

(vii) Van de Castele Test

This test involves taking readings of a manual probe against tide gauge readings over a full tidal cycle. As previously stated the sum of these two readings should remain constant, but this is only true in the case of a perfect tide gauge. Hence the Van de Castele test is designed to determine the accuracy of the tide gauge, as the results having been taken over a full tidal cycle are then used graphically to produce a diagram, the shape of which will identify tide gauge faults. (See accompanying test example in [Figure 3.8](#) and examples of diagrams indicating various faults in [Figure 3.9](#)).

(viii) Stilling Well Test

Although a Van de Castele test may show a float gauge to be operating satisfactorily the information recorded by the gauge will only be accurate if the stilling well is also functioning satisfactorily. Only in severe cases of blockage of the stilling well inlet will this be obvious from the record obtained from the tide gauge (trace very smooth, large lag on rising and falling tides, particularly at mid-tide).

To determine the performance of the stilling well it is necessary to take simultaneous readings of the water level inside and outside the well over a tidal cycle. The inside level can be taken by the manual probe and outside by reading the VTS. When the sea is agitated VTS readings will obviously be less accurate, so the test must be made when conditions are suitable. This test may be combined with the Van de Castele test, VTS readings being taken every hour.

(ix) Tide Gauge Accuracy

An ideal tidal record will show the true water heights referred to the datum used for the whole period of the record. This is not usually the case and most tidal records have errors of some kind which are not always recognised. This situation can result in extra work at the analysis stage and if not adequately corrected during analysis, erroneous data will accumulate. The intention therefore is to record data that is of the highest possible accuracy and where this required standard is not possible with the equipment in use, to provide sufficient information for corrections to be applied at the analysis stage.

(x) Datum Stability

Datum stability is impossible unless we have a tide gauge/chart combination which gives the correct scaling factor. If the gauge does have a scaling error then this must be eliminated or a better gauge substituted. In a float operated gauge random datum variation can be caused by one or more of the following factors:-

a) incorrectly fitted chart

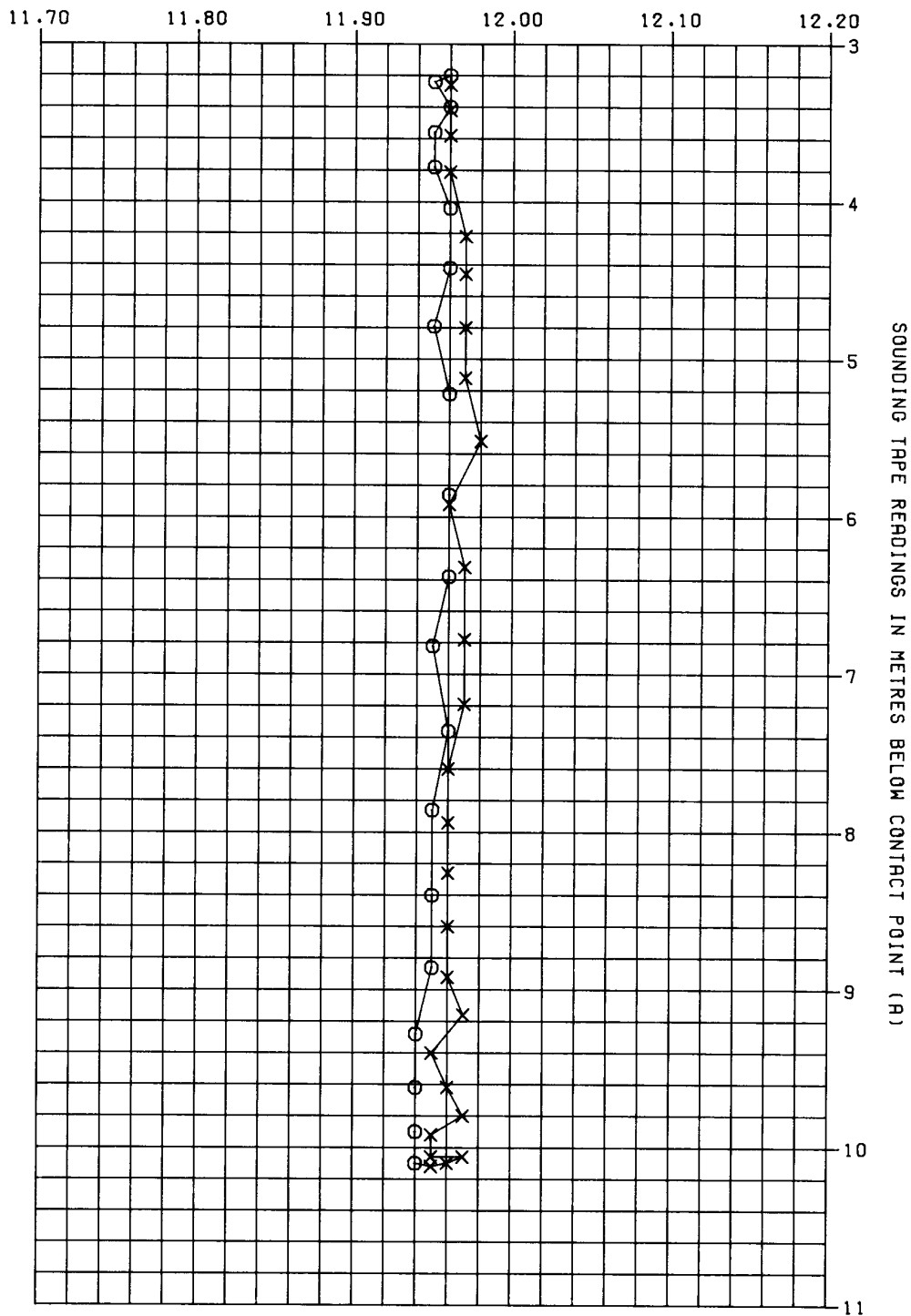
The chart may be a poor fit on the drum leaving a gap or overlap at the join. A step may also occur at the join, resulting in the pen trace suddenly jumping in height at the crossover. A flange is normally provided at one end of the chart drum so that the chart can always be fitted with the edge of the chart touching the flange. Failure to follow this procedure when fitting the chart will result in a datum change each time the chart is replaced.

VAN DE CASTEELE GRAPH

TIDAL STATION : HILBRE ISLAND

DATE : 23-8-79

ZERO IN METRES BELOW CONTACT POINT (A+B)

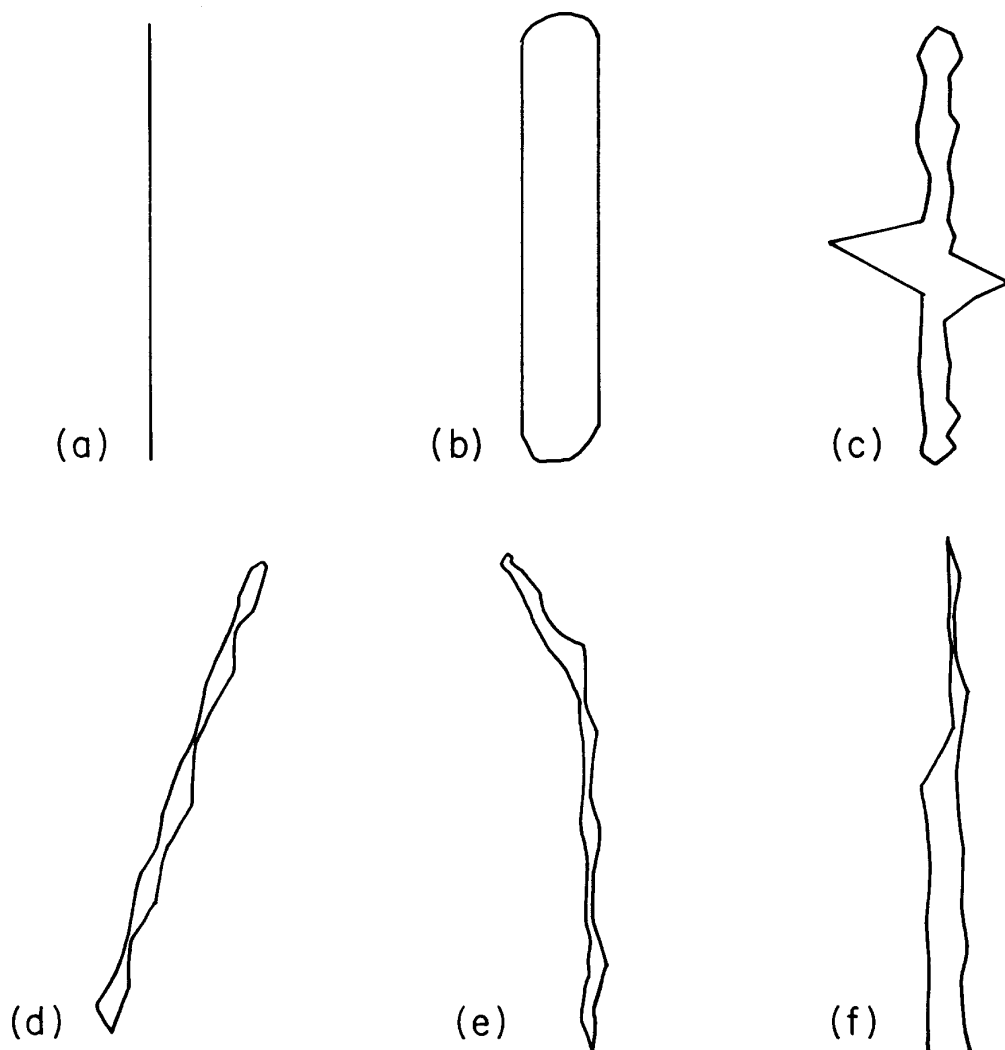


MEAN OF RISING TIDE = 11.95
 MEAN OF FALLING TIDE = 11.96
 MEAN OF WELL SOUNDINGS = 11.96

HORIZONTAL SCALE :- 5MM = 0.02 METRE
 VERTICAL SCALE :- 5MM = 0.20 METRE
 RISING TIDE O FALLING TIDE X

Figure 3.8

VAN DE CASTEELE DIAGRAMS



INTERPRETATION OF DIAGRAMS

- (a) Perfect gauge
- (b) Backlash in gauge mechanism
- (c) Gauge sticking (gauge mechanism or float in well)
- (d) Scaling error (wrong diameter wire, gear ratio or chart)
- (e) Scaling error over part range (overlapping turns on float drum)
- (f) Slippage in gauge mechanisms

Figure 3.9

b) stretch in float wire

It is possible for some stretch to occur in the float wire particularly after being newly fitted. Regular datum checks on the gauge will be necessary until stretching ceases. It is important to use the float wires specified by the manufacturer as these will have been specially chosen to have the best non stretch characteristic.

c) backlash in gauge mechanism

Backlash due to poor adjustment can be eliminated by resetting the gauge gear train. Backlash resulting from worn gears can only be eliminated by replacement of the suspect gears. The diagram produced during a Van de Castele test will show evidence of excessive backlash as separation of the diagram contour for the rising and falling tides; the greater the separation the worse the condition indicated.

d) deterioration of float

All floats deteriorate after prolonged periods of immersion in salt water due to corrosive attack. A hollow float which has corroded right through the skin will gradually take on water and with the added mass float lower and lower until it eventually sinks. Marine growth will also accumulate on a float and that portion which is attached above the water line will increase the effective mass of the float causing it to float lower in the water. This growth can also reduce the gap between the float and the stilling well until movement of the float becomes sluggish such that it lags behind the changing water level. It is particularly important therefore that floats are periodically removed for cleaning, examination and repair or replacement if found defective.

e) movement of gauge supports

It should be ensured that the supports on which a tidal recorder is mounted are stable and rigid. Flexing of the table or bench on which the recorder is supported can cause sudden displacement of the float wire which results in over-lapping turns appearing on the float wire drum. Many tide gauge houses are mounted on cantilevered structures over the edge of quaysides. These supports must be rigid and not liable to flexing, or an up and down movement of the building and recorder will result. This movement will appear on the gauge record as noise, and will be particularly noticeable during periods of high winds or when persons move around inside the building.

It is also possible for the building to gradually settle over a long period, but this will be evident by check levelling from the Tide Gauge Bench Mark (TGBM) to a reference point on the recorder mounting. The contact mark should not be used as this reference point since it is sometimes located on the top edge of the stilling well and is not necessarily connected to the structure of the building.

With a properly installed good quality gauge which is regularly maintained these sources of error can be minimised and in most cases eliminated.

It is particularly important to set the chart correctly on the recording drum. Any requirement to reset the datum should not be treated as routine but investigated to find the reason for needing this action. It must also be remembered that a partly choked stilling well inlet produces recording errors which can appear as changes in datum and therefore the performance of the well must be frequently monitored.