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Quality Control for the Physicochemical Parameters of the Well Water Located in the AMPOTAKA District in the Hell-Vill Nosy-be Madagascar

Razafitsiferana Theophile*, Pr Bruno Razanamparany

University of Antsiranana, Faculty of Sciences Mention Sciences Chimic, Course: Mineral Chemestry, Madagascar

Abstract For physical parameters such as temperature the value found is 16℃, the required standard is less than 25℃, for turbidity the found value is 1.05 NTU, the limit value is less than 5NTU, for pH the value found is 6.34, the limit value is between 6.5 to 9 and for the conductivity the found value is 33.5 µS / cm, the required value is between 180 to 1000 µS / cm. The physical parameters correspond to 99% for the 0.06 mg / L the limit concentration is required that the water is intended for human consumption. For chemical parameters, such as dissolved oxygen 0.2 mg / L the limit concentration is less than 2mg / L, the salinity level is 0mg / L, the limiting concentration is 0 mg / L, the TAC 0.4°f the limit value is less than 11°f, the nitrate 11.2 mg / L the limit concentration is 50 mg / L, the total hardness 3.2 mg / L the limit concentration is 50 mg / L, Ammonium 0.06 Limit value is 0.5mg / L, Sodium 8.28mg / L limit concentration is 200mg / L, Potassium 11mg / L limit concentration is 12mg / L, Calcium 2.4 limit concentration varies from 100 At 200mg / L, the Magnesium 6.31 mg / L limit concentration is 50mg / L, the Chloride 12.78 mg / L the limit concentration is 250 mg / L and the metals such as Iron, Aluminum, Lead are absent. Therefore the chemical parameters of the water of the AMPOTAKA well are acceptable for the standards required to the drinking water, in spite of the insufficiency of some found concentrations. For microbiological parameters, as microorganisms at 22℃ 120 Ufc / mL the required value is less than 100 Ufc / mL, microorganism at 36℃ 25 Ufc / mL the required value is less than 20 CFU / mL, Coliforms 70 CFU / 100 mL the limit value is 0, Escherichia Coli 1 Ufc / 100mL, the limit value is 0, Enterococci 1Ufc / 100mL the limit value is 0 and Spores 4 Ufc / 100mL the limit value is 0. Therefore the well water of AMPOTAKA is microbial it must be treated before being used.

Keywords Physicochemical, Microbiological parameters and treatment

1. Introduction

Nosy be is the largest island of Madagascar, it is located in the North-West of Madagascar. It is located 15 km from the mainland. It measures 30 km from south to north and 19 km from east to west.

The district of Nosy Be has six districts, among six district, is called Hell-Vill that is to say in the center of Ville. In this city we have several neighborhoods that exist, so in our search is done in the neighborhood called AMPOTAKA.

The population of the neighborhood uses wells as spring water in everyday life, that's why I propose the search for the characteristics of the well water that you used.

My research is divided into three parts:

- **Bibliographic synthesis**
- Results of analysis of physicochemical and microbiological parameters
- Continued treatment of the discussions and we end with the conclusi

Well characteristics:

The following table 1 shows the characteristics of the AMPOTAKA district well

Well	Diameter (m)	Depth (m)	Volume (m^3)
AMPOTAKA	3	15	6

Homographic:

The following table 2 gives the number of the population in the district of AMPOTAKA

Sex	Female	Male
AMPOTAKA	1250	1150

The numbers of the population in the district of AMPOTAKA to all the towers of 2400 people around.

Soil types: soils of volcanic origin.

Sedimentation:

- The very fine muddy sediments of the bays of mixed

* Corresponding author:
razafitsiferana78@gmail.com (RazafitsiferanaTheophile)
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origin
- Sandy beach sediments with a very coarse texture of clay-loam fraction
- The coarse textured sandy sediments contain a small proportion of clay fraction less than 5.5%.

Geology and pedology:

The island of Nosy Be has a topographic system characterized by an accentuated relief with steep slopes in its eastern part and a gently accentuated relief with a gentle slope in the western part.

Hydrography and hydrogeology

The river systems of the island consist of rivers, lakes and wells.

2. Bibliographic Synthesis

Water intended for human consumption is required by the three standards, WHO, EU and the Malagasy State, the standards are given next to the table of results that we will give below.

Analysis Parameters

Physical parameters

***Temperature*:** checking the microbe in the water

Turbidity: determining the transparency of the water, regardless of whether the water is cloudy or not.

Conductivity: determination of mineral salt levels in water

pH: to know that the water is acidic, basic or neutral.

Chemical parameters

Dissolved oxygen: measurement of organic matter in water

Nitrate, Ammonium: measuring the pollution that exists in water

Sodium, Potassium, Calcium and Magnesium: are abundant and nutritious elements very important in water.

Lead metals like Lead, Aluminum and Iron are toxic, excess concentrations in water is very dangerous to the consumer.

Microbiological analysis is very important for water intended for human consumption, ie water that is microbial or not.

3. Measurement Results

A. Physical parameters

1- Temperature

Table 3. Gives the value of the temperature

Site	Temperature (°C)
AMPOTAKA	16
WHO	<25
EU	<25
EM	<25

Found value 16°C is acceptable for all three standards because the limit value is 25°C. [4]

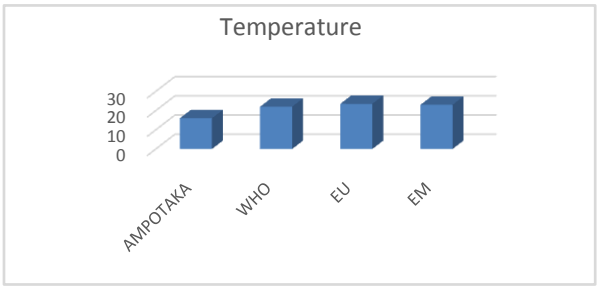

Figure 1

2- Turbidity

Table 4. Below gives the measurement results for the turbidity of the well water of AMPOTAKA

Site	Turbidity(NTU)
AMPOTAKA	1,05
WHO	<5
EU	<5
EM	<5

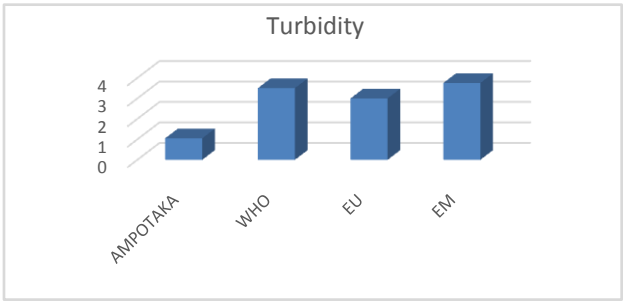

Figure 2. Measurement of turbidity. [1]

According to this value found 1.05 NTU, the water is clear, it is acceptable.

3- The pH

Table 5. below gives the pH value

Site	pH
AMPOTAKA	6,34
WHO	6,5 – 8,5
EU	6,5 – 9
EM	6,5 – 9,5

The pH value found is 6.34, so just around the limit value

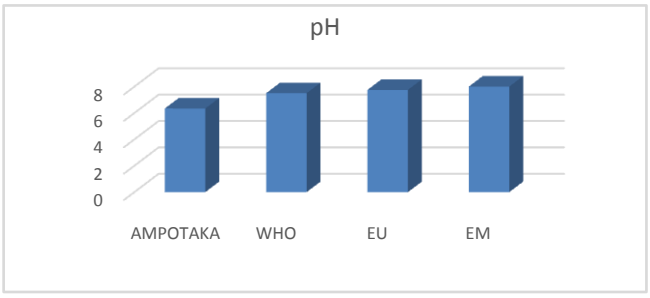

Figure 3. pH measurement. [4], [5]

4- Conductivity

Table 6. Below gives the measurement result for conductivity

Site	Conductivity (µS/cm)
AMPOTAKA	33,5
WHO	180 - 1000
EU	180 - 1000
EM	<3000

The found value 33.5 µS / cm is outside the required value, so the water is low in organic matter.

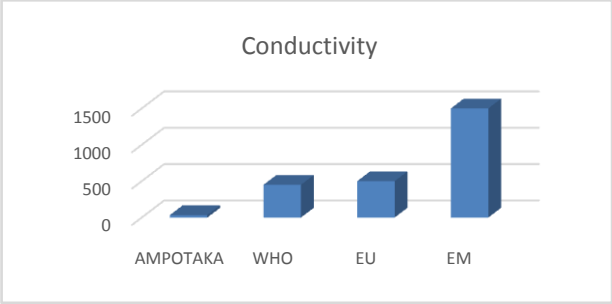

Figure 4. Measurement of conductivity. [3]

B- Chemical parameters

1- Dissolved oxygen

Table 7. Below gives the measurement of the concentration of dissolved oxygen

Site	Dissolved Oxygen (mg/L)
AMPOTAKA	0,2
WHO	<2
EU	<2
EM	<2

The concentration found is 0.2 mg / L, low in organic matter, so the water is good.

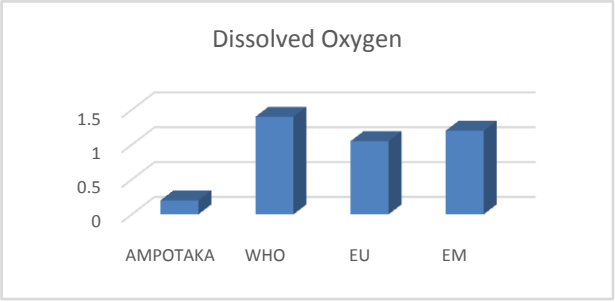

Figure 5. Measurement of dissolved oxygen concentration. [2]

2- T.A.C

Table 8. below gives the value of the TAC

Site	T.A.C (°f)
AMPOTAKA	0,4
WHO	<11
EU	<11
EM	<11

The value found is 0.4°f, the water is low in basic salt content which means that the water is good.

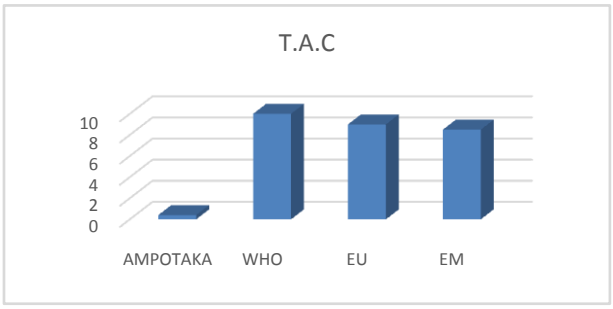

Figure 6. Measurement of the concentration in T.A.C. [6]

3- Nitrate

Table 9. below gives the concentration of nitrate in the water of the AMPOTAKA well

Site	Nitrate (mg/L)
AMPOTAKA	11,2
WHO	44
EU	50
EM	50

The concentration found is 11.2 mg / L, compared to the limit concentration 50 mg / L, the rate of pollution in water is low, so it is good.

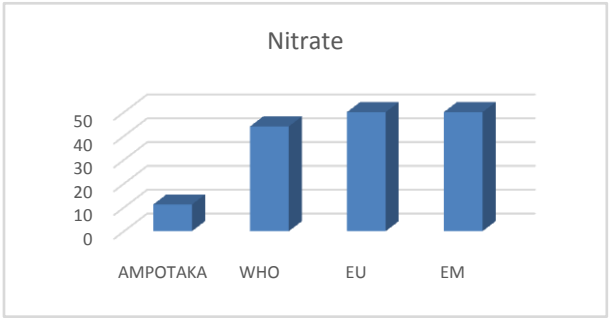

Figure 7. Measurement of nitrate concentration

4- Hardness

The following table 10 gives the concentration

Site	Hardness (mg/L)
AMPOTAKA	3,2
WHO	50
EU	50
EM	50

The concentration found 3.2 mg / L the water is not hard compared to the limiting concentration.

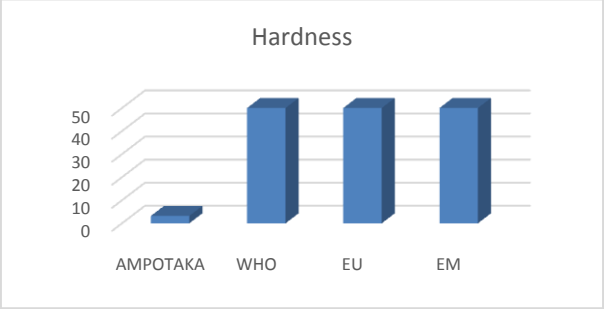

Figure 8. Measurement of the concentration in total hardness. [7]

5 - Ammonium

Table 11. Below gives the ammonium concentration

Site	Ammonium (mg/L)
AMPOTAKA	0,06
WHO	<0,5
EU	<0,5
EM	<0,5

The concentration found is 0.06 mg / L the pollution in the water is very low, it is acceptable for drinking water.

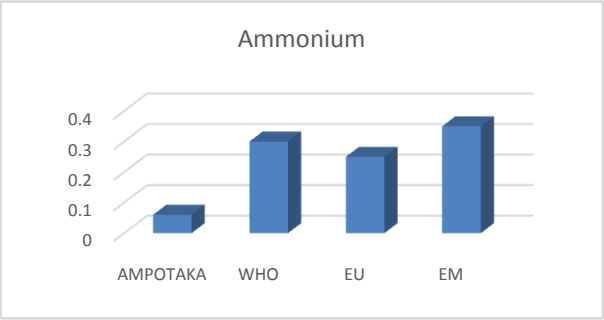

Figure 9. Measurement of Ammonium Concentration. [8]

6 - Sodium

Table 12. below gives the measurement of the sodium concentration

Site	Sodium (mg/L)
AMPOTAKA	8,28
WHO	200
EU	200
EM	200

The concentration found is 8.28 mg / L, it is very low by the required standards.

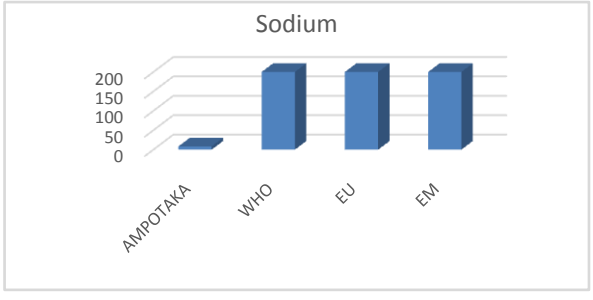

Figure 10. Sodium concentration measurement. [12]

7 - Potassium

The following table 13 gives the measurement of the potassium concentration

Site	Potassium (mg/L)
AMPOTAKA	11
WHO	<12
EU	12
EM	<12

The water is rich in potassium because the concentration found is 11 mg / L.

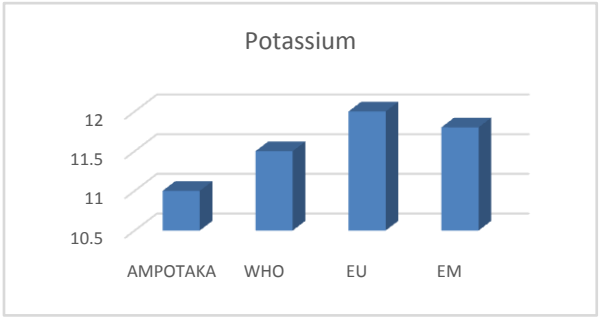

Figure 11. Measurement of Potassium Concentration. [12]

8 - Calcium

Table 14. Below shows the measurement of calcium concentration

Site	Calcium (mg/L)
AMPOTAKA	2,4
WHO	100 – 180
EU	100
EM	100

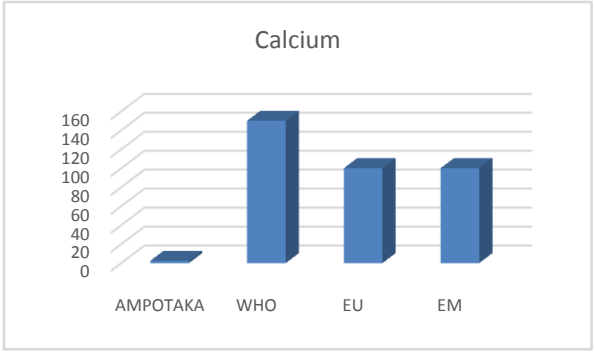

Figure 12. Calcium concentration measurement The concentration found 2.4 mg / L isverylowcompared to the required standards, so the water lacks calcium. [9], [11]

9 - Magnesium

The following table gives the measurement of the magnesium concentration

Site	Magnesium (mg/L)
AMPOTAKA	6,31
WHO	50
EU	50
EM	50

The concentration foundis 6.31mg / L, compared to the limited consultation itisinsufficient.

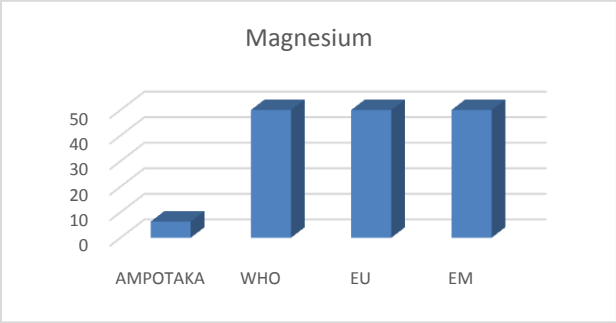

Figure 13. Measurement of Magnesium Concentration [11]

10 - Chloride

Table 16. Below gives the chloride concentration

Site	Chloride (mg/L)
AMPOTAKA	12,78
WHO	250
EU	250
EM	250

The concentration of chlorine in the water is low compared to the limit concentration for drinking water.

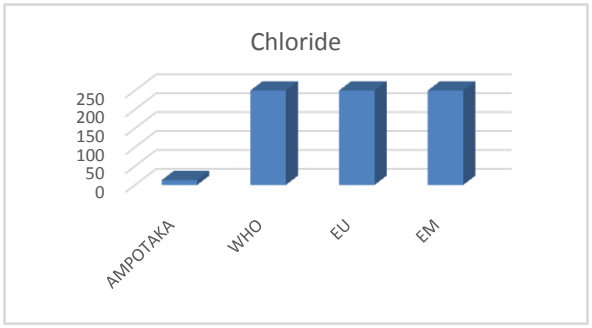

Figure 14. Measurement of chlorine concentration

Note:

For heavy metals such as Lead, Aluminum and Iron do not exist in the sample. [10]

C- Microbiological parameters

Table 17. Below gives the measurement of the concentration of microbiological parameters in the sample

AMPOTAKA	Results	Units	WHO	EU	EM
Microorganisms à 22°C	120	Ufc/mL	<100	<100	<100
Microorganisms à 36°C	25	Ufc/mL	<20	<10	<10
Coliforms	70	Ufc/100mL	0	0	0
Escherichia Coli	<1	Ufc/100mL	0	0	0
Enterococci	1	Ufc/100mL	0	0	0
Spores	4	Ufc/100mL	0	0	0

According to these results the water is microbial, it must be treated before being used. [13]

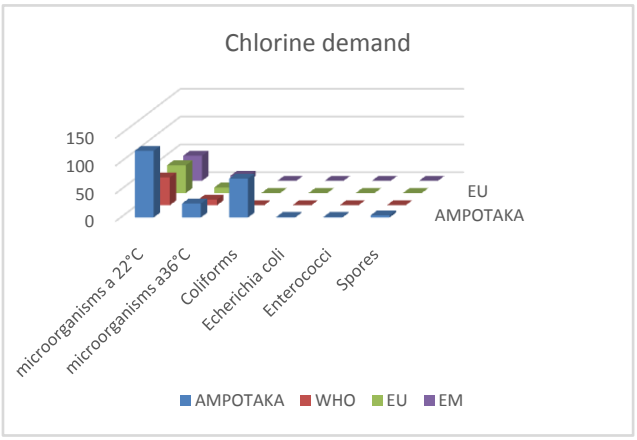

Figure 15. Measurement results for microbiological parameters

Treatment

I propose the treatment for disinfection; the demand for chlorine.

The demand for chlorine consists in adding to the same volume of water increasing doses of calcium hypochlorite. The residual chlorine level measured after a given time as a function of the added dose passes through a minimum called Breack-Point before increasing regularly.

Reagents:

- Calcium Hypochlorite 1g / L (1mL contains 1mg hypochlorite)
- orthotolidine

Materials

- 6 containers (1L, 500 mL or 230 mL beakers)
- Pipets of 1 mL or 2 mL
- Hydrocure Comparator
- Free chlorine blister 0.1 to 2 mg / L

Operating mode:

In a series of 6 containers of a given volume. Introduce V mL of water to be disinfected.

- Add in each of them with a pipette increasing amounts of calcium hypochlorite 1g / L
- Shake and cover each container with a sheet of paper. Leave in contact 30mn.
- Shake in the middle and at the end of the experiment.
- Measure the residual chlorine in the 6 Beakers

Expressions of the results

Let - di: the dose of hypochlorite in each beaker of volume V (in g / L)

- Vi: the volume of hypochlorite to add (in mL)

$$Vi = (di.V) / 1000$$

Results of the tests

Table 18. Below gives the demand for chlorine

Beaker N°	1	2	3	4	5	6
Concentration of calcium hypochlorite mg/L (Di)	0,03	0,13	0,1	0,4	0,6	1
Injection Volume in vi (mL)	0,25	0,50	0,75	1	1,25	1,50
Residual chlorine Cl_2 (mg/L) after 30 minutes of contact	0,01	0,11	0,1	0,2	0,5	0,8

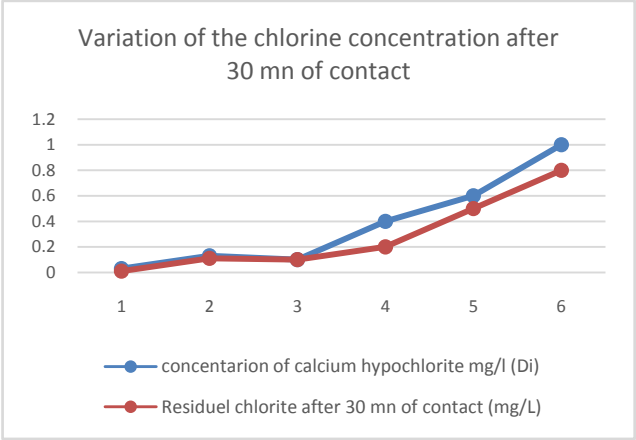

Figure 16. Variation of the chlorine concentration after 30 mn of contact (Break Point)

Curve for Representation Demand for chlorine

According to this curve the dose of calcium hypochlorite is taken from 3,5 mg / L for disinfection.

Results just after treatment

Table 19. Below gives the measurement result of the disinfection just after the treatment

AMPOTAKA	Results	Units	WHO	EU	EM
Microorganisms à 22°C	5	Ufc/mL	<100	<100	<100
Microorganisms à 36°C	0,5	Ufc/mL	<20	<10	<10
Coliforms	0	Ufc/100mL	0	0	0
Escherichia Coli	0	Ufc/100mL	0	0	0
Enterococci	0	Ufc/100mL	0	0	0
Spores	0	Ufc/100mL	0	0	0

Results interpretation

- Physical parameters

The physical parameters of the well water of the AMPOTAKA district are eligible for the standards required for water intended for human consumption.

- Chemical parameters

The chemical parameters of the well water in the AMPOTAKA district meet the limit concentrations for water intended for human consumption, despite the insufficiency of some concentration at the calcium level of only 2.4 mg / L but the concentration Limit ranges from 100 mg / L to 180 mg / L, sodium 8.28 mg / L also the limit concentration is 200 mg / L and the magnesium 6.31 mg / L limit concentration is 50mg / L.

For heavy metals such as lead, aluminum and iron are absent in the sample.

- Microbiological

The six microbiological parameters required for the drinking water are not verifiable, all results obtained are excluded at the limit value, as microorganisms at 22℃ 120 Ufc / mL against the limit value is less than 100 cfu / mL, Escherichia Coli 70 Ufc / 100mL the limit value is 0 and the Enterococci 1 Ufc / 100mL the limit value is 0.

For the treatment we use the chlorine demand for the disinfection of the well water of the AMPOTAKA district with a precaution the dose of 3mg / L of calcium hypochlorite for the disinfection.

4. Conclusions

The well water of the AMPOTAKA district is good in terms of physical parameters and chemical parameters, despite the concentration are low for some parameters like calcium, magnesium and sodium.

For the microbiological parameters the water is not drinkable because the result shows that the water is microbial, so it is necessary to treat before being used.

I propose the method for disinfection in dosing of calcium hypochlorite by the Breack Point curve ie the increase of the curve from the 3,5 mg / L that you used for the disinfection, finally that the population AMPOTAKA district drink safely and safely even in the rainy season.

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