at <u>0.2C</u> mA</li> </ul>	<ul style="list-style-type: none"> <li>the cell or battery shall not be externally deformed and no leakage of electrolyte in liquid form shall be observed, and the subsequent capacity shall not be less than <u>80%</u> of rated capacity</li> </ul>
14. Cycle Life	<ul style="list-style-type: none"> <li>Based on clause IEC61951-2(2011)7.5.1.2 (<b>Reference standard test conditions</b>)</li> </ul>	<ul style="list-style-type: none"> <li>The charge-discharge cycles shall exceed <u>500</u> times</li> </ul>
15. Humidity	<ul style="list-style-type: none"> <li>Standard charge and store for 14 days under the following storage conditions: 33°C ±3°C (91.4°F ±5.4°F), Relative humidity of 80% ±5%. (Salting is permitted).</li> </ul>	<ul style="list-style-type: none"> <li>No leakage of electrolyte in liquid form shall be observed</li> </ul>
16. Vibration	<ul style="list-style-type: none"> <li>Store the cell or battery more than 24 hours after standard charge, following vibration</li> </ul>	<ul style="list-style-type: none"> <li>The subsequent fluctuation of open circuit voltage and</li> </ul>

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	tests over an amplitude of 4 mm (0.1575 inches) at a frequency of 16.7 Hz(1000 cycles per minute) and repeated through any axes during 60mins	internal impedance shall be less than <u>0.06</u> V and <u>15</u> mΩ respectively, and the cell or battery shall not be externally deformed and no leakage of electrolyte in liquid form shall be observed.
17. Free falling: (Drop)	◇ Store the cell or battery more than 24 hours after standard charge, following a drop test from 450mm (17.717 inches ) on to a hard-wood board in a vertical axis 2 times on each of 2 mutually perpendicular axes	◇ The subsequent fluctuation of open circuit voltage and internal impedance shall be less than <u>0.06V</u> and <u>15</u> mΩ respectively, and the cell or battery shall not be externally deformed and no leakage of electrolyte in liquid form shall be observed.
18. Short-circuit testing	◇ to store it for 1 hour after standard charged, and to make positive and negative electrode short-circuit with a wire with the section 0.75mm <sup>2</sup> min and shortest length, the short-circuit time is 1 hour	◇ It shall not explode during or at the end of a 1 hour short-circuit test. However, leakage of electrolyte, external deformation or outer sleeve cracking is permitted.
19. Safety Valve Performance (Over dis-charging)	◇ to be discharged with <u>1C</u> mA for 5 hours	◇ The safety valve must start normally , battery without breakage;Leakage, distortion and outer package breakage are allowed
20. Safety Valve Performance (over charging)	◇ to be charged with <u>1C</u> mA for 5 hours	◇ No explosion, but leakage, distortion and out package breakage are allowed
21. To discharge at low temperature	◇ to be stored for 24 hours at 0°C ±2°C, and discharged at <u>0.2C</u> mA at 0°C ±2°C	◇ Discharge duration shall exceed <u>3</u> hour and <u>30</u> min

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**Remark:****IEC Cycle life: IEC61951-2(2011)7.5.1.2**

Cycles	Charge	rest	Discharge
1	0.1C×16hrs	0	0.25C×2hrs 20mins
2~48	0.25C×3hrs 10mins	0	0.25C×2hrs 20mins
49	0.25C×3hrs 10mins	0	0.25C to 1.0V/cell
50	0.1C×16hrs	1~4hrs	0.2C to 1.0V/cell

Cycol 1~50 shall be repeated until the discharge duration on any 50th cycle become less than 3hrs

**5. The transportation and storage****5.1 Transportation**

In the transportation process the battery should maintain at clean, dry, and the well ventilated environment, and prevents the fierce vibration, the impact or the extrusion, prevents to be exposed to the sun and rain. Battery could be transported by automobile, train, steamboat ,airplane and other transportation vehicle .

**5.2 Storage**

5.2.1 Battery must be stored at -20 °C ~35 °C, (It is best at 15°C ~ 25 °C) and put in the clean, dry and ventilated place with relative humidity 85% max.. It must be kept away from corrodent substance, fire hazard and heat resource.

**5.2.2 Storage placement way**

The packed battery in a carton stack less than 5 layers, to guarantee that between the cell box has the good air circulation condition, please maintain between the carton above 5~10 cm distance, which prevents the safety incident caused by a pile of agglomeration to heat .

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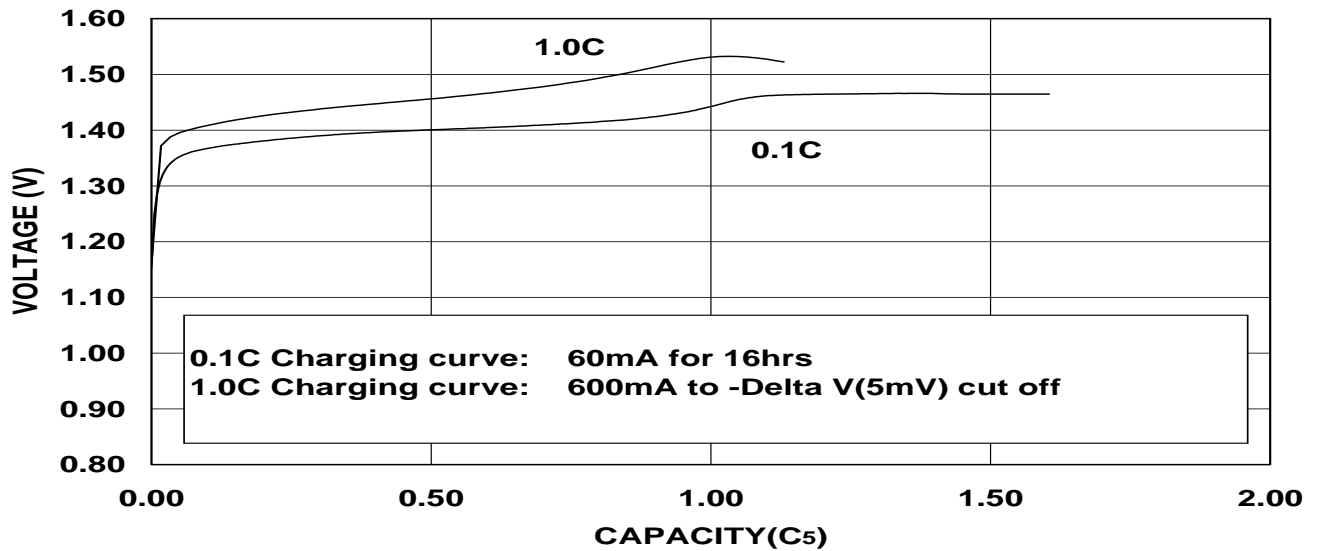
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## 6. Charging and discharging curves(cell):

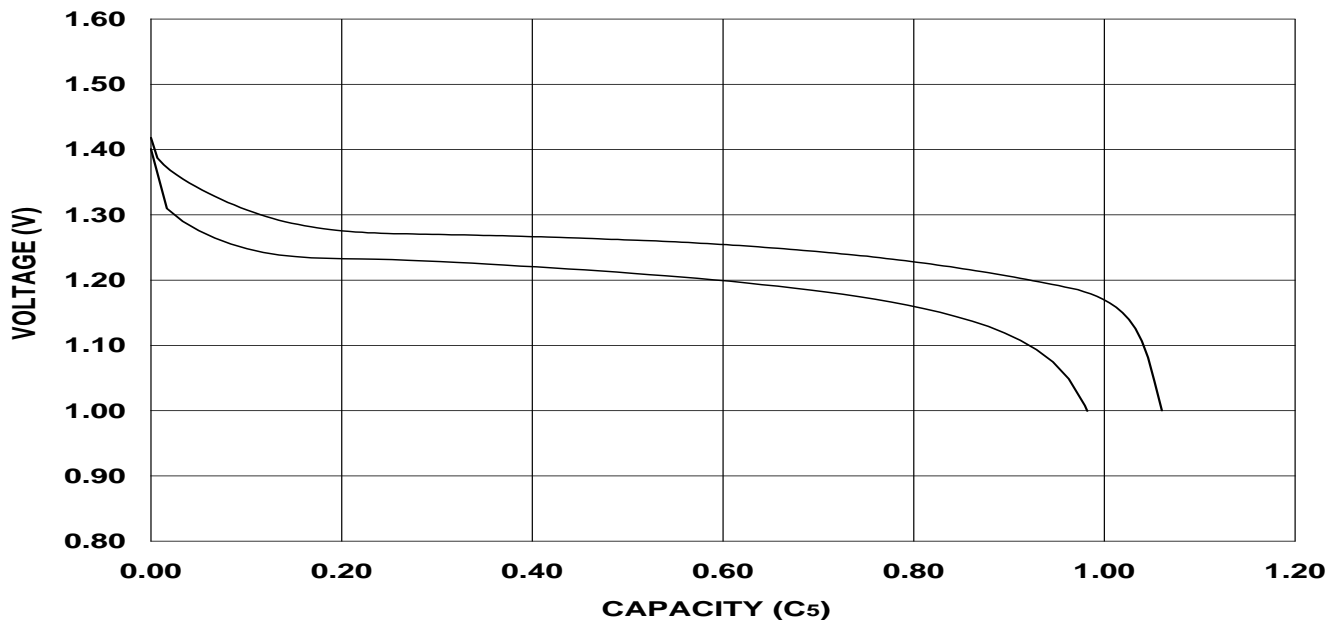
### 6-1. Charging Curves

CHARGING CURVE OF BPI-43AAA600 mAh CELL



### 6-2. Discharging Curves:

DISCHARGE CHARACTERISTICS OF BPI-43AAA600 mAh CELL





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## 7. Warning and Security

To prevent the impact of equipment failure caused by the battery, and to make sure the security of circuit and battery set, please consider below things when design and produce the production equipment.

### Danger !

- (1)Against the following matters will result in battery leakage, heat, explosion, fire and serious personal injury!
- (2)Prohibited to throw the BPI battery into fire or heat!
- (3)Prohibited to collide or throw BPI battery!
- (4)Don't weld the lead on the BPI battery directly.
- (5)Don't put the BPI battery on a place which is more than 1.5 meter in case of dropping. Don't drop it at the height of more than 1.5 meter.
- (6)Don't connect the positive pole and electrode pole directly of BPI battery, such as leading wire. If the tab terminal of poles doesn't set insulation covering, please don't transport or store. Please don't touch the metal necklace, key or any other conductive material. Please use special carton when transport or store.
- (7)Must use the charger appointed by BPI to charge BPI batteries, and follow the instructors of BPI.
- (8)Prohibited to disassemble BPI batteries. It will cause external or internal short circuit, and the exposed parts will have chemical reaction then result in very dangerous heat, explosion, fire or splash of electrolyte.

### Warning ! !

- (1)Don't contact batteries with water, sea water or other oxidation reagents, which will cause rustiness and heat. If batteries get rusty, explosive decompression valve won't work and will lead to explosion.
- (2)Don't over-charge BPI batteries, that is, don't continually charge batteries despite the designed charging time. If the batteries are not fully charged within the designed charging time, please stop to charge. The delay of charging time will lead to leakage, heat and explosion.
- (3) BPI NI-MH battery includes the colorless strong alkaline liquor (i.e. electrolyte), if the skin or clothes touch BPI NI-MH battery liquor, please use the boron acid water or the vinegar acid water to clean, after that, with the clear water thoroughly flushes. Because the battery's electrolyte can corrode the skin.
- (4) It is forbidden for more than 20 pcs batteries in series. Because it will result in leakage, getting shock or giving off heat.
- (5) Don't disassemble the battery, as it will result in short-circuit, leakage, giving off heat, catching fire and explosion.

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- (6) Don't use the batteries when they are leakage, any color deterioration, distortion or other changes are found. Otherwise it will get hot, catching fire or explosion may happen.
- (7) Please keep the batteries and other electronic products related to battery away from baby, children, to avoid accident of swallowing of battery. If there is any accident, please go to see the doctor.
- (8) To use new battery when the working time of the battery is far short from the initial working time, as the cycle life of this battery is finished.

## 8. Others

- 8.1 BetterPower reserve right to revise the specification;
- 8.2 Anything not mentioned in this specifications, customer and BetterPower should discuss to get a solution;
- 8.3 BetterPower does not undertake any responsibility for the accidents caused by actions not matching with specifications(Man-made short circuit to burn out).

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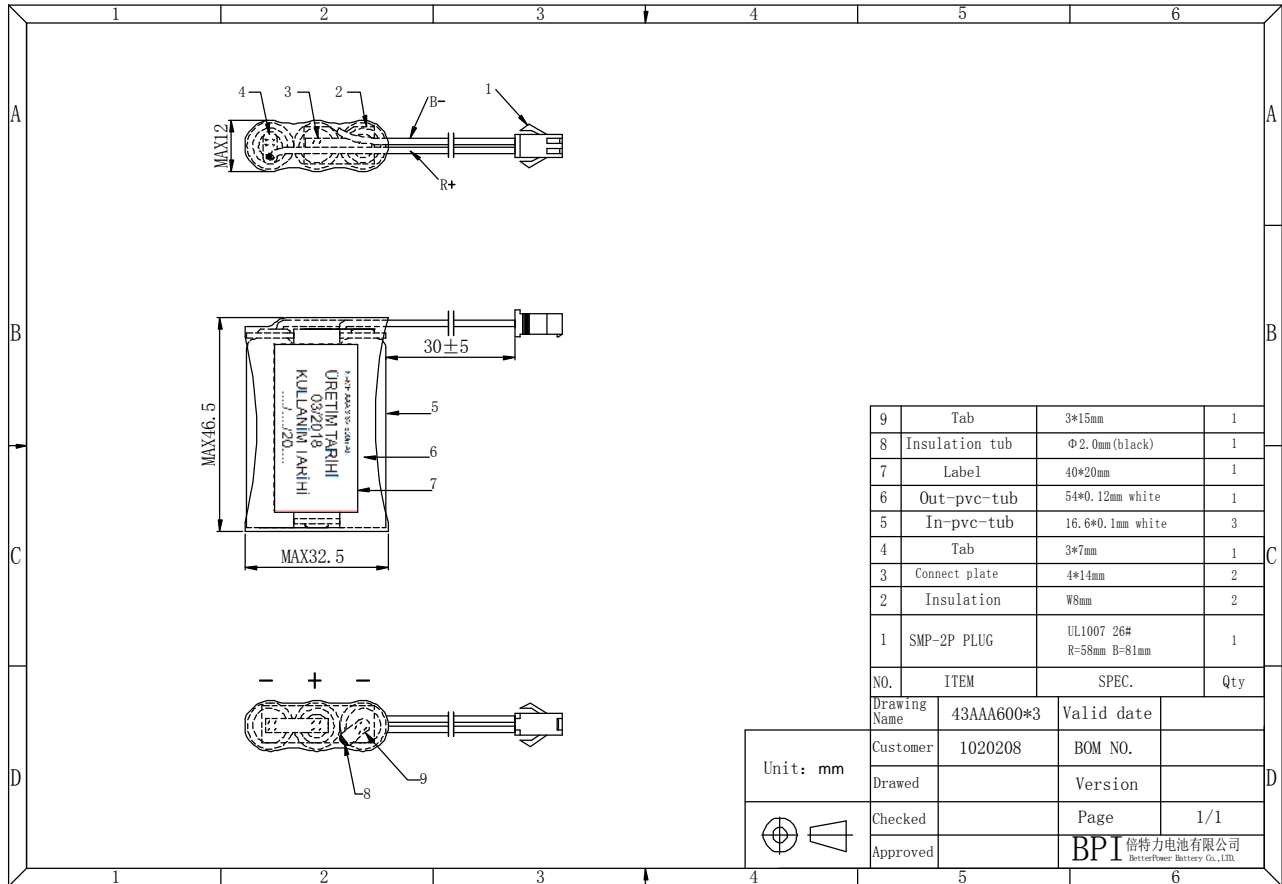
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## 9. Drawings



\*\*\*\*\* END \*\*\*\*\*