

Generally errors are classified into three types: systematic errors, random errors and blunders. Gross errors are caused by mistake in using instruments or meters, calculating measurement and recording data results.

1) Gross Errors

2) Blunders

3) Measurement Errors

Systematic Errors:

- Instrumental Errors
- Environmental Errors
- Observational Errors
- Theoretical Errors
- Random Errors

1) Gross Errors:

Gross errors are caused by mistake in using instruments or meter, calculating measurement and recording data results. The best example of these errors is a person or operator reading pressure gage 1.01N/m^2 as 1.10N/m^2 . It may be due to the person's bad habit of not properly remembering data at the time of taking down reading, writing and calculating, and then presenting the wrong data at a later time. This may be the reason for gross errors in the reported data, and such errors may end up in calculation of the final results, thus deviating results.

2) Blunders:

Blunders are final source of errors and these errors are caused by faulty recording or due to a wrong value while recording a measurement, or misreading a scale or forgetting a digit while reading a scale. These blunders should stick out like sore thumbs if one person checks the work of another person. It should not be comprised in the analysis of data.

3) Measurement Error:

The measurement error is the result of the variation of a measurement of the true value. Usually, Measurement error consists of a random error and systematic error. The best example of the measurement error is, if electronic scales are loaded with 1kg standard weight and the reading is 10002 grams, then

The measurement error is = $(1002\text{ grams} - 1000\text{ grams}) = 2\text{ grams}$

Measurement Errors are classified into two types: systematic error and random errors

Systematic Errors

The Systematic errors that occur due to fault in the measuring device are known as systematic errors. Usually they are called as Zero Error – a positive or negative error. These errors can be detached by correcting the measurement device. These errors may be classified into different categories.

Systematic Errors

In order to understand the concept of systematic errors, let us classify the errors as:

- Instrumental Errors
- Environmental Errors
- Observational Errors
- Theoretical

Instrumental Errors:

Instrumental errors occur due to wrong construction of the measuring instruments. These errors may occur due to hysteresis or friction. These types of errors include loading effect and misuse of the instruments. In order to reduce the gross errors in measurement, different correction factors must be applied and in the extreme condition instrument must be recalibrated carefully.

Environmental Errors

The environmental errors occur due to some external conditions of the instrument. External conditions mainly include pressure, temperature, humidity or due to magnetic fields. In order to reduce the environmental errors

- Try to maintain the humidity and temperature constant in the laboratory by making some arrangements.
- Ensure that there shall not be any external electrostatic or magnetic field around the instrument.

Observational Errors:

As the name suggests, these types of errors occurs due to wrong observations or reading in the instruments particularly in case of energy meter reading. The wrong observations may be due to PARALLAX. In order to reduce the PARALLAX error highly accurate meters are needed: meters provided with mirror scales.

Theoretical Errors

Theoretical errors are caused by simplification of the model system. For example, a theory states that the temperature of the system surrounding will not change the readings taken when it actually does, then this factor will begin a source of error in measurement.

Random Errors:

Random errors are caused by the sudden change in experimental conditions and noise and tiredness in the working persons. These errors are either positive or negative. An example of the random errors is during changes in humidity, unexpected changed in tamperature fluctuation in voltage. These errors may be reduced by taking the average of a large number of readings.