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PERFORMANCE OF RECYCLED PAPER PULP TRAYS IN RELATION TO IMPACT DAMAGE IN APPLE CARTONS

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of the requirements for the degree of
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New Zealand

Rebecca Alison Heap

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ABSTRACT

Excessive bruising during transit of Count 88 apples packed in cartons using paper pulp (Friday) trays is of major concern to the apple industry. The literature shows that this has been observed since at least 1962. Many experiments have been conducted but these have generally involved small quantities of fruit and been directed to specific issues. The object of this project was to review the literature and to examine the performance of Friday Trays directly by the study of their physical properties and indirectly through the experimental bruising of a significant amount of fruit under carefully defined conditions.

The carton configurations of Count 88 and Count 100 apples were assessed through visual observation and by computed tomography to determine the spatial relationships of fruit within the packs. Count 88 cartons had fruit in a 2x2 configuration and the apples were tightly packed. The fruit were close proximity with two contact points above and below for central fruit and one for those on the ends of the pack. Count 100 cartons had fruit in a 3x2 configuration. The apples were more widely spaced on the trays, with the fruit being, to some degree, 'hammocked' by the Friday Tray with less direct pressure on adjacent fruit in the static state. However, under dynamic loading it was shown that force was transmitted between fruit at four contact points above and below for central fruit and at a lesser number for those on the periphery of the pack.

Cartons of Count 88 and Count 100 apples were dropped under standardised conditions from a height of 600mm and the amount and distribution of bruising recorded. Prior experimental work defined the relationship between energy absorbed and bruise production so that it was possible to calculate the energy absorbed by the fruit and other mechanisms in both configurations. With Count 88 cartons the packaging material and other mechanisms absorbed 87% of the energy whilst in Count 100 cartons 97.5% was absorbed

The tensile strength of samples of Friday trays were measured at two moisture contents (MC), based on the MC when trays are first placed in the cartons (8 % MC) and after a minimum of 24 hours in coolstorage (15 % MC). Samples were 16% stronger at 8% MC than 15% MC.

The distribution of energy absorption was assessed using trays at 8% and 15% MC. Whilst tray splitting was more common with trays at 8% MC, the total energy absorbed was not altered and variation in another physical property, such as the ability to stretch, must have been responsible for this.

The study suggests that there is a relationship between excessive bruising and carton configuration. The previously described 'hammock effect' appears to be a protective mechanism in Count 100 packs but the closer spacing of Count 88 packs precludes this. Bruising in the Count 88 configuration may be reduced if a five layer pack similar to Count 100 were adopted or more energy absorptive trays used that would reduce the force transmitted between adjacent fruit. Such changes could have adverse effects in terms of carton overfill and would need further investigation.

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Chapter 1

INTRODUCTION

The New Zealand Apple and Pear Marketing Board (NZAPMB) exports apples to over 50 countries, the majority of which are tray packed in 20 kg cardboard cartons with a nett weight of 18+/-1 kg. The cartons currently used are Half Slotted Containers which are a telescopic carton comprised of an outer and an inner made of corrugated cardboard. Apples are graded into count sizes ranging from 64 to 216 fruit per carton with Count 113 being the most common.

Since at least 1962, when the evidence was documented by Fountain, the Board has been aware that Count 88 fruit suffer more damage during transit than any other count size. This problem was noted in subsequent in-house work by the NZAPMB (1982,1983).

During the 1980's, extensive trial work relating to carton performance was undertaken by the Board using outers (carton lids) of different strengths by assessing bruise damage on out-turn overseas. One notable finding was that the use of stronger heavy duty cartons did not alleviate the significantly higher degree of bruising recorded with Count 88 fruit. Attention was then focussed on Friday Trays. These are moulded paper pulp trays used to separate and position the fruit. A number of small trials were undertaken to investigate their performance but the studies were of limited nature and the data was inconclusive. The present study was therefore designed to look in detail at the relationship between the structure and function of Friday Trays, and to consider apple configurations in relation to the bruising problem known to occur in cartons of Count 88 apples.

1.1 BACKGROUND DETAILS

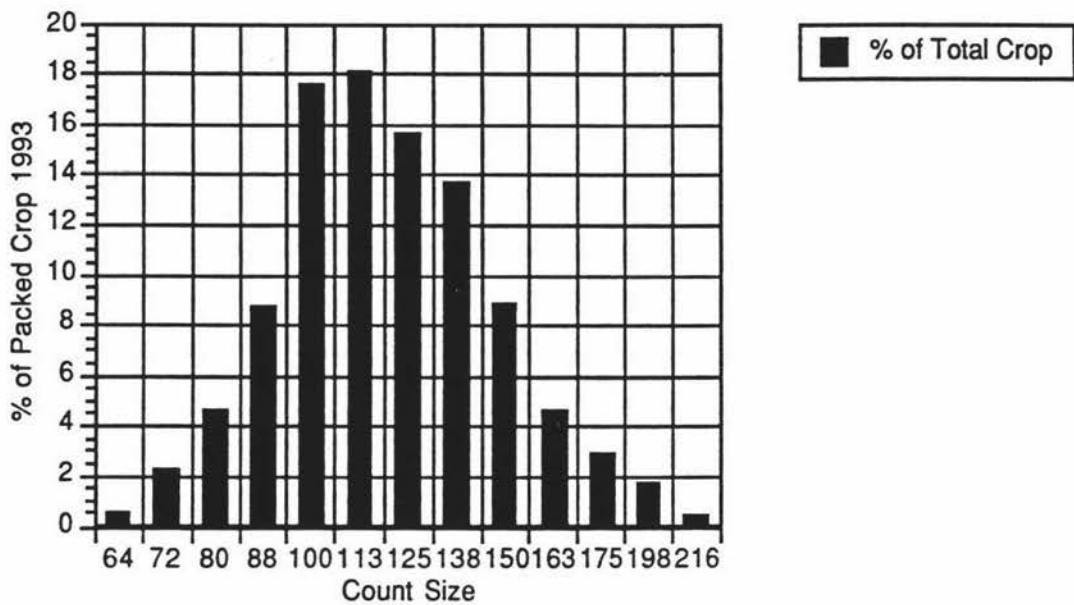
Traditionally apples were marketed in wooden cases holding 17.23 - 19.05 kgs (38 - 42 lbs) of fruit. Each apple was individually wrapped in tissue paper and pattern packed in a specified arrangement according to fruit size. The wrapping and packing technique is still used with pears and is quite a labour intensive exercise, requiring a reasonable amount of skill to wrap and pack the fruit.

Approximately 60 years ago paper pulp trays were first introduced into the apple industry as a more efficient means of separating and positioning

fruit. In the mid 1930's the original patents for these trays (called 'Friday Trays') were taken out in the USA, and although the patents have been expired for many years, trays used in the apple industry are still being produced to the original specifications.

1.2 PRODUCTION INFORMATION

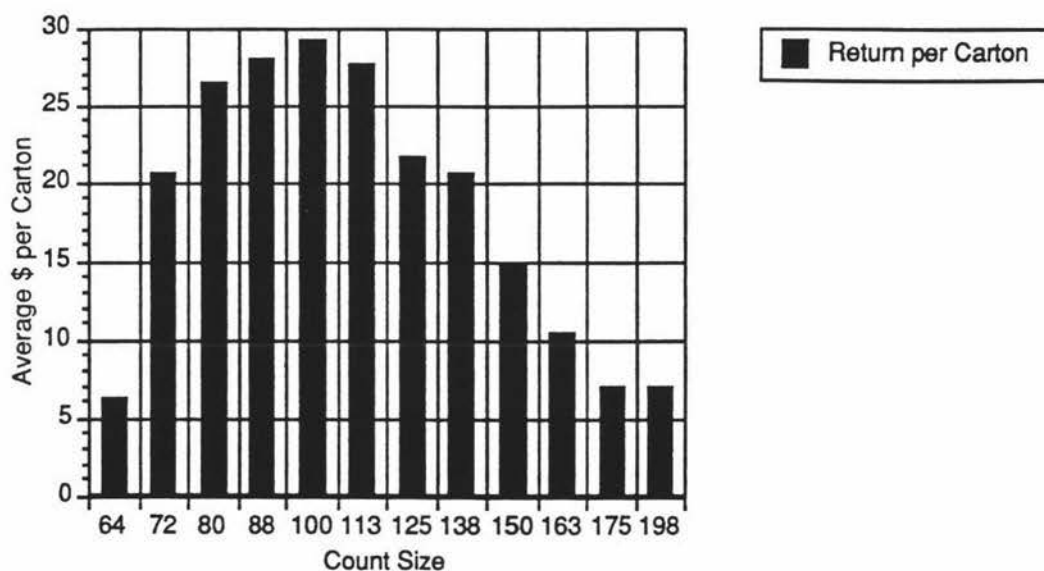
Up to and including the 1993 season the majority of export apples were tray packed in 20 kg cardboard cartons with a nett weight of 18.5+/- 1 kg. Apples were divided into count sizes, the number indicating the quantity of individual fruit in each carton. Depending on the growing conditions during the growing season, the percentage of the different count sizes will vary. Distribution of fruit size based on the number of cartons packed from the 1993 crop is given in Graph 1.1.



Graph 1.1 Percentage Distribution of Count Sizes from the Total 1993 Crop. (Adapted from NZAPMB 1993c)

The prices commanded for export apples vary with variety and count size. Count 88 fruit have a high market value and accounted for approximately 9% of the national packed crop in 1993. Graph 1.2 gives an example of

the grower returns from the 1992 Actual Prices Schedule using the average for Braeburn, Fuji, Gala, Royal Gala and Granny Smith apples.



Graph 1.2 1992 Average Grower Payout per Carton of Export Fruit (Adapted from NZAPMB 1992)

1.3 PRODUCT HANDLING

A number of researchers have reported that damage during handling was an important issue with fresh produce. For example, Holt and Schoorl (1983a) noted that fruit and vegetables were particularly sensitive to loads imposed during handling.

Siyami et al (1988) stated that a major cause of quality loss for fresh market apples was from bruise damage which usually resulted when an apple impacted either a hard surface or another fruit.

Schoorl and Williams (1972) believed that regardless of the method of transport the severest shocks were likely to be encountered in transit through handling operations rather than static weight or vibrational damage. In terms of package design it has been assumed that the severest shock was to be expected when a package landed flat on a hard and rigid horizontal surface (Schoorl and Williams 1972).

According to Holt and Schoorl (1983b), at high energy levels such as in impact situations, mechanical damage was the result of energy transformation, and in the case of apples, damage was directly related to the amount of energy absorbed. The management of damage in horticultural produce required that a trade off be made between the cost of damage and the cost of prevention.

In 1984 the NZAPMB noted that a significant, if not major cause of apple bruising may have been impact damage due to dropping and was unrelated to static pressure on the cartons. (McLeod and Crosby 1984).

Crosby et al (1983) noted that on average the amount of bruised fruit increased by approximately 10% during transit when comparing bruise levels in New Zealand prior to departure and then at out-turn in Europe.

1.4 PREVIOUS RESEARCH

The majority of published research into apple packaging has been undertaken by Schoorl and Holt at the University of Queensland, much of which was done in the early 1980's. A number of in-house research trials have also been conducted by the NZAPMB and Printpac UEB, which, whilst in many instances do not offer concise data and specific results, they do demonstrate trends that occur during the handling of fruit.

Chapter 2

LITERATURE REVIEW

2.1 INTRODUCTION

On reviewing the literature available, it became apparent that there were two broad categories, namely those papers found in refereed journals and those that were essentially industry studies of an unpublished nature.

The industry studies were obtained through the files of the NZAPMB Packaging Committee and the NZAPMB Library which revealed that a large amount of small scale research has been undertaken by the NZAPMB and tray manufacturers over the years. In many instances specific details such as fruit temperature, variety, drop height, presence of existing bruises or count size have been omitted, which means that the exact figures given are only relative to the trial concerned, and cannot be used in comparative purposes with other data. They have not been subjected to the scientific scrutiny of published papers and whilst they contain a great deal of useful information, much of the content is only indicative of likely results under various conditions and are not necessarily statistically valid. However, despite these omissions, there are clear indications which form a useful basis for future research and development work. Personal Communications as well as internal memos were also included in the review.

Through reviewing all the material available, a clear overview of the state of the industry to date in terms of packaging research, knowledge of the problems and possible solutions has been produced.

2.2 FRIDAY TRAYS

The term Friday Tray refers to the purple trays made of recycled paper pulp which are used in corrugated cardboard apple cartons of internal measurements 500 x 300 x 277 mm (nominal). The name originated in America as a Mr Friday designed the first trays (McLeod 1993). Trays made to the original specifications are still used all over the world, but since the patents have been expired for many years, there are other designs which are very similar that have been produced in Canada and Scandinavia. Details of the manufacturing process involved in the production of these trays is given in Appendix 3, and the

specifications to which the NZAPMB require the trays to be made are outlined in Appendix 4.

2.2.1 Carton Configurations

The main role of a Friday Tray is in the placement and separation of apples in 4 or 5 layers depending on count size in standard 20 kg cardboard cartons. Each count size has its own unique arrangement to allow the correct number of fruit per carton. The two main types of packing involve 4 or 5 layers of fruit, whilst 6 layer packs are required for the very small apples.

Four layer packs used with Counts 48 to 88 have four rows of fruit along each tray and each row is offset by approximately half an apple. From this the convention of describing this arrangement as a 2x2 pack is derived. By viewing the four trays end on, in the bottom tray rows 1 and 3 are full length with rows 2 and 4 offset by half an apple. In the second tray, rows 2 and 4 are full length rows with rows 1 and 3 offset by half an apple (Figure 2.1)

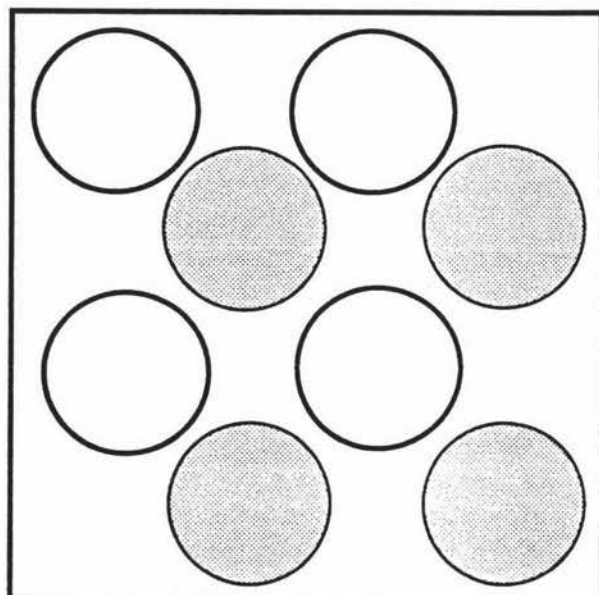


Figure 2.1 Arrangement Spheres to Demonstrate Carton endview of 2x2 Packing Configuration

The five layer packs for Counts 100 to 175 have five rows of fruit along each tray, with each row being offset by approximately one apple. This type of pack is described as being a 3x2 pack. The end view of the carton

is such that in the bottom tray rows 1,3 and 5 have fruit visible at the end of the tray, and tray 2 has rows 2 and 4 visible. This offset arrangement continues for the other 3 trays. (Figure 2.2)

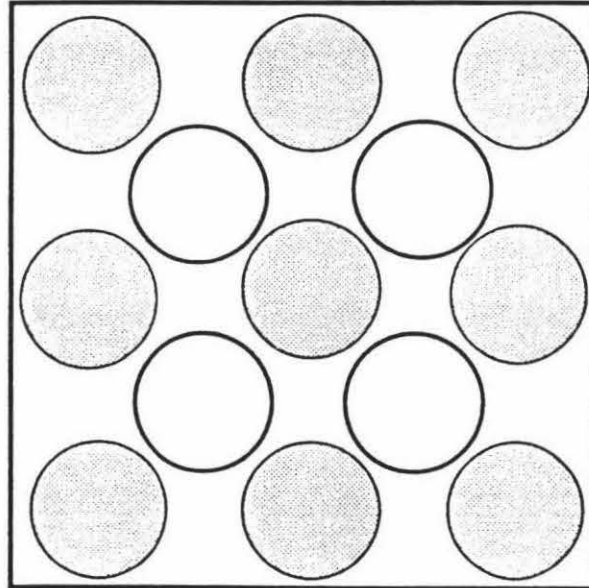


Figure 2.2 Arrangement Spheres to Demonstrate Carton endview of 3x2 Packing Configuration

Counts 198 and 216 are six layer packs with six rows of fruit in each tray offset in a similar manner to the 2x2 configuration, however the arrangement is 3 rows offset by 3 rows and is referred to as a 3x3 pack.

The number of contact points, or number of fruit on which the apple is supported from below, varies with the configuration. Apples packed in a 2x2 configuration have two contact points per fruit in all rows except for the fruit on the ends of the rows where there is only one contact point. Fruit in the 3x2 configuration have four contact points per apple in the middle of the carton, with three on the outer edges and only two for the apples on the corners. This is detailed in Chapter 4 Figure 4.9 and 4.10.

Trays are designed specifically for each count size, and are either reversible where alternate trays are rotated through 180°, or in A and B styles where two different trays are used. Tray specifications are given in Table 2.1. The width configuration describes how the fruit is offset, and the length describes the number of fruit in each row on the tray. The weight range is given for each individual apple based on weight used

before the 1994 season to give a nett weight of 18.5+/- 1 kg of fruit. This has subsequently been increased for the 1994 season to 20.65 +/- 0.35 kg to allow for weight loss during shipping and storage.

Count	Trays	No of layers	Config	Rows Width-Length	Wt Range*(g)
48	A and B Style	4	2x2	3-3	364-406
56	Reversible	4	2x2	4-3	312-348
64	A and B Style	4	2x2	4-4	273-304
72	Reversible	4	2x2	5-4	243-271
80	A and B Style	4	2x2	5-5	219-244
88	Reversible	4	2x2	6-5	200-222
100	Reversible	5	3x2	4-4	175-195
113	A and B Style	5	3x2	5-4	156-173
125	Reversible	5	3x2	5-5	140-156
138	A and B Style	5	3x2	6-5	127-141
150	Reversible	5	3x2	6-6	117-130
163	A and B Style	5	3x2	7-6	107-119
175	Reversible	5	3x2	7-7	100-111
198	Reversible	6	3x3	6-5	88-98
216	A and B Style	6	3x3	6-6	81-90

Table 2.1 Count size specifications as for the 1993 season (From NZAPMB 1992)

* calculated from count number based on a carton weighing 17.5 to 19.5 kg

2.3 PROTECTIVE MECHANISMS OF TRAY PACKS

Peleg (1985) described various types of tray packs for horticultural produce. The packs were classified as using either peg type trays (Figure 2.3) or cushioning type trays, such as Friday Trays, (Figure 2.4) where both carton and fruit, while being tightly cushioned by the trays, support the stacking load.

The peg type trays allow each fruit to be isolated in its own pocket formed by two consecutive trays, place on top of each other by means of specially constructed supporting pegs. This prevents the fruit bearing any of the load due to stacking pressures, and allows the load to be transmitted by the trays as shown by the arrows in Figure 2.3. Because of the variation in fruit size within any one count, a degree of head space is required to ensure that the larger fruit does not have contact with the tray above and take the stacking load. However this head space can in fact cause damage due to fruit bouncing in the pockets, especially those at the smaller end of the count size. Peleg (1985) did not comment on the performance of this tray type in terms of impact damage, but he noted the problems in terms of vibrational damage. If the transportation environment caused vibrational frequencies corresponding to the natural frequency of the fruit in the trays, they would be excited to bounce violently all the way. Under such

circumstances, Peleg predicted that there would be some damage no matter how soft the tray material was.

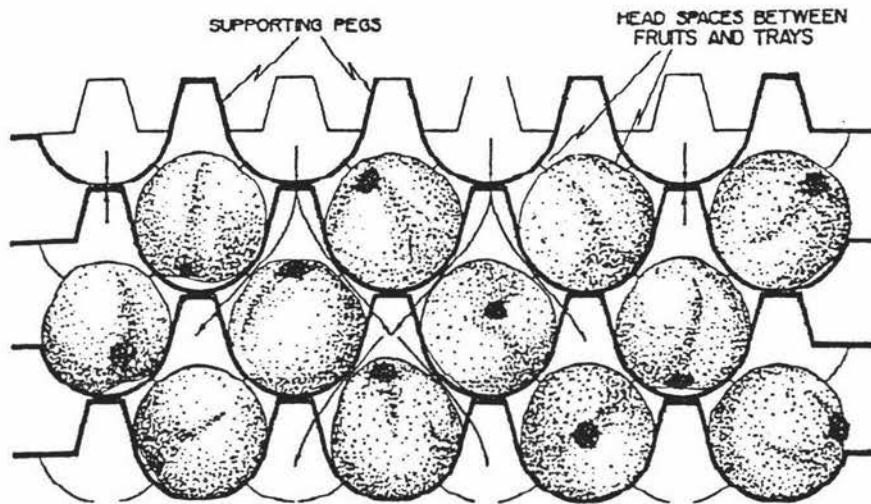


Figure 2.3. Typical Peg Type Trays (from Peleg (1985))

The problem of fruit bouncing is not present with cushioning type trays where the fruit is held closely together. The packing density is also greater with this type of tray as the head space present with peg type trays has been eliminated.

To alleviate the stacking load under compression, cushion type trays must be made to contact a maximal part of the fruit surface area. Friday Trays are designed to direct the downward pressure due to stacking load forces away from the fruit, as shown by the broken lines in Figure 2.3. Effectively this means more fruit contact area and, consequently, less pressure on the fruit.

Pulp trays being, hygroscopic, may absorb moisture from the produce or surrounding atmosphere, resulting in softening and increased pliability of the trays. This in turn may cause trays to conform better to the fruit shape thereby increasing contact surface area and reducing point pressure. On the other hand, deformation of the pockets in the bottom tray creates little flat surfaces in the bottom of the pockets, effectively destroying the curved surfaces which are supposed to cushion the fruit. Since the bottom layer fruit bear the greatest compression forces, created by all the fruit above them, they must be supported by as large an area as possible. Turning part of this curved surface into a flat surface will cause commensurate fruit deformation since this leaves only one contact point between the fruit and the tray (Peleg 1985).

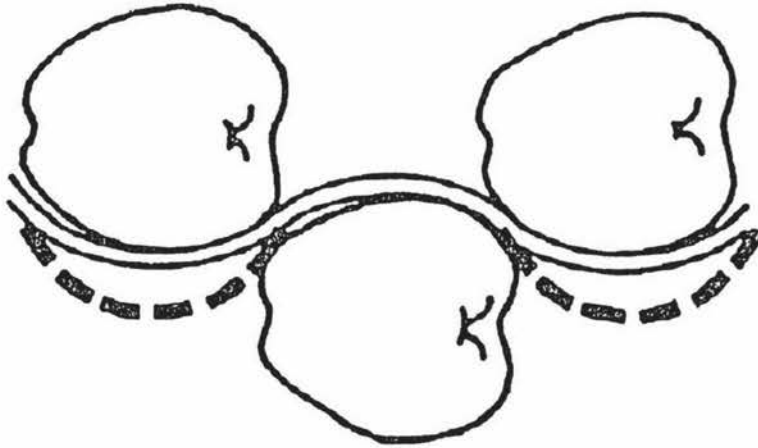


Figure 2.4. Friday Trays designed to direct pressure downwards and away from the fruit as shown by the broken lines (courtesy Keyes Fibre Co, from Peleg (1985)).

2.4 THE EFFECTS OF STATIC AND DYNAMIC LOADS

2.4.1 Static vs Dynamic Loads on Apple Cartons

Work by Holt and Schoorl (1977) demonstrated that there was a strong correlation between bruise volume and energy absorbed for both impacts and slow compression. Apple tissue was bruised more easily by slow compression than by impact, and for the same amount of energy, bruise volumes were approximately 40% larger under slow compression. Mohsenin (1970) and Fridley et al (1964) showed that to achieve bruises of equivalent size, under impact conditions 1.5 to 2 times more energy needed to be dissipated than that required under quasi static loading. Zhang et al (1990) also noted that the behaviour of apple tissue under impact was different from that under static pressure.

During 1982 and 1983 the NZAPMB ran two packaging trials to assess carton performance and apple damage on out-turn overseas. Although the trays were not specifically investigated, useful information pertaining to the type of loadings the cartons and apples experienced was reported.

In 1982 Aitken and Crosby looked at the static vs dynamic loading effects on cartons. The traditional belief, supported by the findings of Fountain (1962), was that by increasing carton compression strength, bruising would be reduced since damage was caused by the static load. From

their observations it was noted that while stacking strength of the cartons was necessary to maintain stack stability during storage, there was increasing evidence to suggest that dynamic effects related to impacts were a far more important cause of bruising than static loading (Aitken and Crosby 1982).

The results of the 1982 trials showed that although bruise damage was greater at the bottom than at the top of a stack, the pattern was too inconsistent to correspond to uniform pressure damage, and was more consistent with the observed practice of dropping rather than lowering many of the cartons at the bottom of a stack into position.

Within these trials a number of cardboard outers of varying strength were assessed, and the results showed that except for the largest size of fruit, bruise damage was as great or greater in the heavy weight non-pressure style of case as in the light weight pressure pack.

The authors concluded that in all count sizes, pressure alone on the cartons was not a major contributor to fruit damage and may not be a significant problem overall. However they did recognise that the results, while indicative, were not conclusive and that additional studies would be required. Further to this, Crosby et al. (1983) proposed that the incidence of bruising was not related simply to stacking pressure since overfilled cartons did not always have more bruising than cartons that were level or had underfill.

2.4.2 Dynamic Behaviour of Apple Columns and Cartons

All experimental studies showed that the amount of apple bruising experienced on impact varies at each level in the carton. Schoorl and Holt (1974) reported that the impact testing of tray packed apples showed bruising to be more severe on the bottom than on the top layers. Acceleration measurements showed that apples experienced the highest accelerations in the top layer and that magnitudes systematically decreased towards the bottom of the pack.

From this Schoorl and Holt (1974) postulated that apples in lower layers were subjected to impacts from both above and below, so while fairly low accelerations were recorded at the centre, substantial bruising occurred at the contact points on the surface.

Holt, Schoorl and Lucas (1981) investigated the behaviour of columns of apples using high speed photography at 500 frames per second, and noted that they acted in a similar manner to whole cartons under impact. The apples were constrained in a clear plastic tube during the experiments. At the beginning of the drop the column of apples separated out due to elastic recovery on removal of the gravitational force, with each apple having a 2 millisecond gap between it and the next fruit. On impact the first apple slowed down and started to deform at the contact point. Meanwhile 2 ms later the second apple hit the first apple and with this added impetus the bottom apple continued to deform. The process continued until all apples were stationary. When deformation of the bottom apple was complete, subsequent collisions had no further effect on this apple. From these trials the authors postulated that each collision only affected the apple immediately below the impact surface, and that apples further down the column received no further bruising.

2.5 DROP HEIGHT EFFECTS AND POSITION OF BRUISED FRUIT

2.5.1 Effect of Drop Heights

Schoorl and Williams (1972) demonstrated that apples in cartons had a critical drop height of 50 mm, below which damage was independent of the number of drops and was substantially random. At greater drop heights the total damage was proportional to the number of times the package was dropped.

Schoorl and Holt (1974) ran trials to measure the acceleration in tray packed apple cartons under impact. The results showed that the percentage of bruised fruit increased with drop height and although the bruise diameters were fairly constant, the depth of each bruise increased with drop height. For impacts greater than 300 mm bruising progressively decreased from the bottom layer upwards, whereas impacts at 150 mm and 300 mm showed an increase in the amount of bruising in the second to bottom layer as compared to the bottom layer. Accelerometers were used to verify the fact that apples towards the bottom of the pack were subject to more severe impact conditions than those on the top. Results showed that the highest accelerations occurred in the top layer and these were 3 to 4 times those recorded in the bottom layer. The accelerations increased with drop height and drop number. The increase with drop

number indicated that there must have been some amount of stiffening or settling of the pack under repeated impacts (Schoorl and Holt, 1974). The shape of the shock waves recorded by the accelerometers indicated that the bottom layer received 4 or 5 impacts whereas the top layer received only one. In general the number of peaks in the shock wave and the layer number corresponded closely. The duration of the peak to peak shock waves was not influenced by the number of drops, drop height or the position the accelerometer was in the pack except for the 150 mm drop where the effect was small (Schoorl and Holt, 1974).

2.5.2 Position of Bruised Fruit

None of the literature described the location of bruising on the fruit, and very few authors specified if bruising had occurred on either the top or the bottom of the fruit. However the percentage of bruised fruit in each layer in a carton had been recorded in a number of trials.

The general trend appeared to be that more bruising occurred on the second to bottom layer than the bottom layer in cartons under impact.

Aitken and Crosby (1982) found that fruit bruising on out-turn in Europe was significantly greater in the second to bottom tray irrespective of count or variety. The same findings were made by Crosby et al. (1983). The incidence of bruise damage in the second tray was more consistent with a dynamic than a static effect according to Aitken and Crosby (1982), who believed that these effects related in some way to tray configuration and support, and to the manner in which impact and static loading forces were distributed between the fruit and the tray.

Bloxham (1982) showed that, after impact, bruising was more predominant in the second to bottom layer in Count 88, (100% bruised fruit in the second to bottom compared to 91% in the bottom tray). This also followed for Count 100 with 90% and 80% bruised fruit respectively.

Crosby (1984) and McLeod and Crosby (1984) also noted that cartons with Friday Trays gave greatest damage in the second to bottom layer.

In trials run by New Zealand Forest Products in 1984 it was concluded that under compression apples on the outer edges and top and bottom layers were better protected than those in the body of the carton. This was attributed to the fact that the apples had room to move when the carton bulged rather than just being squashed.

2.6 CARTON CONFIGURATION AND PACKING

2.6.1 Packing Configurations and Packing Densities

Fresh fruit and vegetables are commonly marketed in either jumble packs or in tray packs. Jumble packs are usually used for lower grade or local market produce where the produce is simply tipped into some form of bulk bin. Tray packed fruit and vegetables are more common with higher value commodities and those destined for the export market.

Peleg (1985) noted that the four universal functions of packaging were containment, protection, utility and information, the first two of which are the most important in terms of wholesale packaging of produce. Containing the product efficiently meant maximum utilisation of the volume of the pack in terms of packing density which should not be at the expense of the protective function of the package.

Packing density varies with the style of packing. With relatively spherical produce such as oranges, jumble packs have a packing density of approximately 50%, compared to produce packed in a face centred cubic (fcc) pattern (refer to Chapter 4) which allows a density of approximately 74% (Peleg 1985).

The economic significance of the packing density, which indicates the volume fraction of the carton actually utilised for carrying fruit is self explanatory, however there is an important quality criteria associated with this which relates to the number of contact points the fruit has between its neighbours and the carton walls. Most fresh produce is highly susceptible to pressure, bouncing and vibration during transit. The greater the number of contact points supporting the fruit in the pack the less the pressure at each contact point, since the loading forces are distributed over a larger part of the fruit. The face centred cube packing configuration allows between 6 and 12 contact points with each nearest neighbour, with other types of configuration giving lower numbers of contact points.

2.6.2 Apple Packing Configuration

The arrangement of apples in relation to bruising was investigated by Schoorl and Holt in 1982. Apples packed with no trays between them, in three different arrangements as shown by plan views in Figure 2.5, were dropped from 450 mm. The shaded areas indicate the fruit used for the

data collection to avoid possible edge effects from fruit in contact with the sides of the cartons.

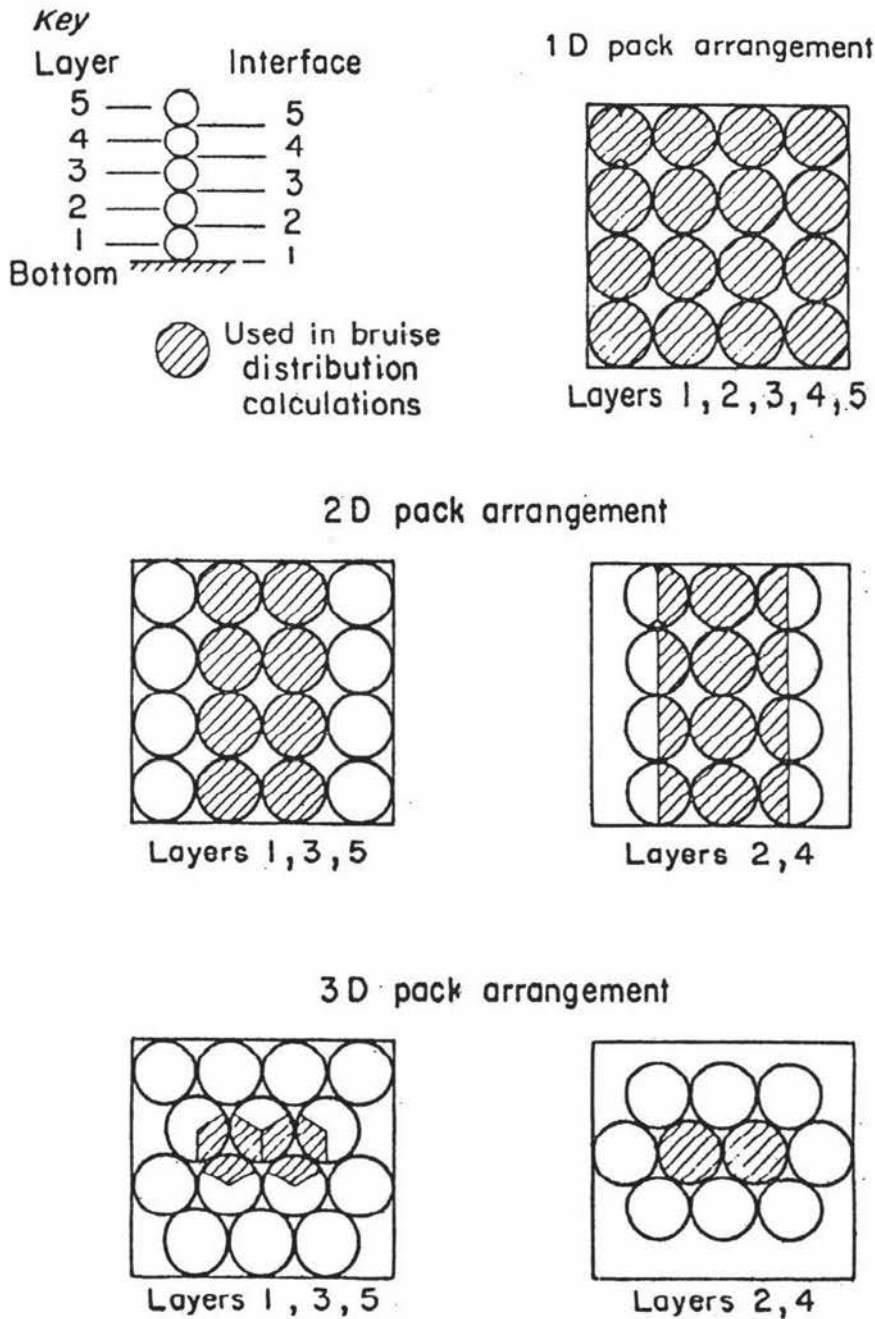


Figure 2.5 Plan view of Apple Arrangements from Holt and School (1982)

The results showed that the total bruise volume after impact was independent of the way in which the fruit was arranged, and that nearly all

of the impact energy (92%) was dissipated in bruising the fruit. This supported the assumption made by Schoorl, Holt, and Lucas (1981) in the prediction of bruising in impacted multi layered apple packs, that all the impact energy was absorbed in bruising.

However, the results also showed that the percentage of bruised fruit in 2D and 3D arrangements was greatest in the bottom layer. 3D arrangements tended to give a more even distribution of bruising in each layer whereas 1D and 2D arrangements showed a bruise decrease in each subsequent layer.

The mean bruise volume showed only a 2.5% difference between the 1D, and the 2D and 3D configuration. Therefore in concluding Schoorl and Holt (1982) stated that while the number of bruises may depend on the support system (arrangement) for the individual fruit within the pack, the bruise volume did not.

2.6.3 Bruising in Relation to Carton Configuration

A number of trials have been undertaken to compare the effects of 2x2 and 3x2 carton configurations in terms of damage to fruit. This has been investigated in controlled impact situations in the lab as well as shipping trials to assess the performance during transit.

Bloxham (1982) conducted two small trials to compare the performance of 2x2 packs against 3x2 packs. One carton of Count 72 fruit was compared to a carton of Count 100 fruit at ambient temperature, and one carton of Count 88 fruit was compared to a carton of Count 100 fruit directly from the coolstore. Cartons were dropped onto the laboratory floor from an unspecified height.

In all cartons the most bruising occurred in the second tray. Count 72 fruit had 50% more bruised fruit than Count 100, with respective totals of 66.6% and 31% bruised fruit (both cartons tested at ambient temperature). Count 88 experienced 87.5% bruising which accounted for 30% more bruising than Count 100 which had 58% of the fruit damaged (both cartons tested directly out of coolstore)). This trend was not in keeping with other NZAPMB research (1982, 1992) which showed Count 88 to suffer significantly more bruising than any other count size. Bloxham concluded that a 2x2 pack gave approximately 30% less protection

against bruising than the 3x2 pack and that this was because there were only two fruit contact points in the 2x2 pack compared to four points in the 3x2 pack. He also concluded that damage associated with the configurational pattern could be exacerbated by mixed sizing, which tended to increase the amount of bruising by reducing the number of contact points. Unfortunately due to the small size and limited nature of this trial it was not possible to draw firm conclusions.

USDA trials involving two different packing configurations with Count 88 fruit showed 9.8% bruising in a 5 layer 3x2 configuration pack compared to 23.8% in a 4 layer 2x2 pack. The trials consisted of 3 shipments of unknown quantity being transported by rail from Washington to markets in the Eastern part of the States. Fountain (1962) suggested that there was better distribution of overhead weight in the five layer 3x2 configuration as compared to the four layer 2x2 arrangement where overhead pressure was the main cause of bruising damage.

Similar findings were made in the NZAPMB 1982 Packaging Trials when it was noted that five tray cartons (Count 100 and smaller fruit) showed a markedly lower incidence of bruising than four tray cartons (Count 88 and larger).

Anderson (1983) showed that for a 750 mm drop the 3x2 configuration Count 113 fruit was in better condition than the 2x2 Count 88 fruit. She also noted that Count 113 trays were split more severely than the Count 88 trays, which suffered little damage.

In the 1982 NZAPMB Trials, on out-turn it was observed that the level of bruising in the Count 88 pack was usually higher than with larger fruit in the Count 80 pack, although both were packed in the same configuration. Similar results were observed with the NZAPMB (1992) in-house trials.

In response to the Count 88 bruising, Bloxham (1982) recommended that until the technical committee of the NZAPMB could address this problem that Counts 88 and larger (2x2 packs) were not stowed in hatches or areas of ships where they were likely to be walked on, put under pressure (by having stacks more than 8 cartons high) or handled roughly. It was recommended that the pallets of Count 88 and larger fruit should not have other pallets placed on top of them in stores or during the handling process.

Recent unpublished data (1992) from NZAPMB showing levels of bruising classified as serious on out-turn is summarised in Table 2.2. This data

showed that Count 88 fruit was prone to more bruising, and in all instances apart from Count 125 fruit there was a reduction in bruising in 3x2 configurations. This data was indicative of the problem but may not have included full inspection of whole cartons of fruit as the numbers of fruit inspected were not always multiples of the count size.

Count	% Bruising	No Fruit insp	No Bruised	Configuration
72	1.74	518	9	2x2
80	1.66	2653	44	2x2
88	4.98	4422	220	2x2
100	1.7	5286	90	3x2
113	1.65	5285	87	3x2
125	3.46	10042	347	3x2
138	1.26	23212	293	3x2
150	1.71	20790	355	3x2
163	1.82	19838	362	3x2
175	1.44	9591	138	3x2
198	2.71	627	17	3x3

Table 2.2 Percentage bruising on Out-turn in Europe NZAPMB 1992

2.6.4 Underfill and Overfill Cartons

Underfill and overfill refers to the height at which apples sit either above or below the top of the carton and is measured at the time of packing or after transportation once the fruit has settled. None of the literature gave a definition of exactly what was meant by overfill or underfill in terms of approximate measurements above or below the top of the carton. There was contradictory evidence as to whether or not the anticipated levels of overfill or underfill at the time of packing were related to the count size and configuration of the pack. Crosby and Aitken (1982) and Crosby et al (1983) mentioned the range of overfill/underfill but did not relate this to count size or configuration.

According to Bloxham (1982) the pack design affected the amount of overfill or underfill, where 2x2 packs displayed more overfill than the 3x2 packs. Kroger (1983) also believed that 2x2 packs had more overfill than

3x2 packs, but Fountain (1962) found the 2x2 pack to have less overfill than the 3x2 pack.

Adolph (1993) stated that the NZAPMB apple cartons were designed as pressure packs where there was a certain degree of pressure on the fruit to hold it firmly in the pockets of the tray.

Crosby (1987) stated that the general trend with all Counts regardless of whether they were pressure or non-pressure packs was that fruit settled, and this occurred to a greater extent with break bulk stowage than with pallets. Crosby (1987) believed that either fruit settling, tray compression or fruit re-alignment was a natural phenomenon which occurred during distribution and was irrespective of any pressure on the carton.

Fountain (1962) noted that less underfill (ie the fruit sat relatively higher in the carton) at packing gave less bruising on out-turn when a higher five layer pack was compared with a lower four layer pack for Count 88 fruit. At packing the four layer Count 88 fruit were flush with the top of the carton, but after transportation had settled to give 6 to 12 mm underfill. The five layer carton had 12 to 25 mm overfill on packing which settled to 3 to 6 mm underfill on arrival. The fruit sat higher in the carton and suffered less damage.

Kroger (1983) argued that the increase in bruising observed in Count 88 fruit at out-turn arose because apples sat lower in the carton, so that the pressure pack effect was reduced, thus allowing more movement, resulting in enhanced bruising.

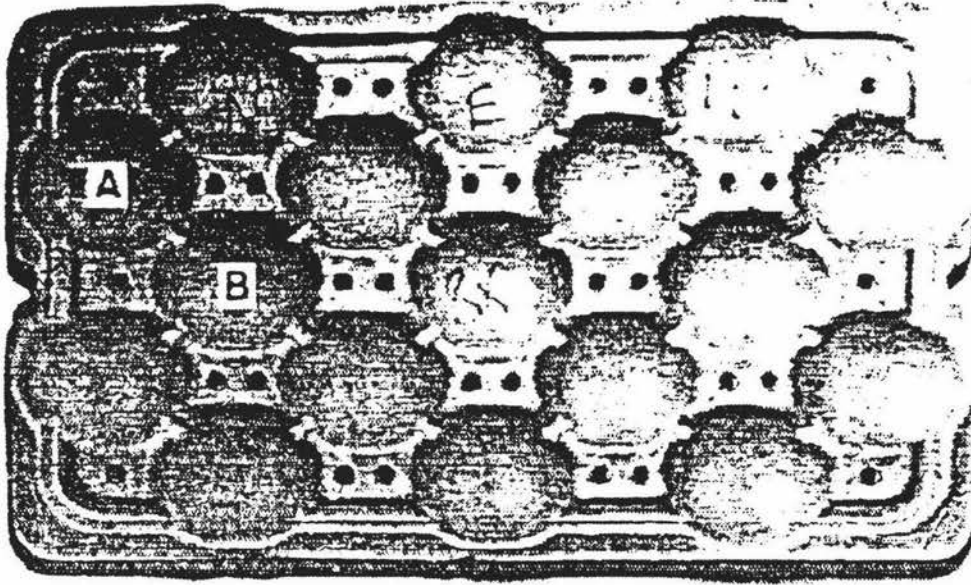
However if the carton was also over-weight, the height of overfill was increased and resulted in a greater amount of bruising (Bloxham, 1982), which contradicted the findings of Fountain (1962) and Kroger (1983).

Blomfield (1987) noticed a great deal of bruising in South African fruit on out-turn in Europe. The cartons displayed significant overfill such that the outers never rested on the carton inners, and Blomfield (1987) believed that the damage was a result of the fruit sustaining the compression load.

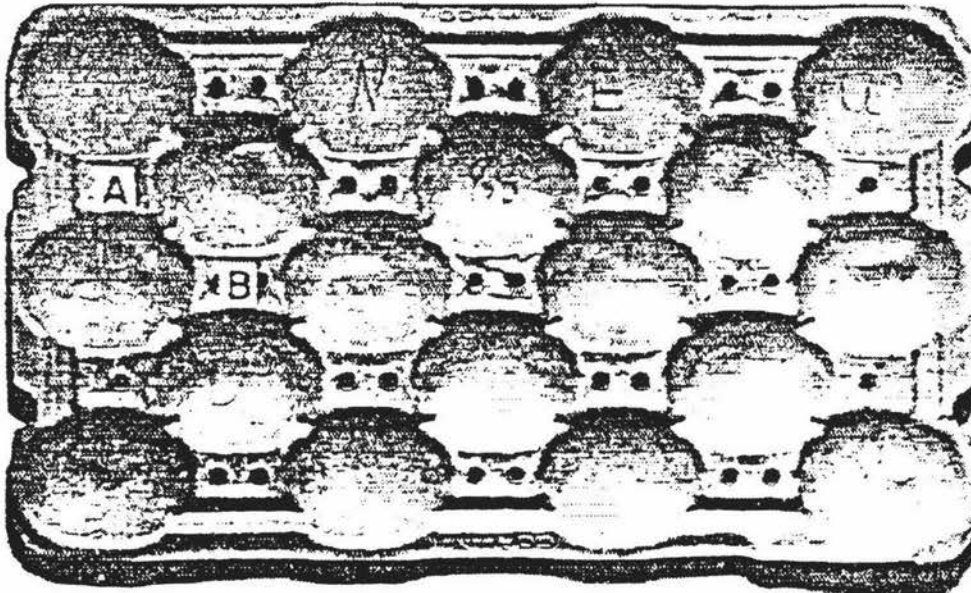
However, Crosby et al. (1983) proposed that incidence of bruising was not related simply to stacking pressure since overfilled cartons did not always have more bruising than level or underfill cartons. Similar findings were reported by Lenting (1989a) where higher overfill in cartons did not consistently show more bruising.

2.6.5 Bruising in Count 88 Packs

The only known published work on bruising in relation to Count 88 fruit was when Fountain (1962) ran trials to assess bruising damage in cartons of Count 88 fruit by altering the configuration in which the fruit was packed. The trial compared a five layer pack with 18 and 17 fruit on each alternate tray (Figure 2.6), with the standard four layer pack with 22 fruit per tray. It was reported that the five layer pack had approximately 60% less bruising than the four layer pack.



Tray A Layers 1,3 and 5, 17 fruit per tray



Tray B Layers 2 and 4, 18 fruit per tray

Figure 2.6 A and B Style Friday Trays used in 5 Layer Count 88 Packs (from Fountain 1962)

Printpac UEB uses dies for Friday Trays originally obtained from the Keyes Fibre Company in the USA. As part of the royalty arrangement Keyes agreed to provide technical assistance to Printpac UEB (previously as Fibre Products). In response to a request by Fibre Products in 1983 for more details regarding this five layer Count 88 pack mentioned by Fountain (1962), Kroger (1983) gave some useful comments regarding why Count 88 fruit continued to be packed in four layers per carton.

Pulp trays were first introduced into the apple industry in the 1930's. Over the years the design changed from deep pockets to more shallow pockets. The dimensions also changed in response to the cultivars grown, as current apple varieties are longer and less round than earlier varieties. In 1961 Pacific Pulp Moulding in America developed the "Spring Cushion" design for the pulp trays, which became the accepted style of Friday Trays (Kroger, 1983).

Kroger (1983) suspected that the five layer pack lost favour due to the additional cost of an extra tray in each carton and that as the apples were rounder they sat higher in the trays. This resulted in too much overfill, believed to be a contributing factor in bruised fruit, although this opinion contradicted the data from Fountain (1962) which suggested the five layer packs were more effective in reducing bruising.

With current varieties Kroger (1983) believed that the longer and less round fruit in four layer 88 packs sat lower in the carton and the pressure pack effect was reduced so the apples moved readily, therefore experiencing more bruising.

Kroger (1983) believed that the moulds and dies used for the five layer Count 88 pack were designed to accommodate older varieties of fruit and have since been destroyed.

2.7 RECYCLED PAPER PULP TRAYS

2.7.1 Pulp Tray Performance

In terms of mechanical damage Schoorl and Williams (1972) showed that tray packed cartons with pulp trays were markedly superior to the traditional pattern packed cases with no trays, under single and multiple impacts.

Work by Holt and Schoorl (1984) on the effect of packaging showed that pulp trays accounted for most of the energy absorption and dissipation on

impact by stretching in two horizontal directions rather than compression at contact points. Their results indicated that only 15% of the kinetic energy was absorbed by the fruit, 60% by the action of the tray stretching, and 25% by other actions such as carton bulging and other complex mechanisms of the tray.

2.7.2 Effects of Tray Design on Bruising

In New Zealand two styles of pulp tray have been used in the apple industry. The Friday Tray, which was the original tray designed in the USA, can be identified by square slots at either end to facilitate lifting in and out of cartons, and the 'Apple Tray' which was based on a Scandinavian design, has round holes at either end. The Apple Tray is only produced at the Nelson Printpac UEB plant.

In 1989 a series of three trials were undertaken by Lenting of Printpac UEB to compare the performance of their Apple Trays with standard Friday Trays after cartons of fruit were stacked in coolstorage for a number of weeks.

Bruising was assessed after the cartons had been in storage. The presence of bruises at packing was not considered and so it was impossible to determine whether or not the bruising was a direct result of the type of tray. No indication was given as to whether or not the fruit had been graded with an absence of mixed sizing.

The first trial (Lenting 1989a) compared Royal Gala Counts 113 and 138 fruit coolstored for 3 weeks. The position in the coolstore, and therefore the compressive force the fruit was subject to, was not known. The data showed that the Friday Tray was more prone to ripping in both count sizes and for the Count 138 fruit there was 3.2% bruising compared to 4.2% with the Apple Trays. The Count 138 Friday Tray pack had a 3 mm greater overfill. In the Count 113 fruit the overfill was the same but the Friday Tray had 3.1% bruising compared to 2.5%.

It was noted during the trial that the Printpac UEB Apple Trays were initially more difficult to pick up, but once picked up were easier to remove from the cartons. The Apple Trays were stiffer and easier to handle resulting in less fruit damage from apples falling off the trays. In comparison, corner pockets on the Friday Trays tended to flatten out and lose rigidity. There were less rips and tears in the Apple Trays. As a

result of the trials Lenting (1989a) proposed that the stiffness in Apple Trays should be reduced slightly.

The average amount of bruising found over all the fruit sampled in the second and third trials were 22.36% and 18.7% respectively (Lenting 1989b, 1989c). This exceeded the NZAPMB standards greatly. However despite this some useful observations were made. Lenting (1989b) noted that the high level of bruising did not appear to be compression bruising as very little bruising was seen on the "shoulders" of the apples where they sat in the trays. This suggested that the apples suffered grader damage rather than in-carton handling or compression damage since there was an absence of bruising in the regions that would have indicated compression or impact damage after packing (Lenting 1989b).

From these trials it is not possible to draw conclusions as to the performance of Friday Trays against Apple Trays.

2.7.3 Tray Weights

In the past Friday Trays were placed in cartons, and then filled with apples. Since the introduction of automatic tray fillers it has been necessary to lift trays with apples on them into cartons. The tray therefore had to be capable of supporting a minimum weight of 3.7 +/- 0.2 kg (mean) in five tray packs to 4.6 +/- 0.25 kg (mean) in four tray packs giving 18.5 +/- 1 kg of fruit per carton. The NZAPMB tray specifications (Appendix 4) state that the current trays should weigh 80 +/- 5g after oven drying.

In 1989 the Board experienced problems with the strength of trays from Fibre Products (now Printpac UEB). Byrom of Fibre Products conducted weight trials on the Count 80 Friday Trays to test if an increase of 5 to 10 grams in tray weight also increased the strength, and what repercussions this would have on the amount of bruising after the carton was subject to an impact from 600 mm (Byrom, 1989). Only four cartons were tested at each weight so the data was indicative although the sample was too small to be statistically significant.

The trials included the standard 90g trays as well as 75g and 100g trays. The moisture content of the trays at these weights were not given, so it is possible that the standard 90g tray equates to the 80 +/- 5g tray after oven drying. Although the 75g trays were able to support the fruit when loading into a carton, 40% more bruising was experienced on impact than with the 90g tray. When compared to the 90g tray the 100g tray showed a 5%

increase in bruise volume and a 1.5% decrease in the actual number of bruises. However the protection afforded by each tray varied according to the position within the carton. (Figure 2.7).

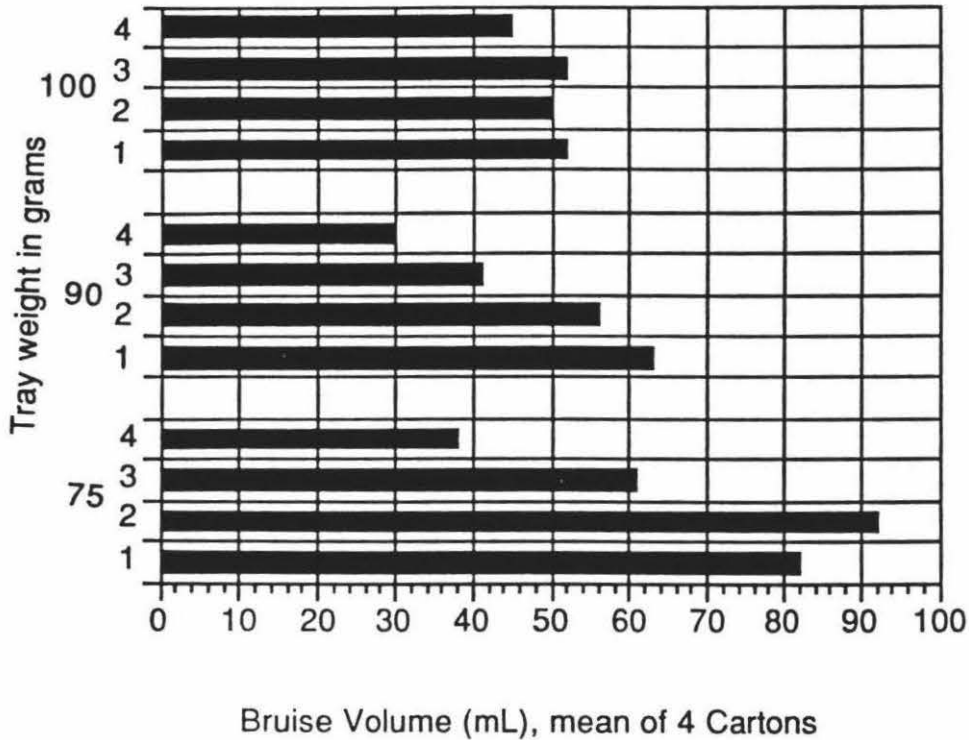


Figure 2.7 Mean bruise volumes against tray position at different tray weights from Byrom (1989) 1= bottom tray in carton to 4= top tray in carton

Byrom (1989) concluded that to increase integral tray strength appreciably the tray design would need to be changed which would be a very costly exercise.

According to Dilley (1989) the Friday Tray was designed to protect the fruit by evenly distributing compression loads from stacking and by absorbing dynamic loads from dropping. He believed that this could be achieved by allowing the tray to tear between the pockets, such that it would automatically adjust to accommodate variations in fruit diameter. Dilley (1989) claimed that tear strength played an important part in obtaining the optimum protection where too little tear strength was as bad as too much, although there was no evidence of experimental work to support this. He believed that tear strength was related to thickness and therefore tray weight, but no mention was made of pulp density or raw fibre input.

From American experience, Hartford (1989) of the Keyes Fibre Company believed that adding weight to the tray would not substantially increase its strength. Examples were cited from the Keyes plant at Wenatchee who carried a lighter yet stronger tray than their major competitor PCA. The Wenatchee trays were approximately the same weight as the standard 90g tray from Fibre Products. It was stated that during shipping trials on larger fruit using trays of approximately 77g, 80g, and 86g, tray weight did not affect the ability of the tray to protect the fruit from bruising. However no data was presented to support this finding.

Hartford (1989) stated that the Keyes Company leaned towards the theory that a tray design which emphasised good structural detail would provide a stronger tray. They claim to have redesigned their trays to meet the tighter requirements for automatic fill lines while still providing good strength for transferring loaded trays into cartons and protecting fruit from bruising, but gave no indications as to the specifications of these trays.

2.7.4 Moisture Content

Tray ripping was observed by Lenting (1989a) during the tray design trials where trays were excessively damp. Trays with a high moisture content of 14-20% were considerably weaker than trays at 8-12% moisture content.

Amos (1993) has shown that the cardboard and pulp trays used in apple packaging maintained their strength when dry. However their protective properties decreased with increasing moisture content and the carton will become unstable and virtually useless at a 17.5% moisture content (McLeod 1993).

2.7.5 Damaged Friday Trays

Crosby et al. (1983) noted that split trays were an intermittent problem observed both in New Zealand and overseas. They believed that this type of failure was caused predominantly through carton impacts, but could also result from excessive compression. However, even when split the New Zealand trays did retain considerable integrity compared to Chilean trays with similar splits which did not allow the trays to be lifted from the cartons. No specifications on Chilean trays were given.

2.8 ALTERNATIVE TRAYS, TRAY COMBINATIONS AND CARTONS

A number of different materials have been tested in small trials to assess their effectiveness in bruise reduction when compared to traditional pulp trays and cartons. The effects of using double trays and increasing carton weight have been investigated along with a variety of other polystyrene and compressed foam type materials.

2.8.1 Double Trays

New Zealand Forest Products (1984) showed static load tests using a compression of 690 kg caused 35% of the apples to be bruised. With double trays the severity and the number of bruised fruit was reduced to 20%.

On impact, drop tests with 2 drops from 550 mm gave on average results of 60% of the fruit having at least one bruise. By using two trays, bruising was not only less severe but also reduced to 40% of the apples. (NZFP 1984). In both trials the count size or configuration pertaining to this data was not specified but fell between Counts 72 and 150.

Crosby (1984) undertook trials on Count 88 and 100 fruit, subjecting the cartons to both impact and compression in which double Friday Trays consistently gave better bruise protection than single trays. The effect was more marked in the Count 88 cartons with bruise volume being reduced by 50%. Count 100 cartons gave a reduction of approximately 20%.

2.8.2 Polystyrene Trays

Full details of a trial using South African 'Bakke' moulded polystyrene trays were not available but in summary NZFP(1984) reported that in storage the foam structure of moulded polystyrene trays collapsed irreversibly, and under compression and impacts the trays immediately split.

Anderson (1983) found American polystyrene trays to be more promising after undertaking trials involving impact testing 3 cartons of Count 88 and 113 fruit from 750 mm. In all drops onto concrete the polystyrene trays gave more protection against bruising in the bottom layer than the Friday Trays. With Count 88 cartons, in all but the second layer bruising was reduced with polystyrene trays. However Count 113 fruit showed an overall increase in bruising with the distribution of bruising varying

(Anderson 1983). With such a small sample it was difficult to draw conclusions as to the protective qualities of polystyrene trays.

2.8.3 Polyurethane Foam Pads

Shipping trials were undertaken using 3 mm (1/8") polyurethane foam pads between each layer of apples which were pattern packed in the traditional manner instead of using pulp trays (Fountain, 1962). Early in the season a test shipment was undertaken using Counts 100, 113 and 125 Red Delicious fruit. The apples showed comparable amounts of bruising, though the author attributes this to shorter holding time of the apples, smaller fruit size and the use of more rigid cartons when compared to the late season trials. Larger fruit, (count sizes 72, 80, 100) shipped later in the season showed a 150% increase in the amount of bruised fruit on out-turn, and the degree of bruising was also more severe. Fountain (1962) concluded that the polyurethane cushioning material was not adequate in thickness and density to protect the apples from bruising.

Foam sheet of unspecified thickness or type was used in a trial by Crosby (1984) when subjecting Count 88 fruit to impacts and compression of unknown distance or force. It was noted that the bruise protecting characteristics of the foam sheets were not to the same standard as Friday Trays.

2.8.4 Polystyrene Foam Pads

A limited trial using 10 mm (3/8") polystyrene foam pads in Count 88 cartons instead of pulp trays was undertaken because of their ability to provide a good cushioning material for many other products since they did not become misshaped or absorb moisture (Fountain, 1962). Details of what treatments the cartons underwent were not given but it was reported that the polystyrene ruptured and cracked permitting direct contact between apples in adjacent layers. There was a great deal of bruising (50% more than with the polyurethane foam pads), much of which was severe.

Styrene sheet of unspecified thickness was used in a trial by Crosby (1984) when subjecting Count 88 fruit to impacts and compression of unknown distance or force. The styrene sheets were less effective than pulp trays under impact followed by compression and under compression alone. However after being subjected to compression and then impact the

styrene sheets afforded the greatest protection in terms of bruise volume with only one third of the bruise volume of the control Friday Trays. However problems with unusually high amounts of bruising in control samples rendered much of this data invalid on comparative terms.

2.8.5 Pressed Foam

Pressed 'Harry and David' foam was used in impact and compression trials on Count 88 fruit by Crosby (1984). The foam did not perform as well as pulp trays in protecting the fruit from bruising.

2.8.6 Foam Netting

Foam netting used as a substitute for Friday Trays under compression and impact in Count 88 cartons did not perform well with 10 times the bruise volume of the control after an impact followed by compression of the cartons (Crosby 1984).

2.8.7 Polybubble Sheets

In the NZAPMB Packaging Trials, Crosby et al (1983) investigated the use of polybubble sheet placed below each tray of apples in the carton. On out-turn approximately 50 cartons were inspected and mean values were given. The data showed that there was no real advantage in using polybubble sheets in conjunction with trays. From this however it was not possible to draw conclusions as to the merits of polybubble under impact conditions as the results from those cartons which experienced severe impacts were probably masked by the sample size.

Using polybubble sheets instead of capper trays (inverted tray on the top of the top layer of fruit) resulted in an increase in the amount of bruising on out-turn in Counts 80 and 88 fruit (Crosby et al, 1983).

Crosby (1984) showed that substituting polybubble sheets for pulp trays in Count 88 cartons gave in excess of 8 times as much bruising damage compared to Friday Trays when subjecting the carton to an impact of unspecified height.

2.8.8 Effect Heavy Duty vs Standard Cartons

Anderson (1983) conducted trials using standard cartons and heavy duty cartons (made of a thicker grade cardboard) with Count 88 and 113 fruit impacted from 750 mm. Both count sizes showed overall bruising was

reduced by 30% in the heavy duty cartons. The bruise profiles show that there was a marked decrease in the percentage of bruised fruit in the bottom layer, from 45% to 27% in Count 88 cartons to 25% to 15% in Count 113 cartons.

However there were a number of limitations with these trials. There was no analysis of size of bruising, position of bruises (top/bottom) or details of fruit temperature. Therefore the data was not highly specific as the extent of damage under the various treatments and actual amount of energy that was absorbed by the fruit could not be determined. Using only three cartons per experiment, the sample size was too small to be conclusive. The results, however, were indicative of the likely performance under the various conditions.

2.8.9 Impacts onto Polybubble Mats

Part of the trials by Anderson (1983) investigated the performance of trays when cartons were impacted onto a sheet of polybubble mat.

The author claimed that there was no real advantage in bruise reduction through impacts onto polybubble mat. The data showed variable results for the polystyrene trays but in all cases using Friday Trays apart from the heavy duty Count 113, overall bruising in each carton was reduced. The bruise profiles for each layer showed reductions in bruising in all trays for Count 88 fruit, and for Count 113 in the standard carton in all layers except the fourth, and with the heavy duty cartons in all layers except the first.

2.9 SHIPPING METHODS AND STACKING PATTERNS

2.9.1 Shipping Method

To date the majority of New Zealand export apples have been shipped in break bulk stowage where the cartons are de-palletised on the wharf and loaded as single units, which must then be re-palletised on arrival. However, in the NZAPMB 1987 Packaging trials, Crosby noted that marginally less bruising was observed on out-turn with palletised fruit when compared to break bulk stowage.

2.9.2 Stacking Patterns

Effects of stowage patterns on bruising were observed in both the 1982 and 1983 NZAPMB trials. In 1982 Aitken and Crosby stated that the results conclusively demonstrated that cartons stowed in the bottom of the

hold incurred greater damage than in the middle or top. They suggested that this could be because of the greater distance the carton could be dropped during loading. The following year deep stow trials were carried out where cartons were stacked 12 deep as compared to the usual 7 deep stacking pattern. The percentage of bruising ranged from 16.2% in the top carton to 20.5% in the 6th carton, 25.7% in the 7th carton and 29% in the 12th (bottom) carton (Crosby et al., 1983). As there was no additional data to enable a comparison to be made between this trial and the standard 7 high stacking patterns it was not possible to draw a conclusion as to whether it was the static load or dynamic load (as suggested by Aitken and Crosby) that was causing the damage.

2.10 SUMMARY AND CONCLUSIONS

2.10.1 Bruising

The theory on the exact mechanism behind bruising varied (Chen (1972), Peleg (1976), Holt and Schoorl (1977) Segerlind and Dal Fabbro (1978), Diehl (1979)), but the basic principle underlying the bruising phenomenon was that it occurred due to failure of the apple tissue when subjected to adverse conditions of impact or compression.

Holt and Schoorl (1977) have shown a good correlation between energy absorbed and bruise volume under high energy impact situations.

The general consensus was that for the same energy input, bruises would be larger under slow compression than under impact conditions (Mohsenin (1970), Fridley et al (1964), Holt and Schoorl (1977)).

Fountain (1962) was of the opinion that bruising during transit was due to static loading on the cartons. This assumption was questioned by Aitken and Crosby (1982) who observed that pressure alone on the cartons was not a major contributor to fruit damage.

2.10.2 Carton Configurations in Relation to Bruising

Studies of apples packed in cartons in 1,2, and 3D configurations with no trays between showed that while the actual number of bruises depended on the support structure beneath the fruit, the total volume of the bruises was the same for all configurations (Holt and Schoorl (1982)).

Evidence from the NZAPMB (1992) suggested that apples packed in the 4 layer, 2x2 configuration were subjected to more damage during transit. Fountain (1962) has shown that by packing Count 88 size fruit in four layer packs of the 2x2 configuration, more bruising was experienced on out turn than with a five layer 3x2 configuration. Small scale trials by Bloxham (1982) and Anderson (1983) supported these findings; five layer 3x2 configuration packs displayed less bruising than four layer 2x2 packs.

Peleg (1985) noted that the greater the number of contact points supporting each fruit in a pack, the less the pressure at each contact point, since the forces of fruit weight from above are distributed over a larger area of the fruit.

2.10.3 Bruise Patterns and Damage Trends

Although there were differences between research studies as to exactly which layer incurred the greatest amount of bruising under impact, all experimental studies reviewed indicated that bruising decreased from the second layer up to the top layer. Schoorl and Holt (1974) found that the amount of bruising on impact was more severe in the bottom than the top layers. Schoorl and Williams (1972) showed that impacts from drop heights of over 300 mm produced the most bruising in the bottom layer, while at drop heights between 150 mm and 300 mm, the greatest amount of bruising occurred in the second to bottom layer. Aitken and Crosby(1982), and Crosby et al (1983) found that most bruising occurred in the second to bottom tray irrespective of count size or variety on out-turn inspections in Europe. Bloxham (1982) agreed with this trend in both Count 88 and Count 100 cartons when dropped onto the laboratory floor. Anderson (1983) noted that heavy duty cartons followed this trend with Count 88 fruit under a 750 mm impact, but that standard cartons displayed more bruising in the bottom layer.

From these findings it could be concluded that the most bruising occurred in the bottom layer for high energy impacts and that lower level impacts produced the most bruising in the second to bottom layer. However this was contradicted by Anderson (1983) with high impacts using standard cartons.

Schoorl and Williams (1972) found that there was a critical drop height of 50 mm below which damage within cartons of fruit was substantially random. They noted that the percentage of bruised fruit increased with

drop height, and although the bruise diameters were fairly constant, the depth of the bruises increased. Siyami et al (1988) however noted that bruise diameters increased with drop height.

Holt, Schoorl and Lucas (1981) postulated that when apples impacted each other, the collision only affected the apple immediately below the impact surface in terms of bruising, and that apples in layers beneath this received no further bruising.

2.10.4 Underfill and Overfill

None of the literature gave a definition of exactly what was meant by overfill or underfill in terms of approximate measurements that the fruit sat above or below the top of the carton. There was also no indication as to whether or not the anticipated levels of overfill at the time of packing were related to the configuration of the pack. Adolph (1993) stated that the NZAPMB apple cartons were designed as pressure packs where there was a certain degree of pressure on the fruit to hold it firmly in the pockets of the tray.

The general opinion on the issue of underfill and overfill in cartons varied. Fountain (1962) claimed that in shipping trials cartons with more overfill gave less bruising on out-turn. Crosby et al (1983) noted that overfilled cartons did not always display more bruising than level or underfilled cartons on out-turn. Similar findings were reported by Lenting (1989a). Kroger (1983) was of the opinion that underfill reduced the pressure on the fruit, which allowed them to move more freely, and resulted in increased bruising. Bloxham (1982), however believed that overfill resulted in increased bruising. Blomfield (1987) noted that South African fruit with significant overfill resulted in badly bruised product.

2.10.5 Moisture Content

There is clear evidence that the tensile strength of paper products decreases with increased moisture content (eg Britt (1970)). This was supported by observations of McLeod (1993), who noted that cardboard and pulp trays maintained their strength when dry, and Lenting (1989a), who noted that trays with a high moisture content of 14-20% were significantly weaker than trays at 8-12%.

2.10.6 Pulp Trays and Other Materials

Schoorl and Williams (1972) showed that tray packed cartons protected fruit from bruising under single and multiple impacts to a greater extent than cartons which were pattern packed in the traditional manner. Work by Holt and Schoorl (1984) suggested that under impact, pulp trays accounted for 60% of the energy absorption through stretching in two horizontal directions.

NZFP (1984) showed that using double trays between the fruit reduced the severity of bruising on impact by 50%, although the count size was not specified. Crosby (1984) agreed with this finding for Count 88 fruit, but noted that for Count 100 fruit bruising was reduced by only 20% with double trays.

Polystyrene trays were noted to breakdown during coolstorage and to split under impact and compression (NZFP 1984). Anderson (1983) showed that polystyrene trays performed favourably in Count 88 cartons, but increased overall bruising in Count 113 cartons. However in both cases the extent of bruising in the bottom tray was reduced.

Both Fountain (1962) and Crosby (1984) found that the bruise protection characteristics of polyurethane foam sheets and polystyrene foam pads were not as good as pulp trays. Crosby (1984) also noted that pressed foam, foam netting and polybubble sheets did not perform well as a pulp tray substitute.

Heavy duty cartons showed a reduction in bruising by 30% when compared to standard cartons, with a marked decrease in the level of bruising in the bottom layer of the cartons (Anderson 1983).

From these findings it can be concluded that the Friday Tray has the overall best performance in terms of bruise protection in the carton as a whole, and that heavy duty cartons showed a reduction in bruising at impact. The location of the greatest number of bruises appears to always be in either the bottom or the second to bottom layer, and the distribution appeared to be altered by the level of energy absorbed by the fruit.

Chapter 3

OBJECTIVES

To investigate why Count 88 apples are subject to excessive damage by bruising during transit through:

1. Reference to the literature.
2. Detailed observation of the spatial relationships of apples in Count 88 and Count 100 cartons.
3. Experimental work directed at measuring and comparing energy absorption in cartons of Count 88 and Count 100 apples under dynamic loading by examination of the extent and distribution of bruising.
4. Study of the physical properties of Friday Tray material with reference to the changes that occur with variations in moisture content.
5. Analysis of the performance of Friday Trays when used in Count 88 and Count 100 cartons with reference to the different packing configurations.

Chapter 4

ANALYSIS OF CARTON CONFIGURATIONS

4.1 INTRODUCTION

In order to pack an appropriate number of apples in each carton, the way in which fruit is arranged varies between count sizes. All count sizes have their configuration classified according to the end view of the carton, where the rows of fruit on the trays are offset either 2x2, 3x2 or 3x3 as detailed in Chapter 2.2.1. Each tray has its own unique arrangement and to achieve the correct number of fruit, the trays may all be made from the same die with alternate trays reversed, or as a and b style trays where the configuration and/or the number of fruit is different on each tray.

The arrangement used to pack the maximum number of spheres into the smallest space possible is hexagonal closest packing, where each sphere is supported on 3 contact points from below as shown in Figure 4.1. The arrangement of spheres within a cube to create the highest packing density is that of the face centred cube (fcc) in Figure 4.2. Each of these packing arrangements look the same regardless of the plane from which they are viewed

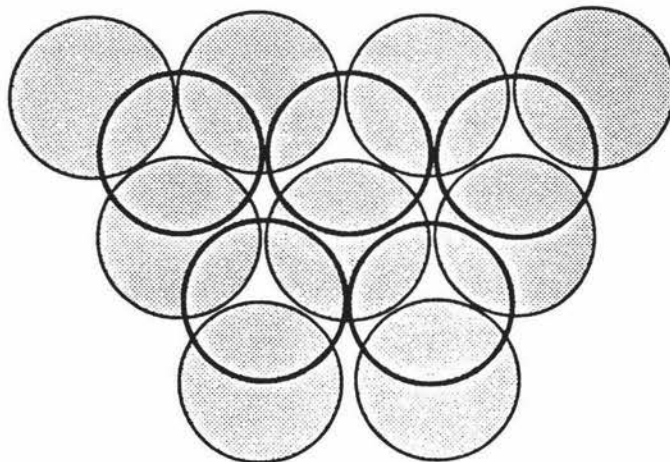


Figure 4.1 Hexagonal Closest Packing of Spheres

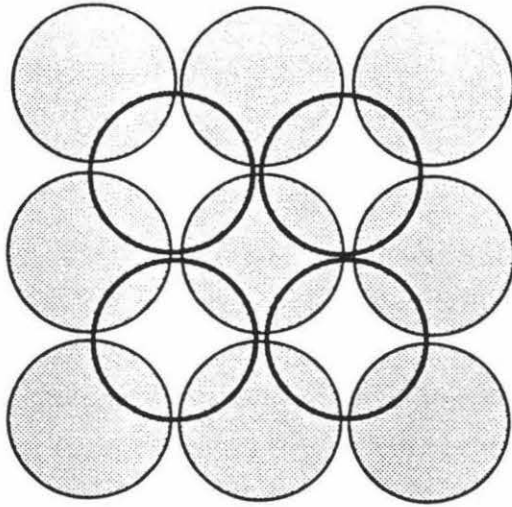


Figure 4.2 Face Centred Cube (fcc) Packing of Spheres

Due to the design requirements of a carton, the actual arrangement of fruit does not conform to strictly to these configurations as cartons are a standard size, and each has to accommodate a set number of fruit according to the count.

Count 88 and Count 100 cartons of fruit are quite different in their packing arrangements. Count 88 fruit is packed in four rows on each tray whereas the Count 100 arrangement uses five rows and gives an approximation to a face centre cube configuration.

Count 88 fruit in the 2x2 four row configuration gives 2 contact points on all fruit except those on the corners of the tray, and 3x2 five row packing configuration gives 4 contact points on fruit in the centre of the tray, three contact points on the edges and two on the corner fruit. This is demonstrated by the use of spheres in Figure 4.3 and 4.4

The length of rays running centre to centre between the fruit is shown in Figures 4.5 and 4.6. The four contact point support system of the 3x2 pack has rays a and b of equal length whereas the two contact point 2x2 pack has rays of different lengths.

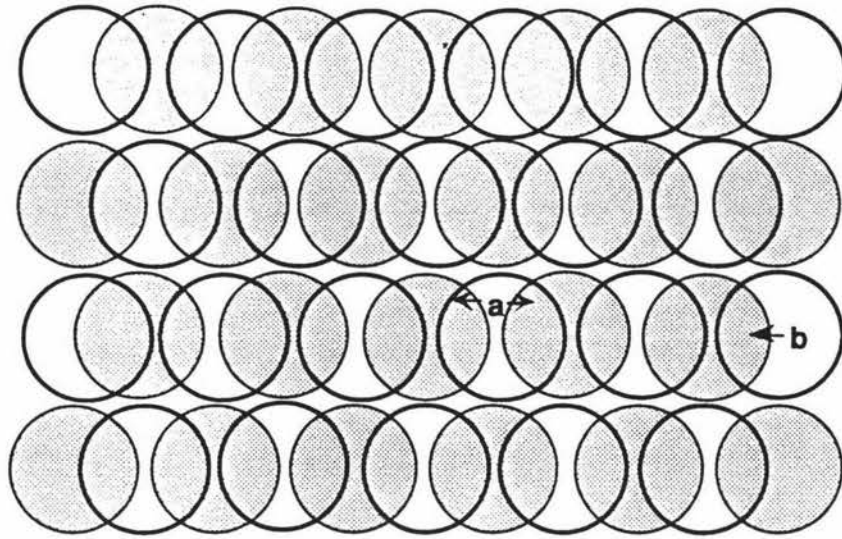


Figure 4.3 Arrangement of Spheres in the Configuration of Count 88 Fruit. Shaded spheres represent fruit in lower layer. Contact points are represented by arrows on positions a and b.

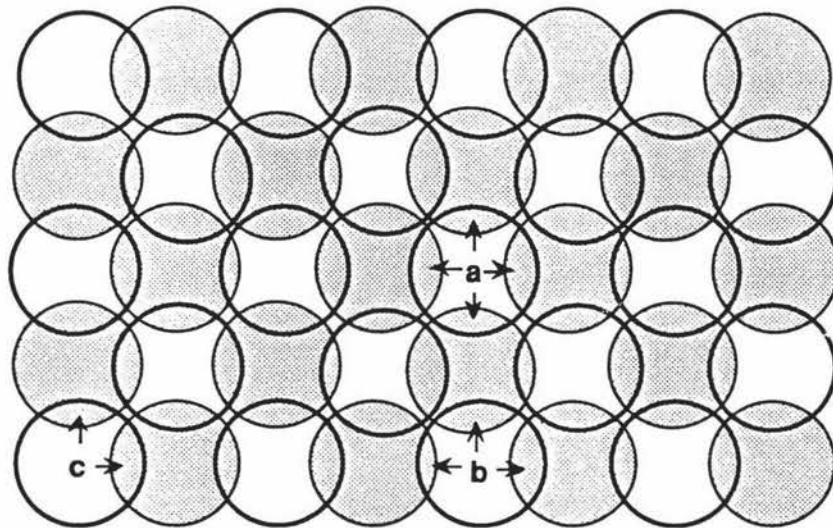


Figure 4.4 Arrangement of Spheres in the Configuration of Count 100 Fruit. Shaded spheres represent fruit in lower layer. Contact points are represented by arrows on positions a, b and c.

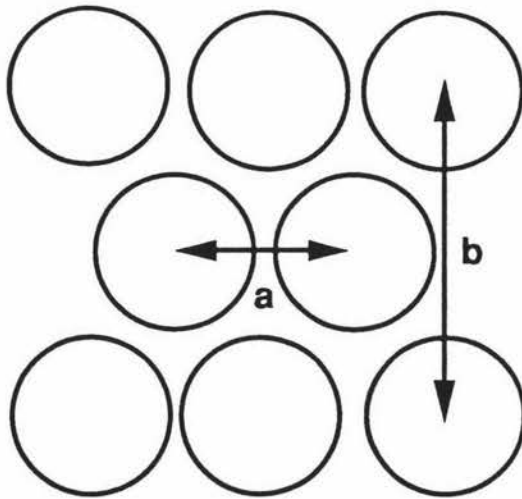


Figure 4.5 Dimensions of Actual Fruit Placement
2x2 Arrangement $A < B$

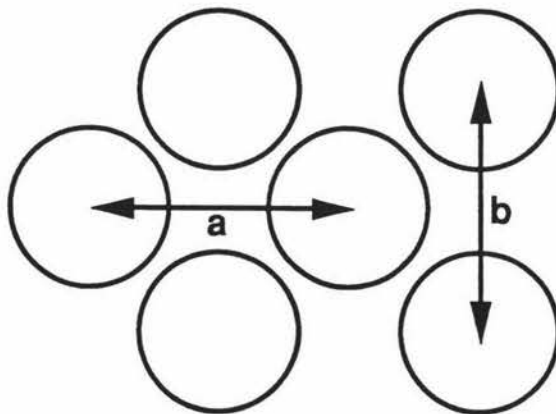


Figure 4.6 Dimensions of Actual Fruit Placement
3x2 Arrangement $A = B$

Count 88 and Count 100 fruit both have reversible trays. Count 88 cartons consist of 4 trays of 22 fruit offset in the 2x2 configuration, while Count 100 cartons have 5 trays of 20 fruit offset in the 3x2 configuration. Each of these configurations use reversible trays.

Comparisons were made with the Count 88 and Count 100 cartons to assess the carton configuration and spatial arrangement of fruit on trays and within the carton as a whole. Each count size was investigated through means of visual

observation followed by Computed Tomography allowing internal vertical sections to be viewed.

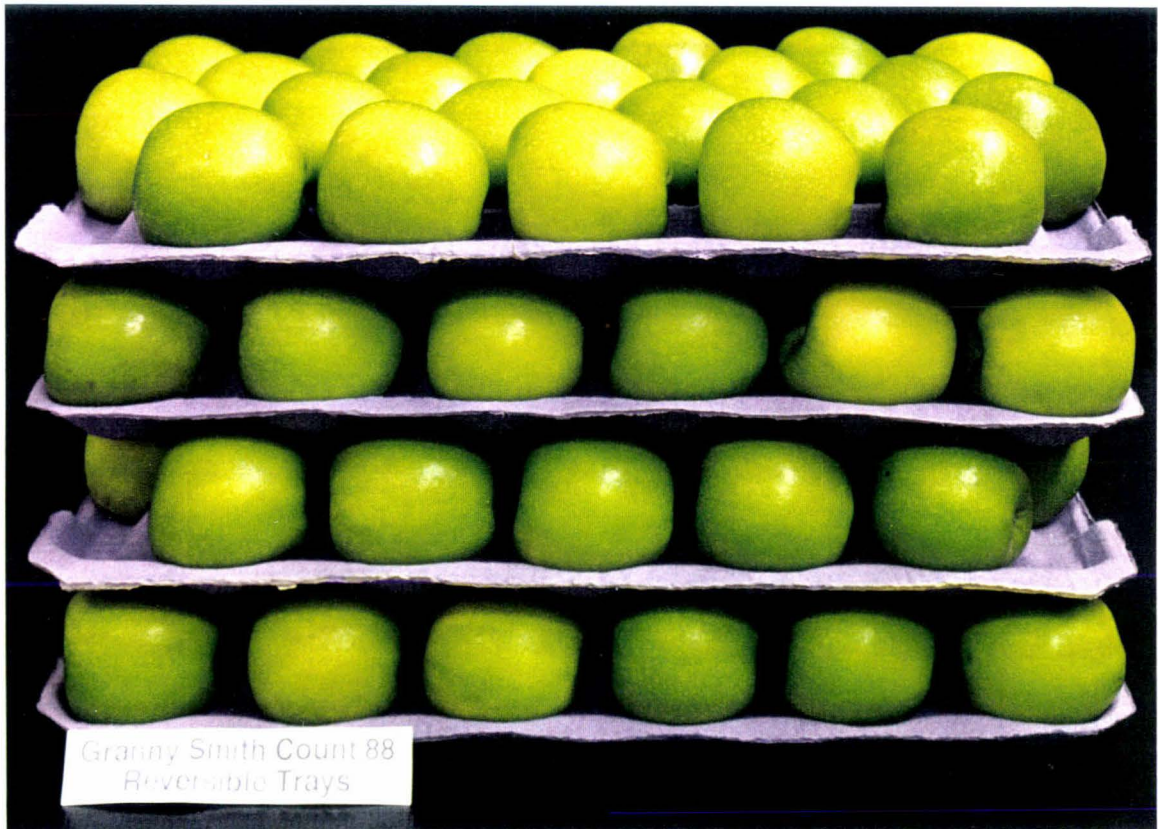
All the photographs in this section are of Granny Smith fruit and the CT Scans are either Granny Smith or Braeburn in Count 88 Cartons as detailed, with the Count 100 scans being of Gala apples.

4.2 VISUAL ANALYSIS OF CARTONS

The configuration of apples in cartons was simulated by removing the carton from around a box of fruit (Figure 4.7), and the arrangement of fruit on each tray was recorded (Figure 4.8). The apples had been re-graded to ensure that all fruit was within the correct weight band, and fruit was aligned according to the NZAPMB specifications.

From the photographs several points can be made immediately. Since Count 88 fruit have 22 apples on a tray, and are also larger than the Count 100 apples, they are much more closely packed on the trays than the smaller Count 100 fruit with only 20 apples per tray (Figure 4.8). From the side view it can be seen that the fruit appear to 'nest' more in the Count 100 configuration with the trays creating a 'hammock' effect suspending the fruit above when compared to the Count 88 fruit which appear to abut one another (Figure 4.7).

The method of support under each apple varied with the configuration. In the Count 100 cartons each apple is suspended on the tray with the weight supported from below by 3 fruit on the edge of the carton or 4 fruit in the middle of the carton. The fruit is supported at both the stem and calyx ends as well as touching on both sides of the underside around the equatorial region of the fruit as illustrated in Figure 4.10. Count 88 fruit predominantly transfers it's weight or downward thrust through two contact points at the stem and calyx ends of the fruit. Apples on the ends of the rows only have one contact point (Figure 4.9).



Photograph 1 Count 88 Carton



Photograph 2 Count 100 Carton

Figure 4.7 Side Views of Cartons of Fruit



Photograph 1 Tray of Count 88 Apples



Photograph 2 Tray of Count 100 Apples

Figure 4.8 Plan View of Trays of Fruit

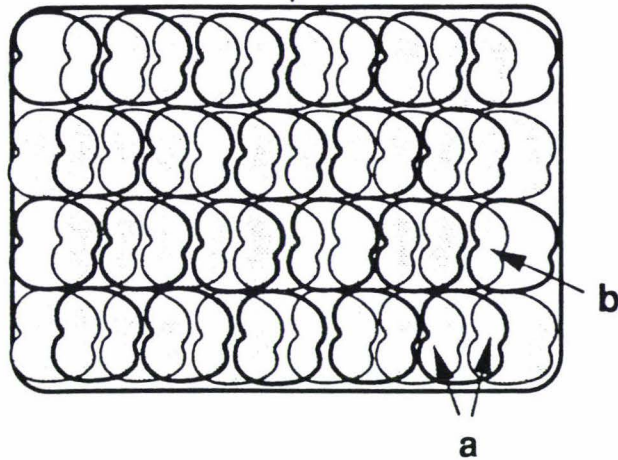


Figure 4.9 Support System for Count 88 Fruit, with 2 contact points at a and only 1 contact point at b

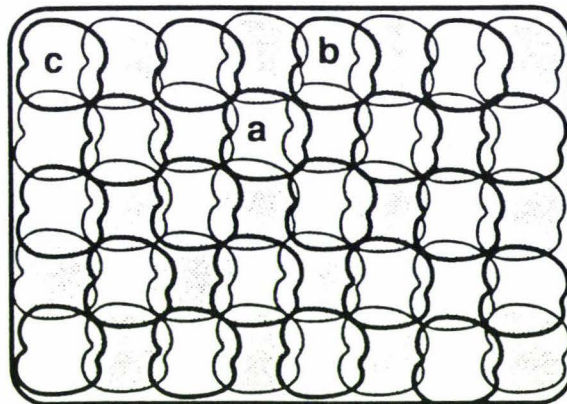


Figure 4.10 Support System for Count 100 Fruit, with 4 contact points at a, 3 contact point at b, and 2 contact points at c.

4.3 ANALYSIS OF CARTONS BY COMPUTED TOMOGRAPHY

Sections in various planes of cartons of Count 88 and Count 100 fruit were obtained using a Siemens Ltd Somatom CT Scanner at Auckland Hospital and a Toshiba CT Scanner at Mercy Radiology Auckland, to determine the exact configuration and spatial arrangement between apples within a carton. The fruit was packhouse graded but re-aligned by hand prior to taking the scanned

images in all cases except Figure 4.17 Scan 2. The images are not to a common scale.

4.3.1 Computed Tomography Background Details

Computed Tomography (CT) enables cross sectional images of an object to be obtained. X-rays are projected through an object, with their ability to penetrate living tissue varying with the atomic structure of the matter. CT scans are different from traditional x-ray pictures as the source of x-rays and the detector rotate slowly around the object in a circle effectively producing a 3D volume image. The method depends on a knowledge of the attenuation of the x-ray beam as it traverses the object. During rotation multiple samples are taken and these are then integrated using a complex algorithm to produce a slice image that is divided up into 1024x1024 squares and varies from 1 to 10 mm in thickness.

The linearity of the image is checked regularly. This ensures that the shades of grey in the electronic image accurately reflect the point density of the object being scanned. Until recently the accuracy of hard copy was compromised by the fact that it had to be produced by photographing the output phosphor of a television tube, but this is no longer a problem as the images are now produced using a digital scanning technique (Curry et al, 1990)

Having been developed for medical imaging the technique is also applicable to any object where the attenuation lies within a comparable range to that of human tissue. It was therefore decided that this technique could be used successfully for scanning apples within a carton and thus producing an accurate spatial representation of the configuration without disturbing the fruit.

4.3.2 Computed Tomography Scans

Each carton of fruit was placed in the CT Scanner as shown in Figure 4.11. The initial image called a Scannogram is a simple shadow picture cast by the x-ray source. The carton is viewed from above, upon which were superimposed lines for the vertical planes to be scanned. At this point the exact position of the lines could be adjusted to ensure that the precise cross section required was recorded. Images were taken along the predetermined lines at 5 mm intervals across the centre of the rows of fruit with the most central image being reproduced in the following pictures.

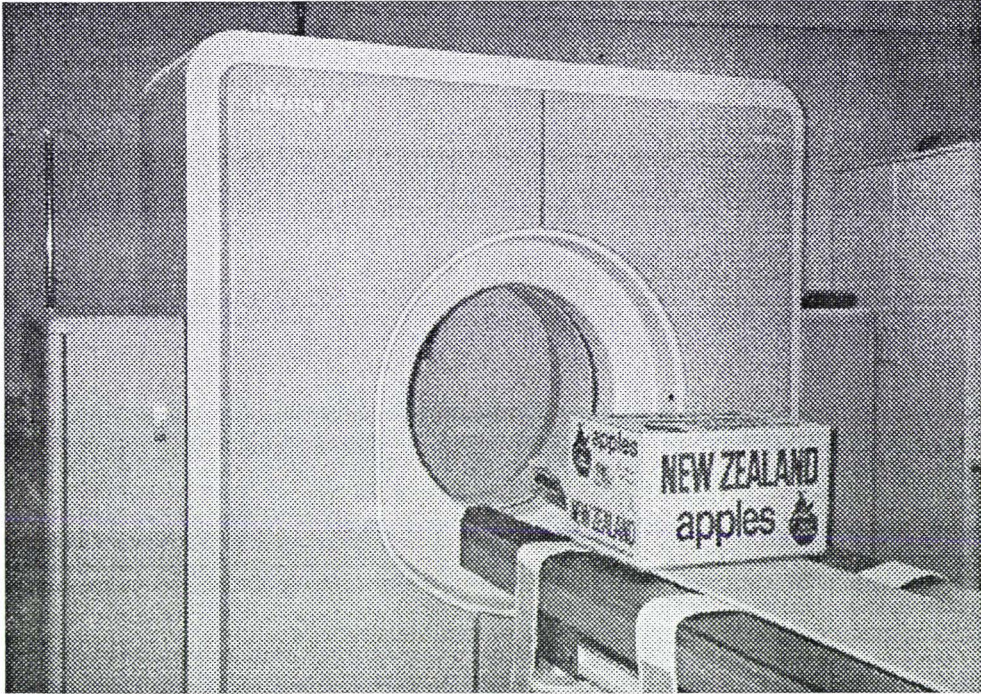


Figure 4.11 Siemens Somatom CT Scanner with Carton of Fruit in Place

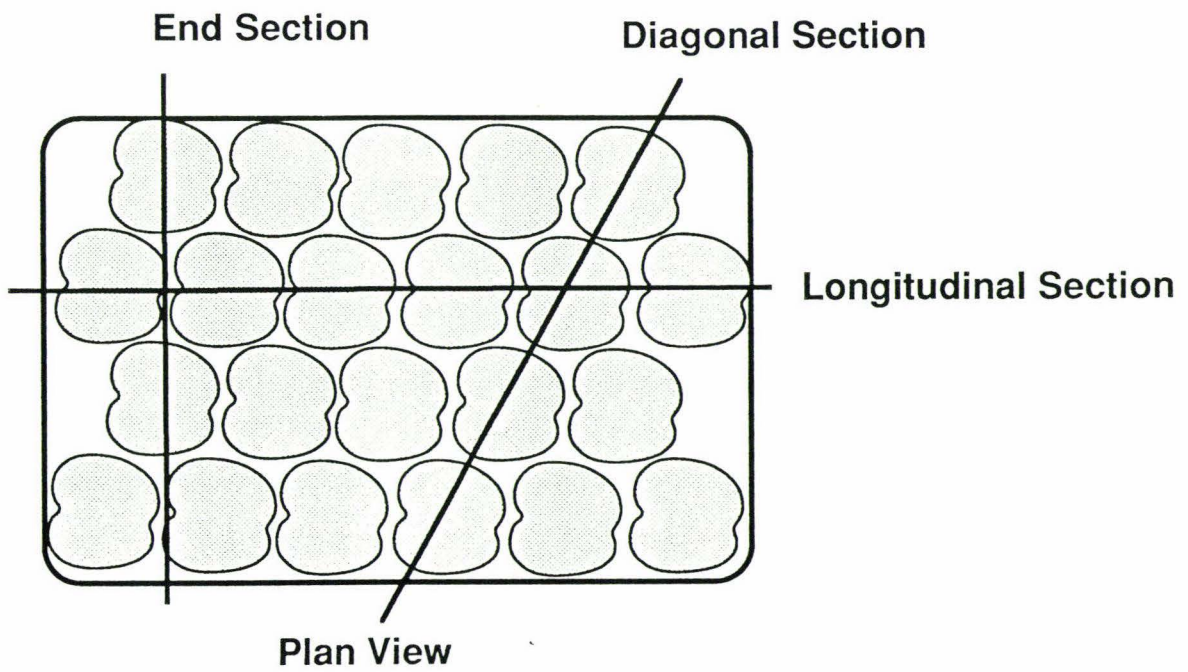


Figure 4.12 Plan View of Scanned Sections of Count 88 Cartons

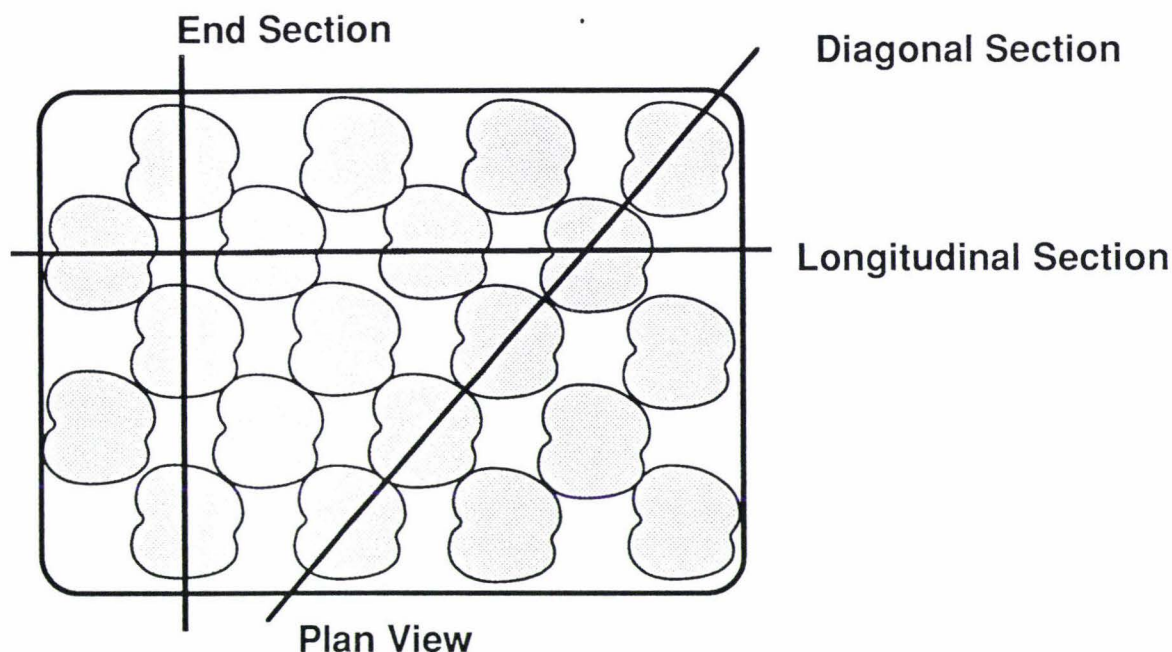
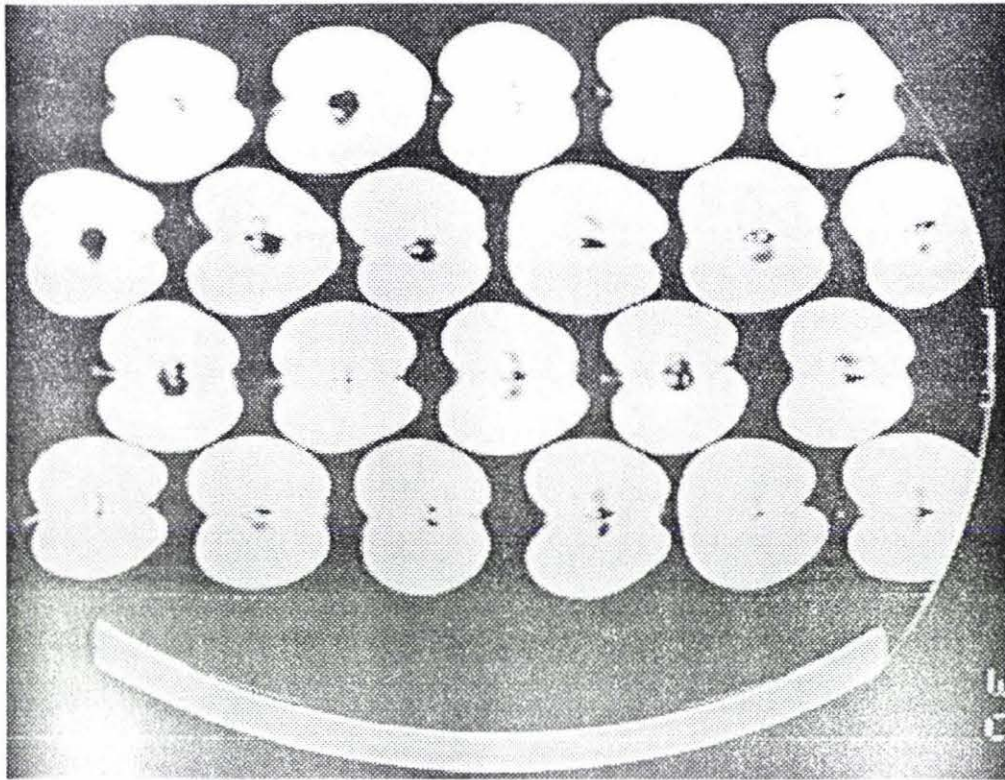


Figure 4.13 Plan View of Scanned Sections of Count 100 Cartons

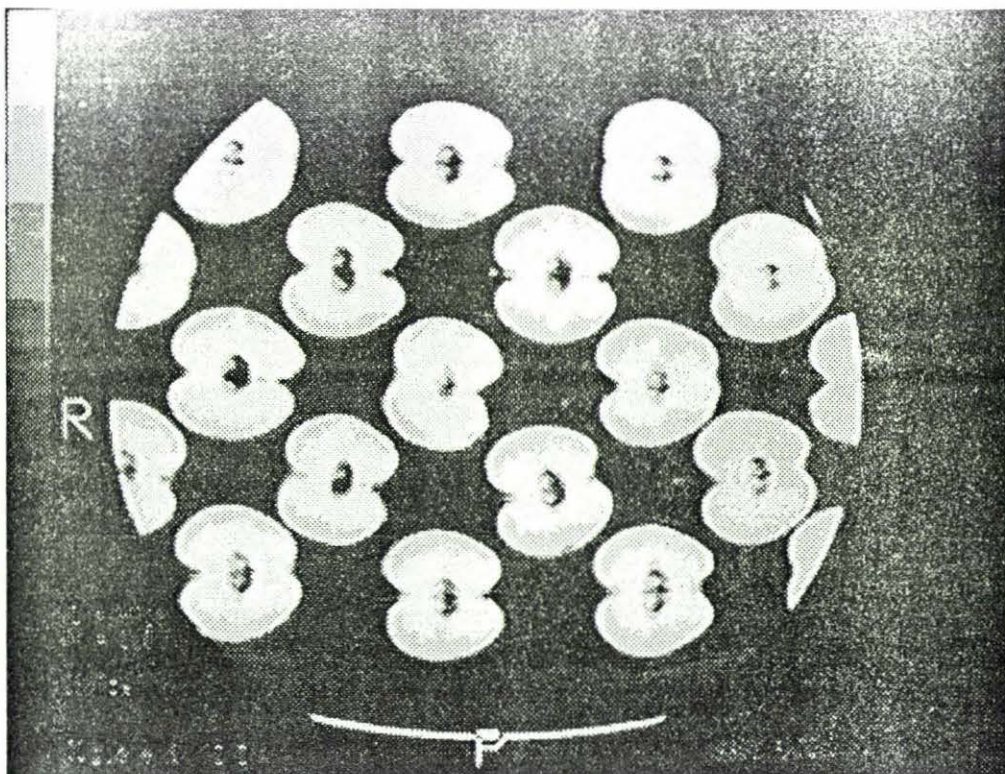
Figures 4.12 and 4.13 show plan views of the cartons indicating the planes along which CT Scans were taken.

Figure 4.14 Scan 1 clearly showed the relationship between the fruit and tray where fruit abuts on two points in Count 88 cartons. Figure 4.14 Scan 2 showed the large spaces between each apple and demonstrated the way in which Count 100 trays supported the fruit with the trays acting as a hammock for the fruit above. Figure 4.15 Scan 1 and 2 gave a good indication of the 2x2 configuration of Count 88 fruit and the 3x2 configuration of Count 100 fruit. They also showed that with either count size there were no apple to apple contacts in this plane, through the equatorial region of the fruit. Figure 4.16 Scans 1 and 2 showed the relationship between the fruit along a diagonal line across all 4 rows in the Count 88 carton and 5 rows in the Count 100 carton. Both count sizes showed that the apples could touch at the mid point on the sides of each fruit through the equatorial region.

The effect of compression can be seen by comparing Figure 4.17 CT Scan 1 and Scan 2. Scan 1 showed a newly packed carton whereas Scan 2 showed a carton which had been under compression for some time in a coolstore. The fruit were irregularly orientated and trays have absorbed moisture and moulded round the fruit.

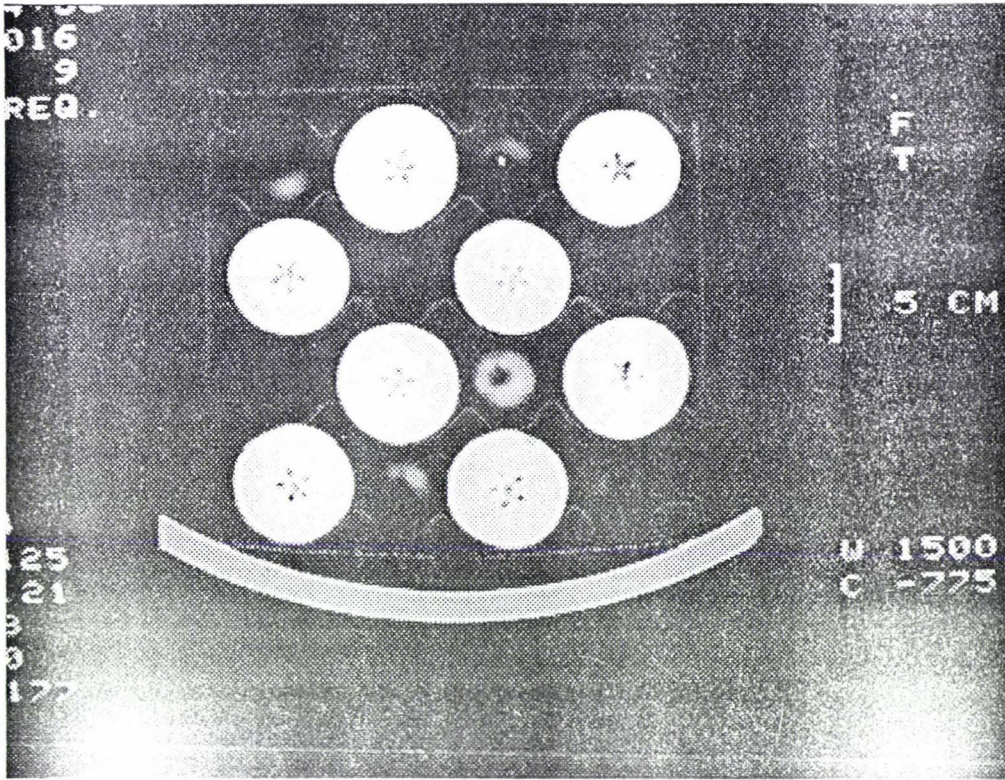


Scan 1 Longitudinal Section of Count 88 Granny Smith Apples

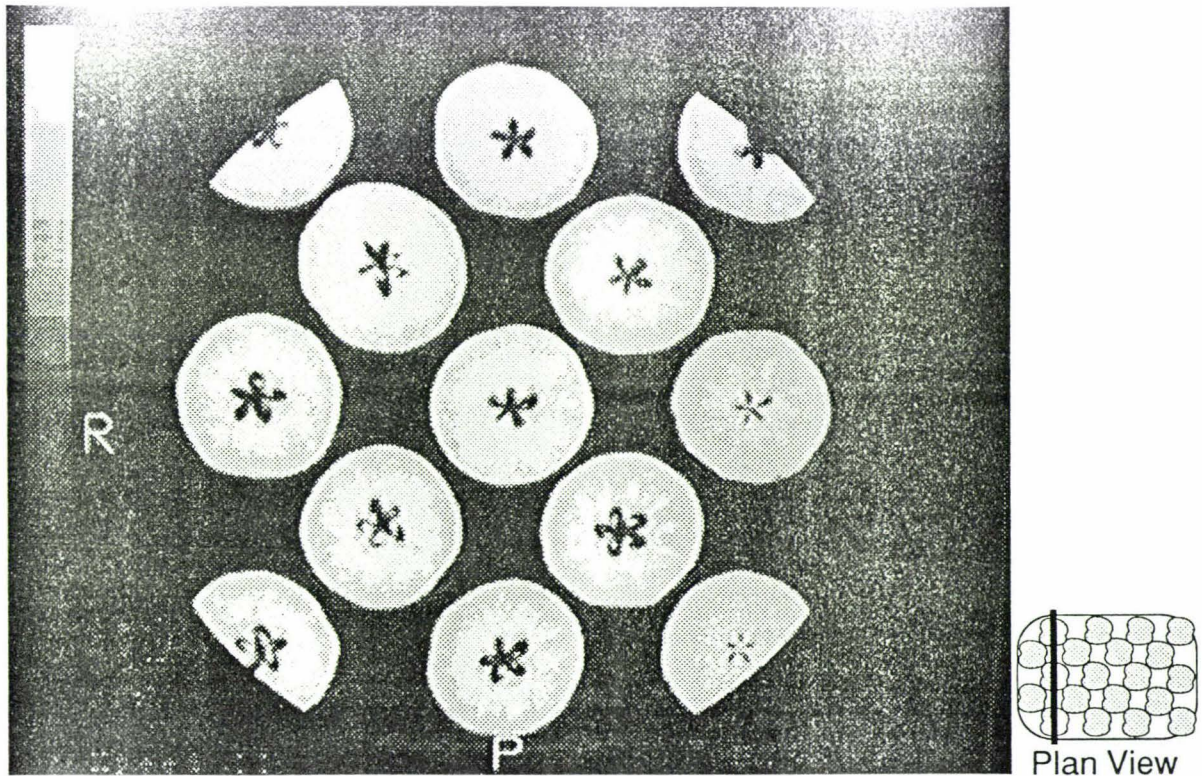


Scan 2 Longitudinal Section of Count 100 Gala Apples

Figure 4.14 CT Scans of Longitudinal Sections through the Cartons
 Note Scans not to common scale

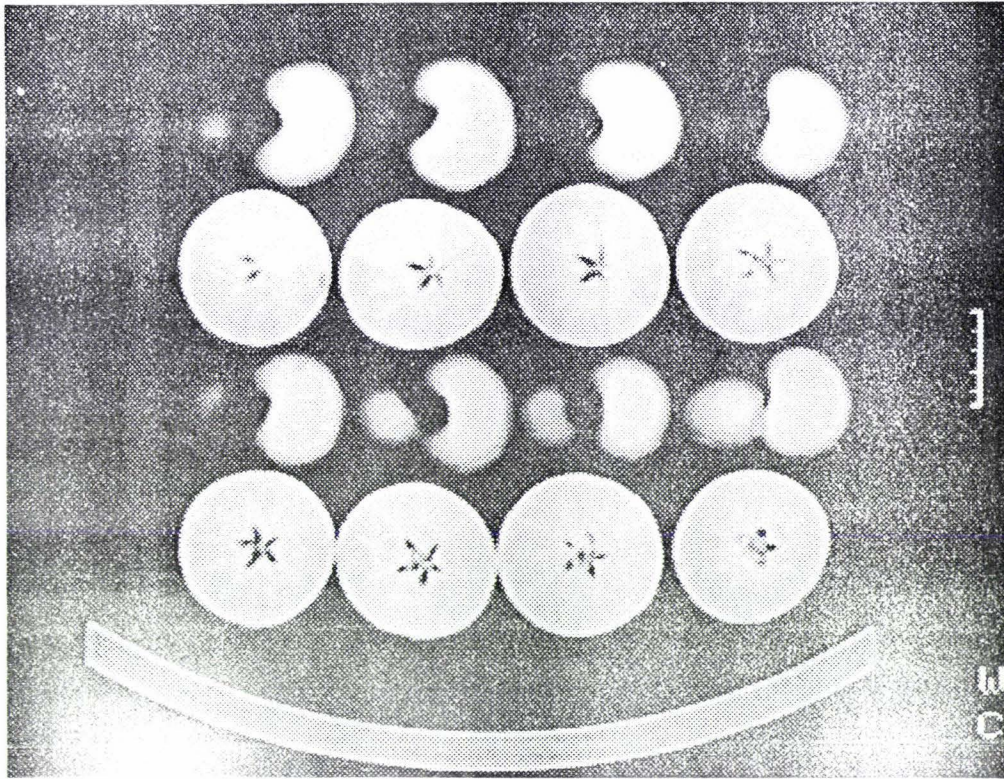


Scan 1 End Section of Count 88 Granny Smith Apples

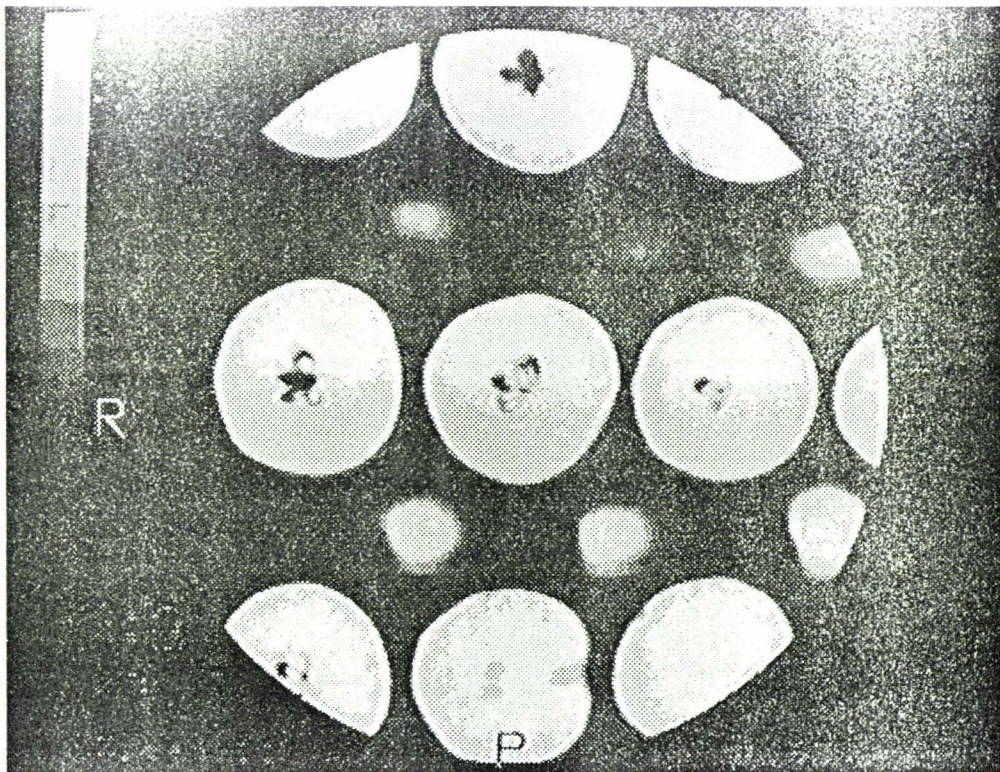


Scan 2 End Section of Count 100 Gala Apples

Figure 4.15 CT Scans of End Sections through the Cartons
 Note Scans not to common scale

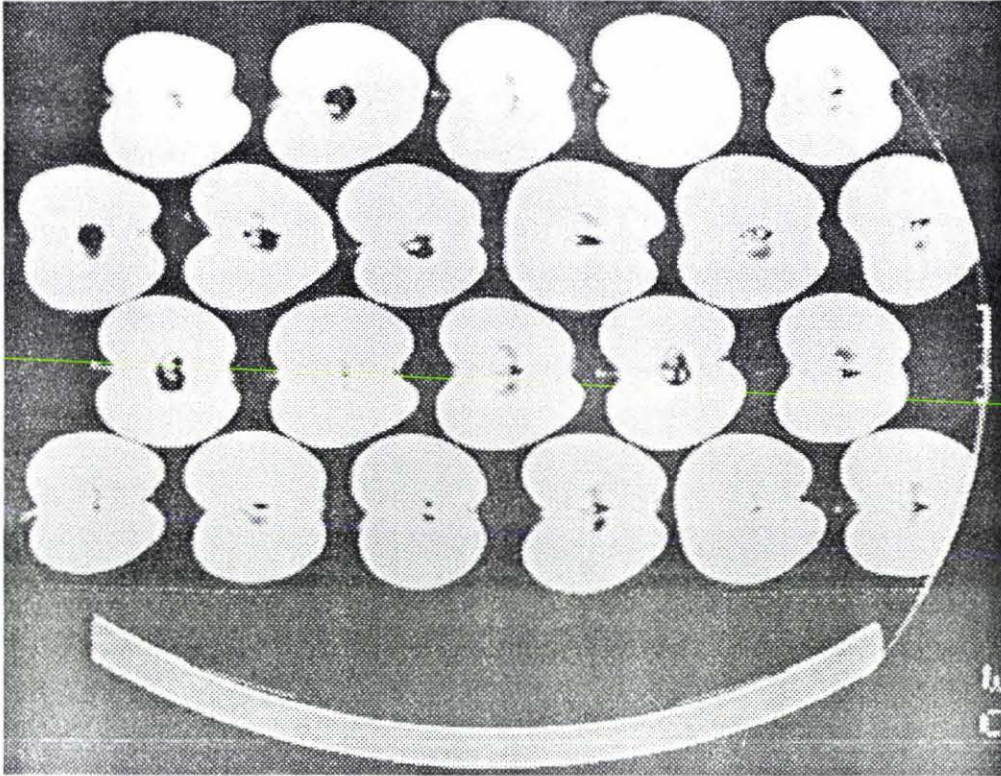


Scan 1 Diagonal Section of Count 88 Granny Smith Apples

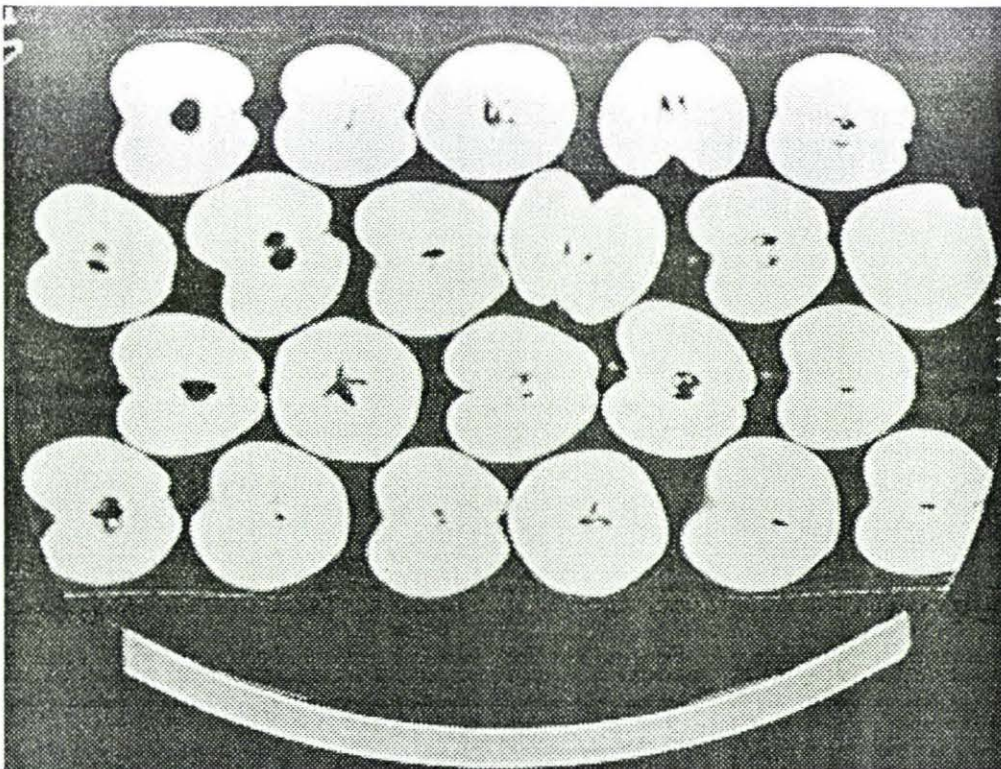


Scan 2 Diagonal Section of Count 100 Gala Apples

Figure 4.16 CT Scans of Diagonal Sections through the Cartons
 Note: Scans not to common scale



Scan 1 Longitudinal Section of Newly Packed Count 88 Braeburn Apples



Scan 2 Longitudinal Section of Previously Packed Count 88 Braeburn Apples, showing irregularly orientated fruit, and the effect of compression and moisture, causing trays to mould around the fruit.

Figure 4.17 CT Scans of Longitudinal Sections through Cartons

4.4 DISCUSSION

Visual observations showed that the rows of Count 88 fruit were arranged much closer together than the Count 100 fruit with one additional apple on each row. The fruit were overall larger and slightly longer making this a tighter pack.

Viewing the carton side-on showed that the fruit appeared to sit high on top of the two beneath in the Count 88 carton, whereas the Count 100 fruit tended to sit lower in the carton and nest together in the gap created between the two fruit on the tray below.

In the diagonal plane across each tray, both Count 88 and Count 100 fruit were in very close proximity. Some fruit touched the adjacent fruit in this plane.

Confirmation of the visual observations through Computed Tomography showed that the Count 88 fruit abutted one another in longitudinal vertical section whereas the Count 100 fruit nested together, with the tray assuming a hammock effect to support the fruit. Despite the extra tray in this configuration, the fruit sat lower and so the overall height of the carton was the same as the Count 88 carton.

It is not possible to specify why the fruit was irregularly oriented in Figure 4.17 Scan 2. The most likely cause is from poor placement at the time of packing, however possibilities of fruit movement through settling and transportation should not be ruled out.

Chapter 5

TENSILE STRENGTH TESTS

5.1 INTRODUCTION

The recycled paper pulp Friday Trays used by the industry have a dual function: they control the placement of fruit within a carton and also act as separators between each layer. Since the early 1980's many packing sheds have had automatic tray fillers on their grading machines. The trays of fruit are automatically filled before being manually lifted into the cartons by the packers who hold the trays at either end where there are slots or holes cut in the trays. As discussed in Chapter 2.7.3 standard cartons used in the 1993 season held 18.5 ± 1 kg, so therefore each tray needed to support a mean weight of 3.7 ± 0.2 kg in 5 layer packs and 4.6 ± 0.25 kg in 4 layer packs while being placed in the cartons. From observation during packing shed studies and quality control checks immediately prior to shipment, it was noted that occasionally trays tore at these handholds when being loaded into the cartons.

During transit a small proportion of fruit was inspected for phytosanitary requirements by MAF personnel as well as routine inspections by NZAPMB Field Staff. It had been observed that the trays tended to tear frequently when being unloaded for inspection purposes after the fruit had been in coolstorage and the trays had a high moisture content.

Splits between the pockets on the trays have been reported to occur (Crosby et al, 1983). McLeod (1993) suggested that the trays were prone to splitting when the cartons were subjected to an impact. These observations indicate that trays are likely to be subject to various stresses during transit, and that trays are handled at different moisture contents.

A series of tensile strength tests were therefore undertaken to assess the strength of the tray at two moisture contents in relation to splits between the pockets and the positions where these splits occur. Trays from the Nelson Printpac UEB plant were chosen because the raw product used in these trays was more homogeneous than that used at the Auckland plant, and the alternative manufacturer was not producing trays of this count size at the time.

To determine the correct preparation of the samples for tensile testing, conditions which occurred within the industry were considered. Cartons of fruit could be dropped at packing when the trays were dry and when newly packed cartons

were being palletised prior to entering the coolstore. At other times during transit such as loading and unloading vessels, cartons out of coolstorage could also be subjected to impacts. During coolstorage the trays absorb moisture (Amos 1993) and preliminary trials showed that within 24 hours the moisture content (MC) rose from around 8% to around 15%. Tensile tests were therefore undertaken at 8% MC and 15% MC to simulate these conditions.

5.2 EXPERIMENTAL DETAILS AND PROCEDURE

5.2.1 Experimental Design

The tensile strength of twelve Nelson Count 88 Friday Trays was assessed to determine the strength of the paper pulp mix used at the Nelson Printpac UEB Plant. One bundle of 125 trays manufactured during a production run were obtained and 12 trays were selected at random. Six of these were tested directly, and 6 were conditioned in a coolstore. Samples were taken at the 18 possible sites where splitting on impact may occur as shown in Figure 5.1. The remaining trays from this batch were retained for use in the drop testing experiments.

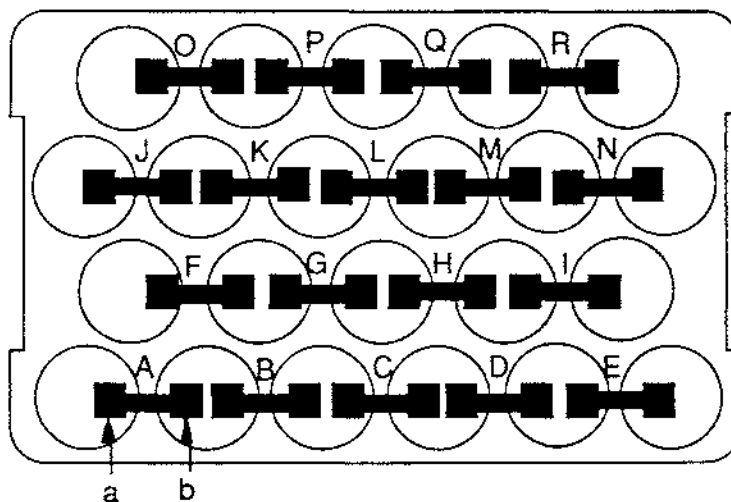


Figure 5.1 Position of Samples on a Count 88 Friday Tray

5.2.2 Conditioning of Samples

The Australian Standard AS 1301 P414m 86 on Conditioning of Paper states that prior to testing, paper should be conditioned for 24 hours at 20-35% Relative Humidity not above 40°C. After consideration of this, it was decided that in order to simulate conditions experienced within the industry under which Friday Trays were stored and used, it would appear more appropriate to test trays held in an ambient atmosphere, together with those in a coolstored condition prior to testing. Samples from 6 trays were therefore tested direct from the supplier at 8 % moisture content, and samples from 6 trays were conditioned for 5 days in a coolstore at 1°C and 85% Relative Humidity so that they attained a 15% moisture content prior to testing .

5.2.3 Moisture Content Analysis

The moisture content of the samples was assessed by the method described in the Australian Standard AS 1301 P401s-78 Testing Moisture Content by Oven Drying. The samples were weighed then dried in an oven for 2 hour periods at 105°C, cooled and then re-weighed until an equilibrium moisture content was attained.

Moisture content was calculated by the formula:

$$\% \text{ Moisture Content} = \frac{\text{Wet Weight} - \text{Dry Weight}}{\text{Wet Weight}} \times 100$$

5.2.4 Sample Dimensions

The Australian Standard (AS 1301.448s-91) states that rectangular samples should be used. However this resulted in a very high number of 'jaw breaks' where the sample piece failed close to the grips of the testing machine rendering the data invalid. Therefore the samples were cut to the same dimensions used by Holt and School (1984) as shown in Figure 5.2.

Thickness was measured in the centre of the three regions marked 1, 2 and 3 across the sample (Figure 5.2) with the average thickness used in stress calculations. Positions a and b on Figures 5.1 and 5.2 indicate

orientation of sample in testing machine (a at top), and position of 'jaw break'.

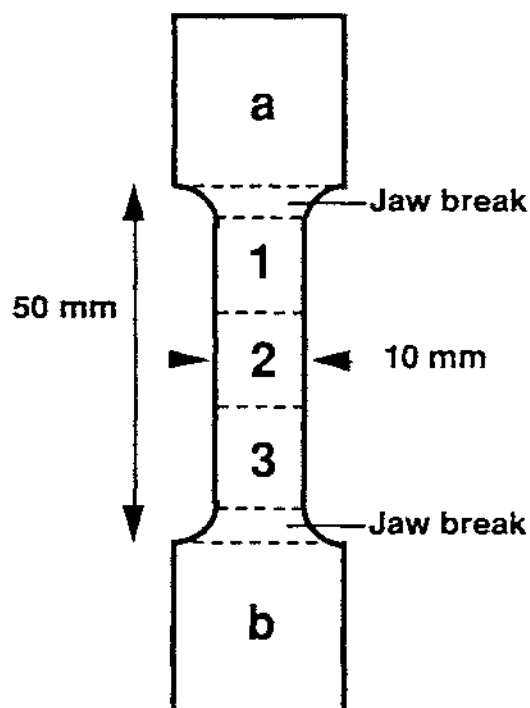


Figure 5.2 Sample dimensions

5.2.5 Testing Procedure

Samples were loaded into the jaws of a JJ Instruments T30K Universal Testing Machine set 47 mm apart to maintain the curve of the sample as it would be on the tray. Samples were tested to breaking point at an extension rate of 10 mm/min as recommended by the Australian Standard AS 1301.448s-91. Force in Newtons and extension in mm were recorded. Samples at 15% MC were selected at random from sealed plastic bags, being removed immediately prior to testing to reduce evaporation.

5.3 RESULTS

Tables 10.1 in Appendix 10 give the raw data for mean sample thickness (mm), force (N), and extension (mm) to break the sample, and calculated values for cross-sectional area and stress, from the following equations:-

$$\text{Stress} = \text{Force} / \text{cross-sectional area of sample}$$

$$\text{Cross-sectional area} = \text{mean thickness} \times \text{sample width (10 mm)}$$

Calculation of means and statistical tests were performed on data from those samples that failed in the regions labelled 1,2 and 3 on figure 5.2. None of the data from 'jaw breaks' at the grips was included.

Results of mean sample thickness (mm), force (N) and stress required to break the samples are given in Tables 5.1 and 5.2. The overall mean values for force, stress and extension are given in Table 5.3 .

TRAY	WT (g)	No SAMPLES	THICKNESS	FORCE (N)	STRESS
1	82.2	17	1.32	56.20	4.280
2	84.0	16	1.30	54.74	4.260
3	83.7	15	1.25	51.55	4.130
4	83.4	15	1.28	56.57	4.530
5	83.0	18	1.21	57.10	4.720
6	83.2	14	1.23	58.21	4.660
Mean	83.25		1.265	55.73	4.430
se	0.26		0.017	0.96	0.098

Table 5.1 Mean Data 8% Moisture Content

TRAY	WT (g)	No SAMPLES	THICKNESS	FORCE (N)	STRESS
7	84.3	14	1.18	42.11	3.590
8	84.4	15	1.21	45.49	3.770
9	84.4	16	1.15	44.55	3.930
10	84.6	17	1.18	44.34	3.750
11	83.7	17	1.16	46.08	4.000
12	84.7	16	1.20	45.79	3.890
Mean	84.35		1.180	44.73	3.822
se	0.143		0.009	0.59	0.060

Table 5.2 Mean Data 15% Moisture Content

	8% MC	15% MC
Force (N)	55.73 +/- 0.96	44.73 +/- 0.59
Stress	4.43 +/- 0.098	3.822 +/- 0.06
Extension (mm)	1.547 +/- 0.031	2.252 +/- 0.05

Table 5.3 Mean Values for Results of Tensile Strength Tests at 8% MC and 15% MC

5.4 DATA ANALYSIS

Data was analysed using t-tests on the mean values for force, stress and extension (Tables 5.1 and 5.2 and Tables 10.1 in Appendix 10). One way ANOVA was performed on data between the trays, and within the 18 positions on each tray. The mean thickness of the sample pieces utilised all 12 trays, whereas the stress ANOVA was performed on the six trays used at the two different moisture contents. Duncan's Multiple Range Test was used to establish which of the trays or sample pieces were significantly different (Table 10.2 Appendix 10)

5.4.1 t-Tests

Independent Group t-tests on the 6 mean values at each moisture content showed significant differences between:-

Stress to break the samples ($t=6.592$, $p=0.0012$, $d.f.=5$)

Force ($t=10.692$, $p=0.0001$, $d.f.=5$)

Extension ($t=12.331$, $p=0.0001$, $d.f.=5$).

5.4.2 Thickness of Trays and Sample Pieces

A One way ANOVA performed on the mean thickness of each sample piece, showed that there was no significant difference between the 12 trays ($F_{11,204}=1.251$, $p=0.2555$), or between the sample pieces from the 18 positions across the trays ($F_{17,198}=0.895$, $p=0.581$).

5.4.3 Stress Required to Break the Sample Pieces at Different Moisture Contents

A One way ANOVA performed on the mean stress required to break the test samples gave a significant difference between the two moisture

contents ($F_{1,214}=97.312$, $p<0.001$). The trays at 8% MC required significantly less stress to break the samples than those at 15% MC

The proportion of the variance accounted for in the one way ANOVA was $\approx 30\%$.

5.4.4 Stress Required to Break the 18 Sample Pieces from Each Tray

One way ANOVAs performed on the mean stress required to break the 18 samples from each tray gave a significant difference between both the 6 trays at 8% MC ($F_{5,102}=2.864$ $p=0.0184$), and the 6 trays at 15% MC ($F_{5,102}=2.604$ $p=0.0293$)

The proportion of the variance accounted for in the one way ANOVA was:-

6 trays used at 8% MC $\approx 8\%$

6 trays used at 15% MC $\approx 7\%$

5.4.5 Stress Required to Break the 6 Sample Pieces from the same Position on Each Tray

One way ANOVAs performed on the mean stress required to break the 6 samples from each position on the tray gave a significant difference between the 18 samples at 8% MC ($F_{17,90}=1.789$, $p=0.0418$), and the 18 samples at 15% MC ($F_{17,90}=2.639$, $p=0.0016$)

The proportion of the variance accounted for in the one way ANOVA was:-

18 positions on 6 trays at 8% MC $\approx 12\%$

18 positions on 6 trays at 15% MC $\approx 30\%$

5.5 INTERPRETATION OF RESULTS

Results from the t-tests showed that there were significant differences between the results obtained at the two different moisture contents. Samples at 15% moisture exhibited more extension (or stretch) prior to rupture than samples at 8% MC. However, they failed at a lower force. It appears that the samples at 8% were more brittle and tended to snap rather than stretch prior to failure. Trays at 8 % MC were approximately 16% stronger than trays at 15% MC in terms of the force required to break the sample. This trend follows the literature as paper and paper products become notably stiffer and less flexible under dry conditions (Britt

1970). The tensile strength decreased with increasing moisture content, due to the weakening of interfibre bonding within the tray. Therefore the more frequent presence of tray tearing on unloading of cartons after coolstorage could be attributed to the weakening of the tray with increased moisture content.

The ANOVAs revealed that there was no significant difference in the thickness of the trays.

Duncan's Multiple Range Test performed on the tray stress means (Appendix 10) demonstrated that tray 5 was significantly stronger than tray 3 of the trays tested at 8% MC, and that there was no significant difference between the other trays. The trays at 15% moisture (Trays 7 to 12) showed tray 7 to be significantly weaker than trays 9, 11 and 12. It is difficult to determine why some trays appear to be stronger than others, and from these results it appears that thickness is not related to strength in terms of stress require to break the sample.

Position across the trays was also tested. All samples showed positions E and O to be significantly weaker than the other positions, and samples at 8% MC showed position D to be significantly stronger than the other positions ($p < 0.05$). It was not possible to determine why positions D was significantly stronger in the 8% MC samples, or why E and O were significantly weaker than the other positions. Although it was initially suspected that this could be caused by the strapping of bundles, on closer investigation it was found that the bindings did not pass close to these points.

The ANOVA samples at 15% MC accounted for significantly more variance ($\approx 30\%$) due to position than the ANOVA on samples at 8% MC (variance $\approx 12\%$). The reason for this is not clear. One possible explanation is that the damper trays exhibited more stretch prior to rupture, which enhanced the variability and overall significance of sample position.

The difference in stress to failure between samples across the trays suggests that even within a batch there could be significant strength variations, despite random selection of trays from the same bundle to take account of the possibility of inherent variability within the pulp mix. However, the sample size was too small for a conclusive result

The data obtained gave a good comparison of the effects of moisture content on tray strength. However it did not necessarily give a clear representation of the strength of Friday Trays in general as trays were all from the same batch, and the exact proportions of different waste paper types in a production run may vary slightly.

Chapter 6

DROP TESTS EXPERIMENTAL DETAILS AND RESULTS

6.1 INTRODUCTION

As discussed in Chapter 2, Schoorl and Williams (1972) reported that significant bruising occurred during transit when cartons of fruit were dropped. Aitken and Crosby(1982) noted that around half the cartons of apples exported from New Zealand probably suffered an impact in transit, though less than 50% would be dropped more than once, and others not at all.

Results of the NZAPMB 1982 trials showed that although bruise damage was greater at the bottom than at the top of a stack of cartons in a ships hold, the pattern was too inconsistent to correspond to uniform pressure damage, and was more consistent with the observed practice of dropping rather than lowering many of the cartons at the bottom of a stack into position.

The time at which cartons of apples were most likely to be dropped was immediately after packing when the fruit was being palletised prior to coolstorage, and then during ship loading and unloading. By this time the tray moisture content would have changed from approximately 8% at packing to 15% after 24 hours in a coolstore.

At the time of writing, the method of shipping apples was under review by the NZAPMB and it appeared probable that more apples would be shipped in palletised form than in the past. However it was considered likely that the Port of Napier would still ship fruit under break bulk stowage. Since 1990, vessels have been loaded using the 'Omniport' system which de-palletises cartons of fruit and delivers them on a conveyor into the hold, from which the cartons are then manually stacked.

Therefore, because dropping of cartons (accidentally or otherwise) was common in the industry, experiments were undertaken to investigate the effectiveness of Friday Trays in protecting fruit from bruising at impact.

6.2 EXPERIMENTAL DESIGN

To simulate drops that occur during transit, cartons of Count 88 fruit with trays at two different moisture contents, and cartons of Count 100 fruit with trays at one moisture content, were impacted on to a solid concrete floor from 600 mm using a pneumatic drop tester.

Count 88 fruit was tested at two moisture contents to simulate conditions that occur within the industry. Trays at 8% moisture content were used to simulate the condition of trays in the packing shed at the time of carton filling prior to coolstorage. Trays at 15% moisture content were used to simulate the tray condition from 24 hours after placement in coolstorage to out-turn overseas. Count 100 fruit was tested with trays at 8% moisture content.

The 600 mm drop height was chosen after assessing the height at which a person holds a carton of apples when moving it from one position to another which was tested by measuring a number of people performing this role. If the carton had been dropped it would have fallen approximately 600 mm. Work by Holt and Schoorl, and in-house trials run by the NZAPMB, used drop heights of 500 mm to 750 mm, and so experiments were standardised on a 600 mm drop height.

Details of individual fruit position, weight and dimensions were recorded.

Bruise resistance was calculated by means of a Bruise Resistance Coefficient as outlined by Holt and Schoorl (1980) at the beginning of each run of experiments, to allow comparisons of energy absorbed in creating bruises to be made between each experiment.

Due to time constraints 10 cartons was the feasible limit for each run of experiments. Recommendations regarding the size of further studies are given in appendix 12. The main experiments comprised of:-

- i. 10 cartons of Count 88 fruit with Friday Trays ex Nelson at 15% moisture content.
- ii. 10 cartons of Count 88 fruit with Friday Trays ex Nelson at 8% moisture content.
- iii. 10 cartons of Count 100 fruit with Apple Trays ex Nelson at 8% moisture content.

Additional Experiments with Count 88 fruit were undertaken using modified trays. In each instance only one carton of fruit was assessed. The experiments comprised of:-

- i. 1 carton of Count 88 fruit with double Friday Trays ex Nelson at 8% moisture content where two trays were used to separate each layer of fruit.
- ii. 1 carton of Count 88 fruit with hardened Friday Trays ex Nelson at 8% moisture content where the trays had been given two coats of sanding sealer rendering them very rigid and inflexible.
- iii. 1 carton of Count 88 fruit with thickened Friday Trays ex Nelson at 8% moisture content. These trays had an additional 25 mm strip of tray material lightly glued to the back of the tray running along the length of the tray in the centre of the pockets.

All cartons were dropped with fruit number 1 on the front left hand corner of the box. A video of five of the Count 100 drops was recorded. Fruit bruising and tray damage were assessed.

6.3 EXPERIMENTAL DETAILS

6.3.1 Fruit Details

Granny Smith apples harvested in May 1993 and stored in an NZAPMB Controlled Atmosphere (CA) Store in Hastings were used for all the experiments. Fruit were taken from three lines as it was not possible to obtain all fruit from a single line. However all fruit used in each experiment came from the same packing shed, and Bruise Resistance Coefficients for each line were established (refer Appendix 1.2). The Count 88 fruit came out of CA storage in September, and the Count 100 fruit in October. Both lines were held in a standard coolstore prior to the drop tests. The fruit had a flesh temperature of 1.0°C at the time of impact. The experimental programme ran from early September through to late October 1993.

The apples were graded according to the industry grade standards for 1993 to give a net weight of 18.5 kg +/- 1 kg per carton. Each apple was weighed by hand to ensure that the Count 88 fruit were between 200 g and 222 g and Count 100 fruit between 175 g and 195 g. All existing bruises were marked with a cross encompassing the full diameter of the bruise using a spirit based marker pen. Each apple was marked with a printed label giving the carton number and fruit number. The labels measured 5 mm by 20 mm and served the purpose of marking the orientation of the fruit in the box. The labels were placed on the top stem end of the apples.

The diameter of each apple was taken in two directions across the equatorial region of the fruit. The first measurement gave the vertical

height the fruit sat in the tray, oriented by means of the label, and the second measurement defined the width.

Trays within the cartons were numbered with tray 1 being the bottom tray. Fruit was positioned in the carton with the stems to the left starting with fruit number 1 on the front left hand corner of the bottom tray. The first tray in the carton for both Count 88 and Count 100 fruit always had the count size stamp on the left of the tray as shown in Figures 6.1, 1 and 2.

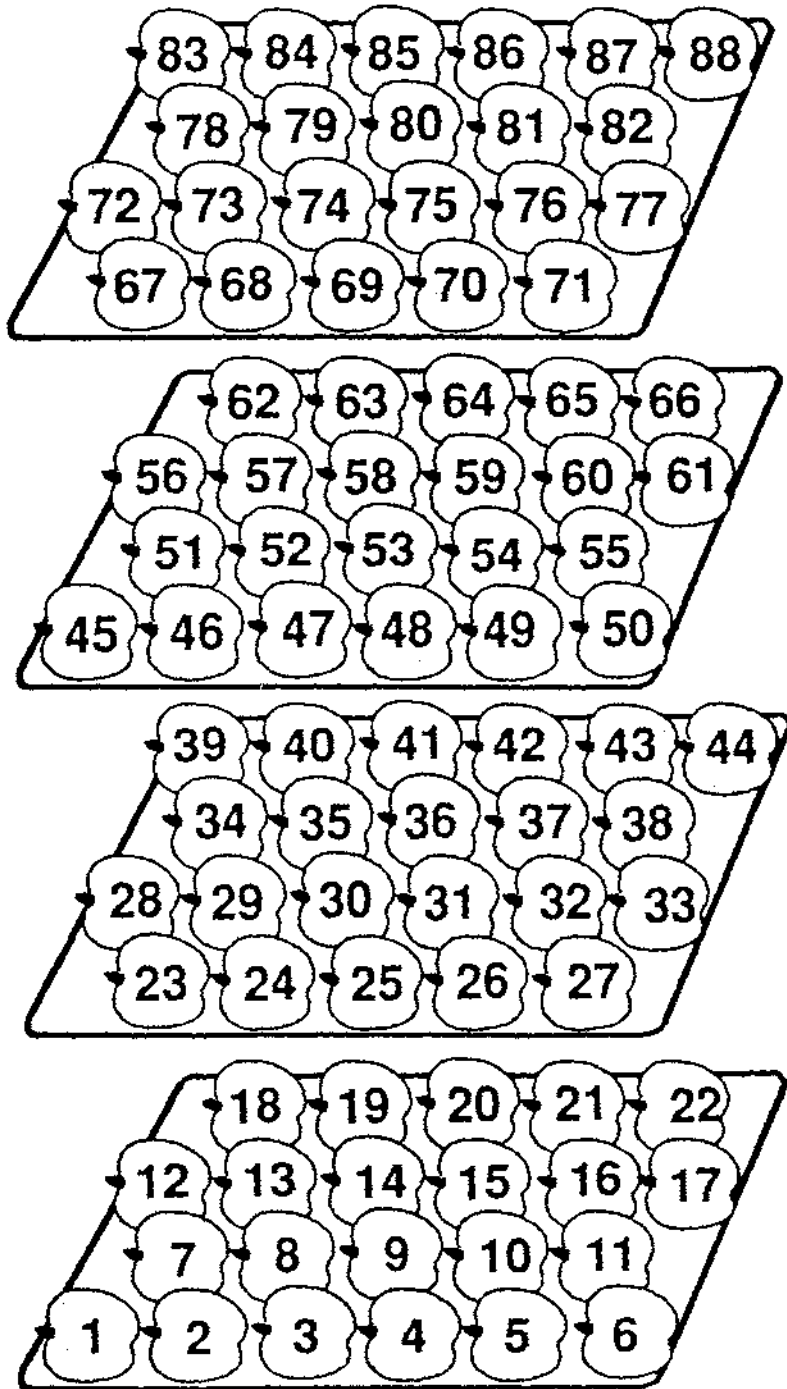


Figure 1. Position of Count 88 Fruit within each carton

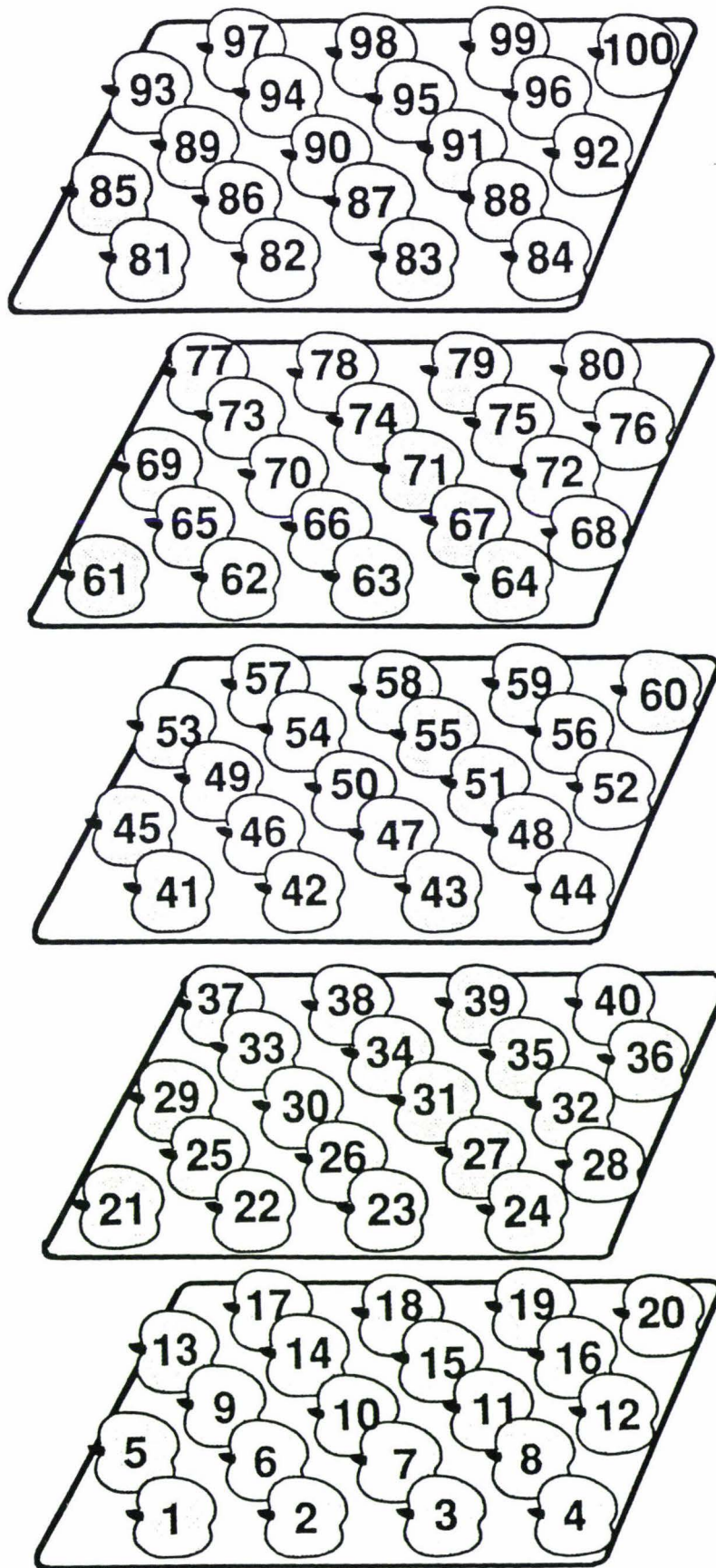
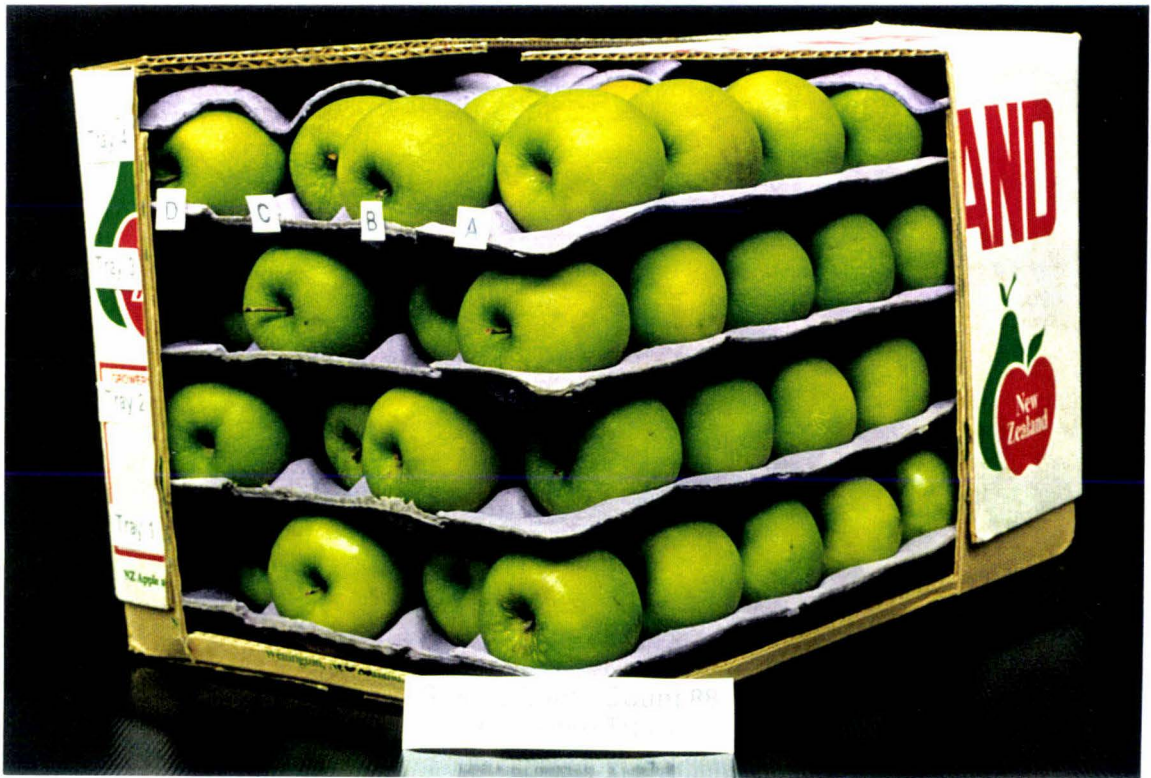


Figure 2. Position of Count 100 Fruit within each carton
 Figure 6.1 Fruit Position within each Carton

The number and letter convention for identifying the trays and rows in each carton is shown in Figure 6.3, 1 and 2



Photograph 1 Tray and Row identification Count 88 Fruit



Photograph 2 Tray and Row identification Count 100 Fruit

Figure 6.2 Tray and Row Identification

6.3.2 Tray and Carton Details

Trays from the Nelson Printpac UEB plant were supplied in bundles of 125 trays. These were numbered and then selected using a random number generator. Count 88 trays were from the standard Friday Tray die and the Count 100 trays were Apple Trays as this count is only produced from Apple Tray dies at the Nelson plant. Within this document, the generic term 'Friday Tray' is used to refer to the pulp trays used in the experiments, as the count size is always specified. Trays were conditioned and moisture contents assessed in the method described in Chapter 5 sections 5.2 and 5.3. For the tests at 15% MC, fruit was loaded into the cartons in the coolstore and immediately drop tested. Trays were taken directly from the lab where they had been conditioned for the 8% MC tests. Fruit was removed from the coolstore, immediately loaded into cartons and then drop tested.

All experiments were undertaken using new standard weight cartons. The inners were of grade 626C (tare weight 570 g), and the outers of grade 313 Oyster C flute (tare weight 440 g) as specified by the NZAPMB. Carton inners and outers had the flaps glued using a hot melt glue gun.

6.4 EXPERIMENTAL PROCEDURE

6.4.1 Calculation of Bruise Resistance

Bruise resistance was calculated by means of a Bruise Resistance Coefficient as outlined by Holt and Schoorl (1980). This was calculated at the beginning of each run of experiments which were undertaken over a period of two weeks, using a random sample of 22 of the apples used in each series of experiments.

The Bruise Resistance Coefficient was calculated by using a 3.42 m pendulum impacting the apples from a horizontal distance of 0.98m giving an equivalent vertical drop height of 0.14 m. Rebound distances were measured by means of a measuring staff placed beneath the pendulum. The fruit were marked as side A and side B to enable two bruise measurements to be made on each apple. A video recording was taken during the impacts and rebound distances were measured by playing the tape through a video player at single frame speed to determine maximum distance each apple rebounded. Rebound distances were then converted to equivalent rebound heights. Details of the results obtained are given in

Appendix 5. These figures were then incorporated into the spreadsheets for each series of experiments.

6.4.2 Drop Testing and Fruit Analysis

Cartons of fruit were impacted from 600 mm using a pneumatic drop tester at a pressure of 3 bar.

Fruit was left 24 hours to allow bruised regions to develop a brown hue. Positions of bruises were recorded according to the plan shown in Figure 6.3. The bruises were measured in two dimensions as shown in Figure 6.4 using a digital vernier calliper and the bruise volume formula from Holt and Schoolt (1980), as detailed in Appendix 1.2, was applied.

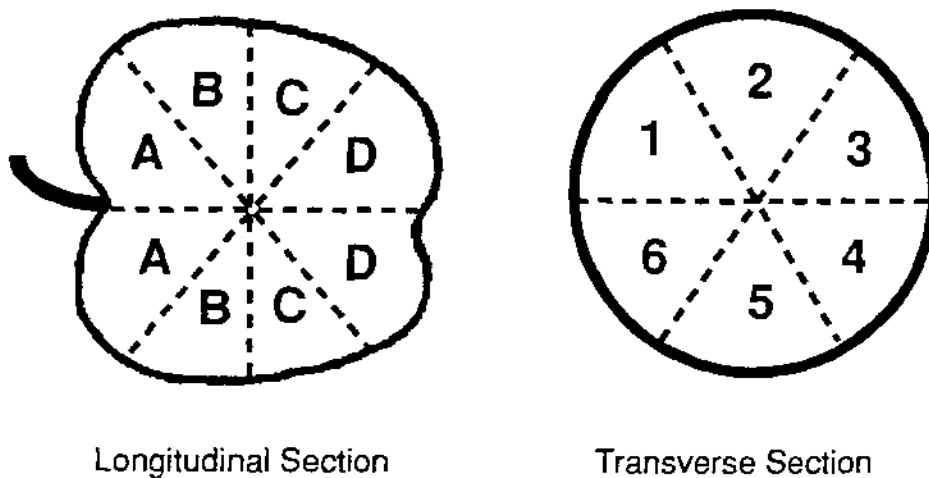


Figure 6.3 Bruise Position

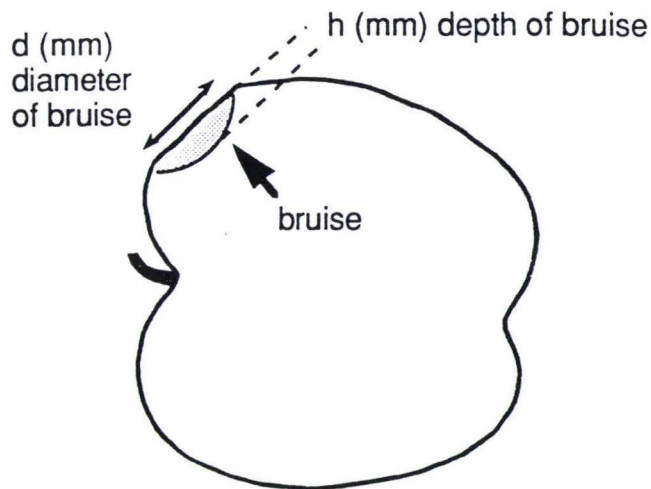


Figure 6.4 Bruise Dimensions

6.4.3 Documentation of Data

Details of fruit dimensions, weight, position in carton, position of bruises, dimensions of bruises and the Bruise Resistance Coefficients were entered onto spreadsheets (Appendix 6). The spreadsheets were formatted to calculate the volume of bruised tissue and the energy absorbed per bruise, per apple, per tray and per carton.

Photographs were taken of the fruit in cross section for Count 88 as detailed in Figure 6.14. Typical bruise positions in the Count 100 cartons are shown in Figure 6.15. Tray splits were recorded, an example of which is shown in Appendix 9 Figure 9.3 for Count 88 trays at 8% MC. The trays used in Figure 6.15 also show typical split patterns of a Count 100 carton after impact at 8% MC. Rebounds on impact with Count 100 fruit were recorded on video and digitised to produce an image on the computer screen as shown in Figure 6.18 and 6.19.

6.5 RESULTS AND ANALYSIS OF DROP TEST EXPERIMENTS

Data showing the fruit dimensions, position in carton, position of bruises and calculations of volume and energy absorbed by each bruise is given in appendix 6 . Summaries of the data obtained for each carton are in Appendix 7 and 8.

6.5.1 Bruise Resistance Coefficients

Bruise Resistance Coefficients were calculated as detailed in Appendix 5.

6.5.2 Data Variability

The data obtained from the number of bruises and energy absorbed in creating the bruises varied slightly between the cartons in each series of experiments. All experiments were carried out in close succession and the same conditions were imposed on all cartons. Count 88 data was consistent with a random distribution over both treatments, however a brief examination of the data showed that one carton of Count 100 fruit gave much higher bruise values than the other Count 100 cartons. Accordingly, the variability of the data was investigated in terms of standard deviations to assess whether the high values were likely to be due to random chance. The Count 100 data showed 3 cartons to be just below 1 standard deviation, 6 cartons to be within 1 standard deviation, and 1 carton (carton number 2) to be just over 3 standard deviations from the mean. The cause of this single carton suffering more damage was unknown. Possible sources of error had been reduced through personally undertaking all the experiments and by checking the fruit on loading the cartons immediately prior to drop testing. The validity of the data was checked by re-analysing a video taken during the drop tests to confirm that no experimental errors had occurred in the drop testing procedure. However the cartons of fruit were left to stand unsupervised for 24 hours in the lab and it is possible that something could have happened to this particular carton of fruit during that time to increase the amount of damage to the fruit. The data for carton 2 showed that 5.05 joules of energy were absorbed in bruising compared to an average of 2.73 joules, (standard deviation 0.3601) . Three standard deviations from the mean gives a 99.7% probability that the difference in the data can be attributed to random error. Therefore the data from carton 2 was removed from the data analysis. For reference, the Data Summary prior to removing this data is given in appendix 8. The mean values for number of bruise fruit, individual bruises and energy absorbed are given

for all 10 cartons as well as the 9 cartons used in data analysis in Table 6.1 for comparative purposes with Count 88 fruit.

6.5.3 Energy Absorbed in Creating Bruises

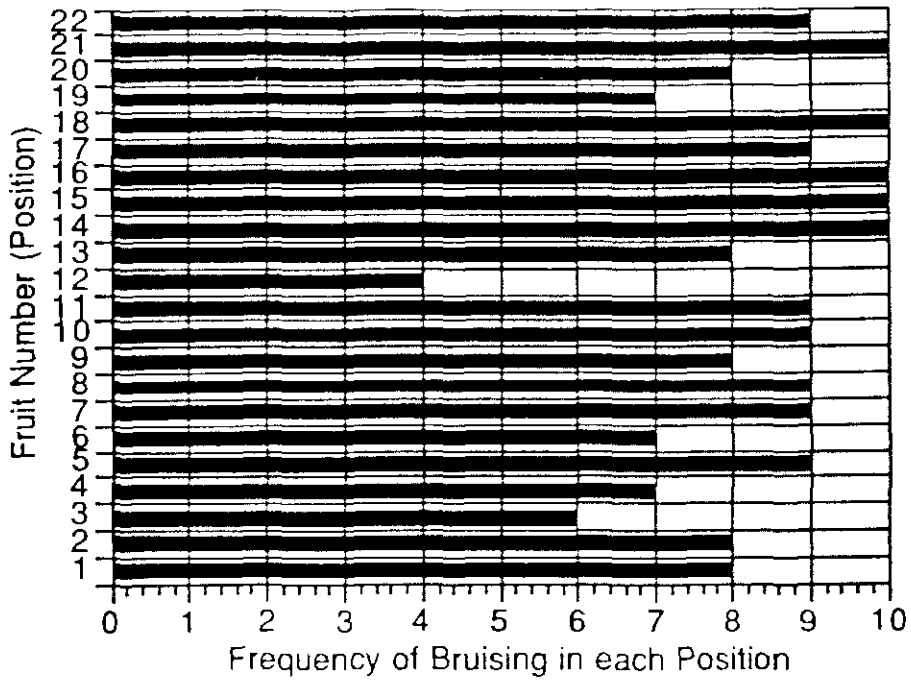
The mean numbers of bruised fruit, individual bruises and energy absorbed for each series of experiments is given in Table 7.2.

	Number of Cartons		Number of Bruised Fruit	Number of Indiv Bruises	Energy Abs in Bruising (j)
Count 88	10	mean	69.4	115.9	14.39
15% MC		se	1.38	5.07	0.100
Count 88	10	mean	69.2	119.7	13.28
8% MC		se	0.841	4.04	0.752
Count 100	9	mean	27.5	35.2	2.73
8% MC		se	0.58	0.86	0.12
Count 100*	10	mean	28.5	37.1	2.95
8% MC		se	1.07	2.03	0.25

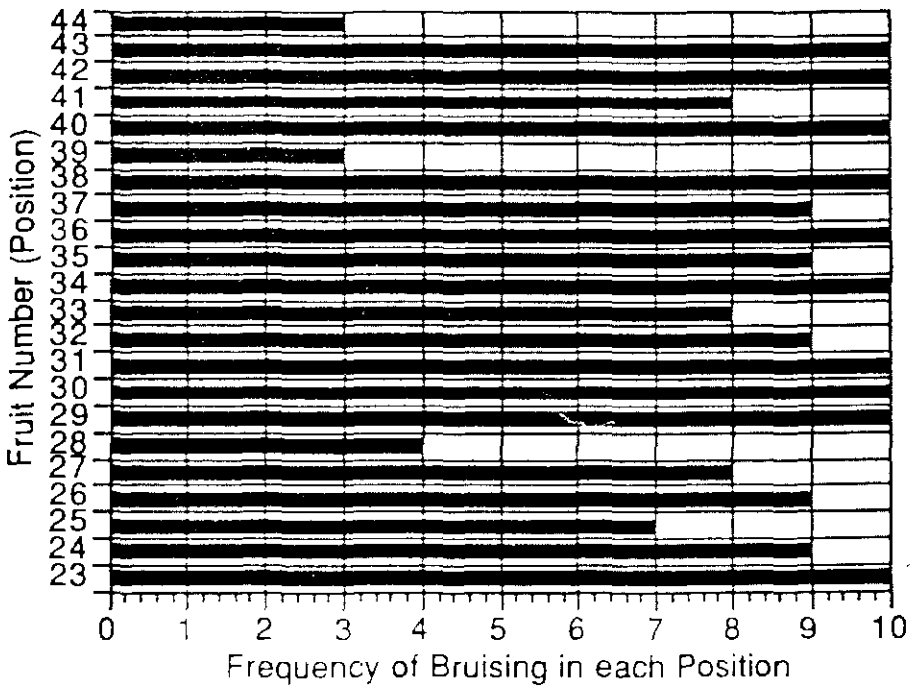
Table 6.1 Summary of Mean values for Number of Bruised Fruit, Number of Individual Bruises and Energy Absorbed per Carton. * includes Carton Number 2 with aberrant data.

6.5.4 Bruising Patterns within Each Carton

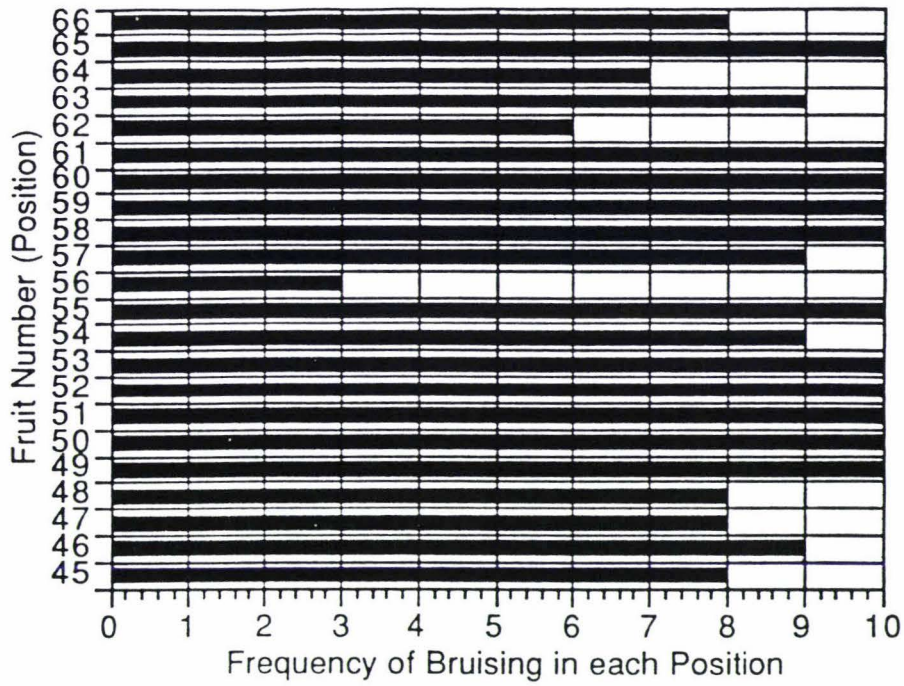
The extent of bruising at each position in the cartons was assessed. The following graphs in Figure 6.5 show the frequency of apples with one or more bruises at each position over the ten cartons in each Count 88 experiment and nine cartons in the Count 100 experiments. No bruises were found in the top tray (layer 5) in any of the Count 100 cartons after impact.



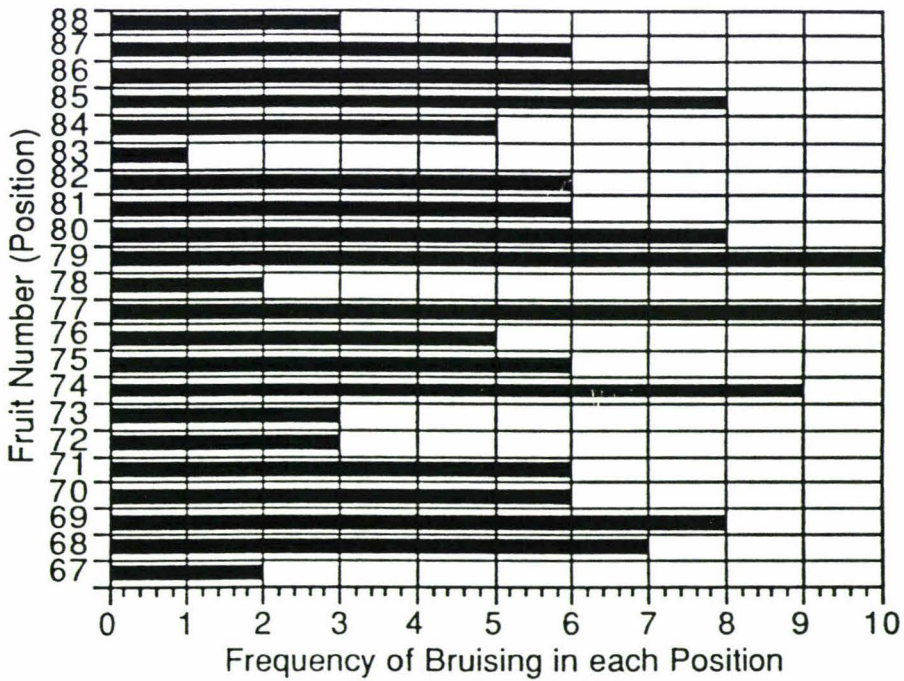
Graph 1 Count 88 Cartons 1-10 at 15% MC Tray 1



Graph 2 Count 88 Cartons 1-10 at 15% MC Tray 2

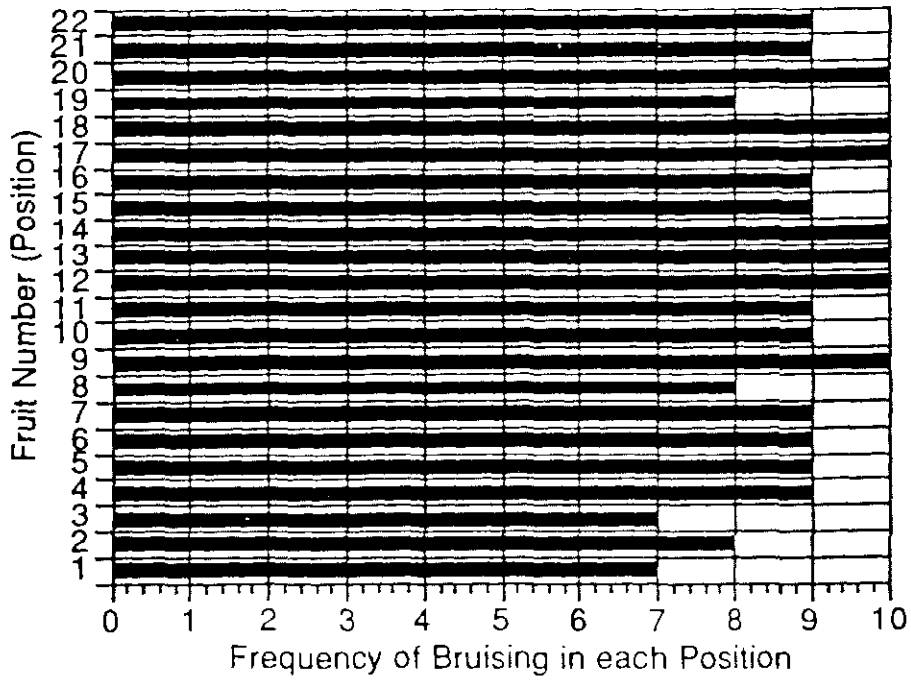


Graph 3 Count 88 Cartons 1-10 at 15% MC Tray 3

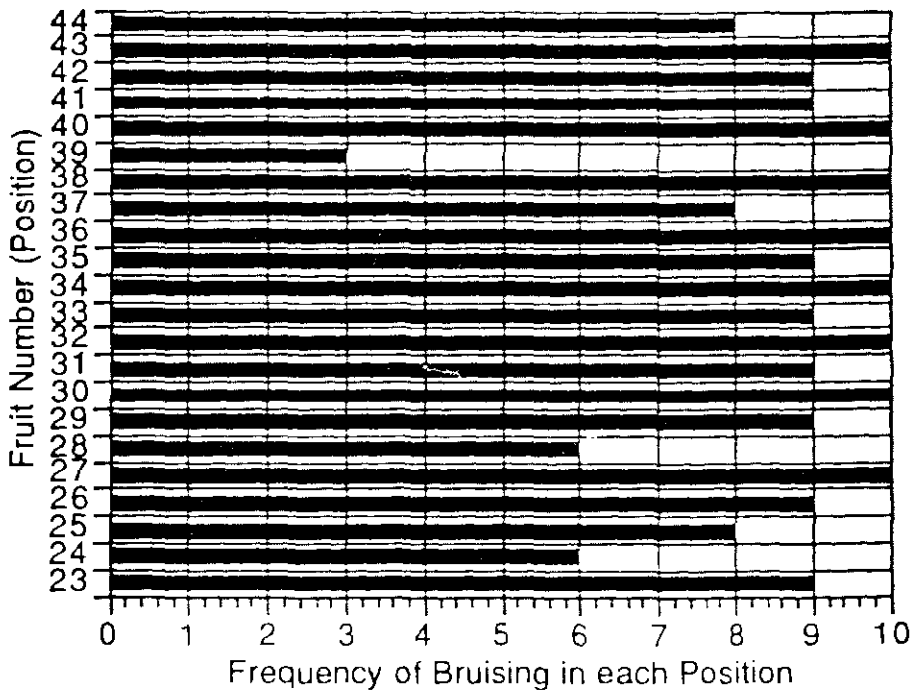


Graph 4 Count 88 Cartons 1-10 at 15% MC Tray 4

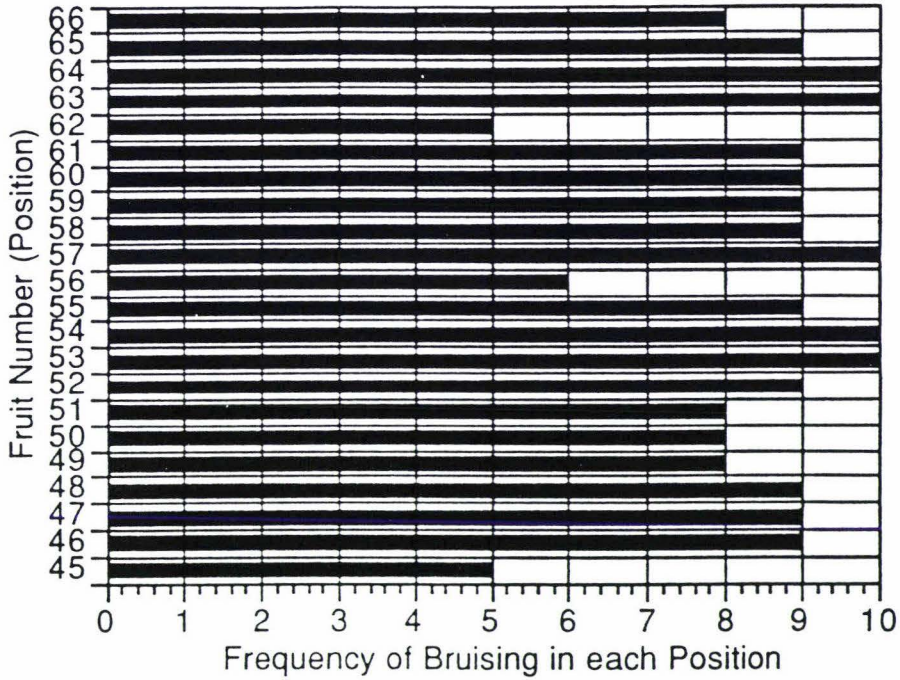
Figure 6.5 Graphs of Bruise Distribution Count 88 15% MC (refer to Figure 6.1 to define fruit position).



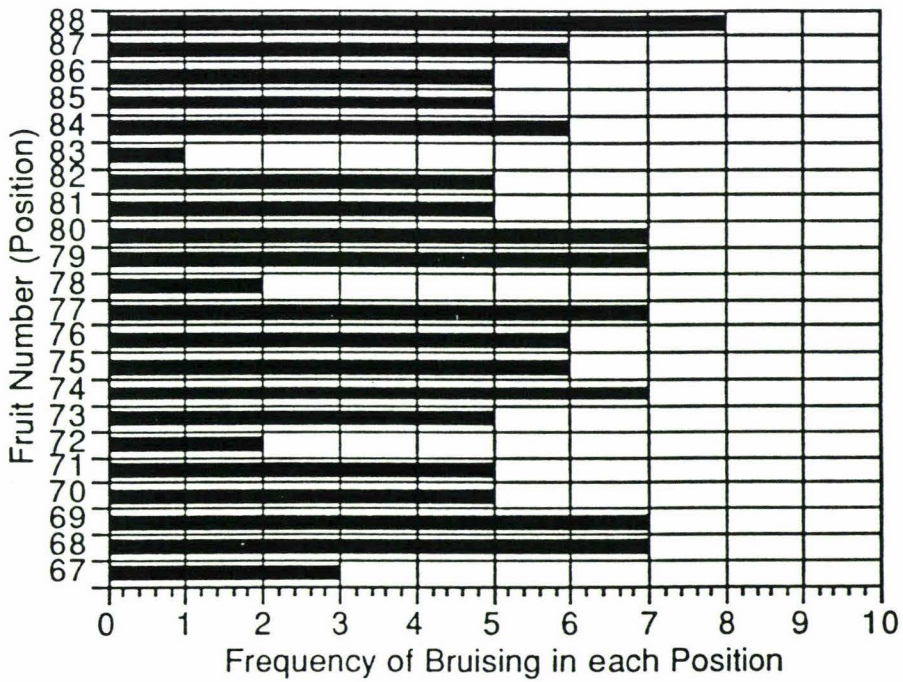
Graph 1 Count 88 Cartons 11-20 at 8% MC Tray 1



Graph 2 Count 88 Cartons 11-20 at 8% MC Tray 2

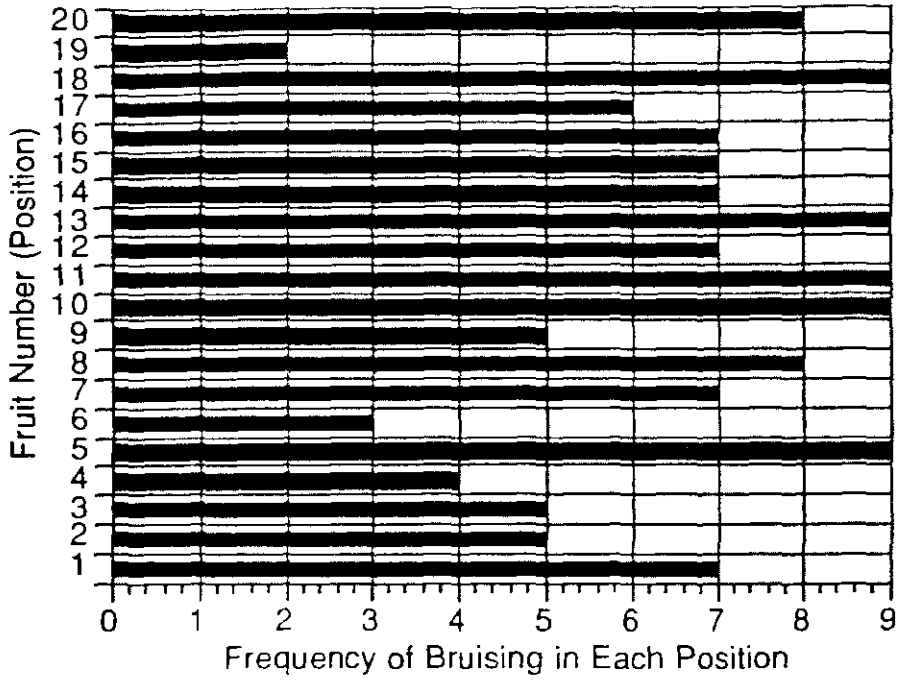


Graph 3 Count 88 Cartons 11-20 at 8% MC Tray 3

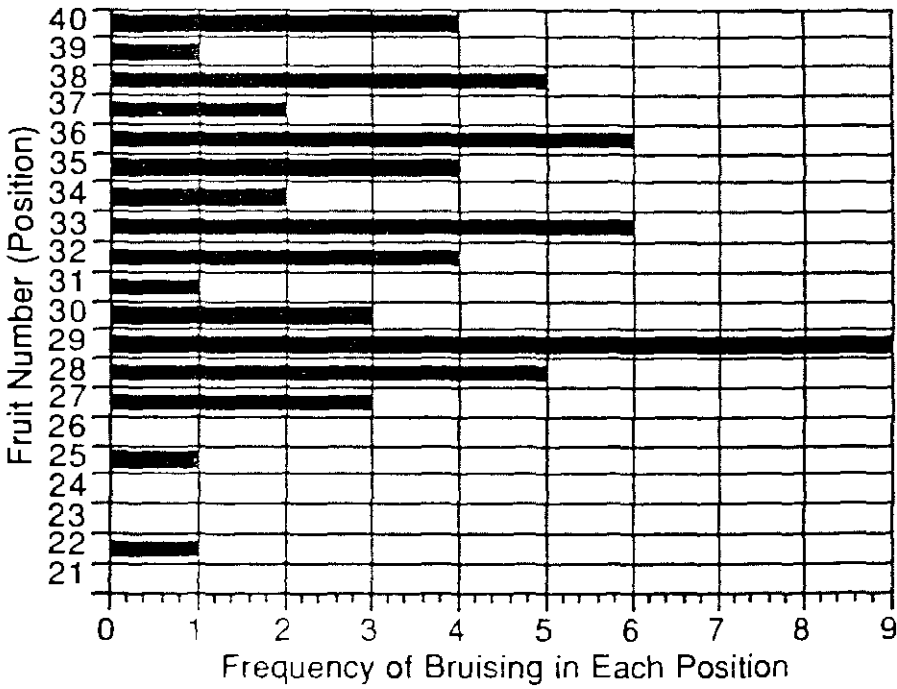


Graph 4 Count 88 Cartons 11-20 at 8% MC Tray 4

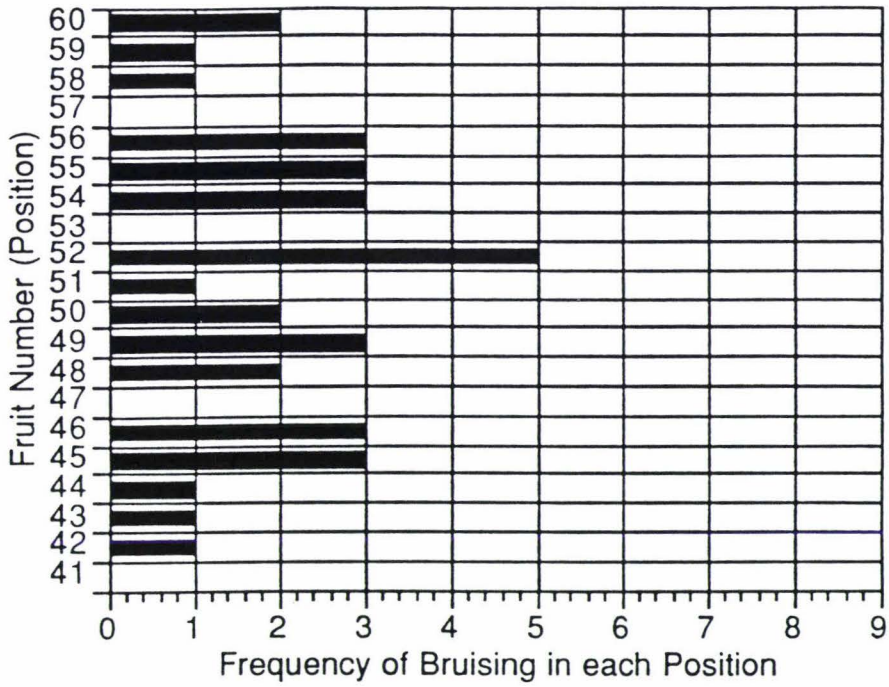
Figure 6.6 Graphs of Bruise Distribution Count 88 Cartons 8% MC (refer to Figure 6.1 to define fruit position).



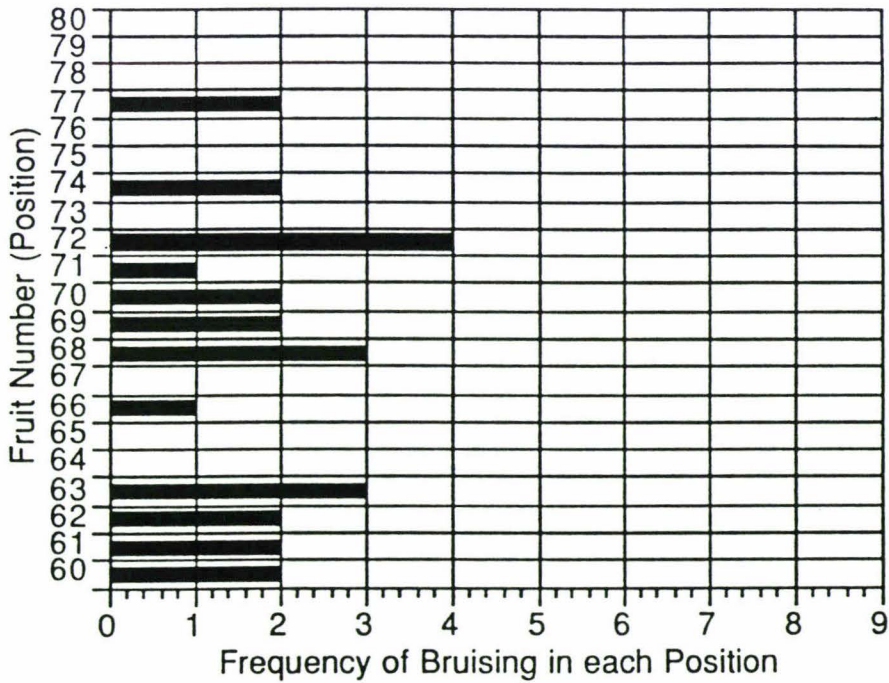
Graph 1 Count 100 Cartons 1-9 at 8% MC Tray 1



Graph 2 Count 100 Cartons 1-9 at 8% MC Tray 2



Graph 3 Count 100 Cartons 1-9 at 8% MC Tray 3



Graph 4 Count 100 Cartons 1-9 at 8% MC Tray 4

Figure 6.7 Graphs of Bruise Distribution Count 100 Cartons 1-9 8% MC (refer to Figure 6.1 to define fruit position).

6.5.5 Bruising Patterns at Each Layer

The mean percentage of bruised fruit at each layer is given in graphs in Figures 6.8, 6.9 and 6.10.

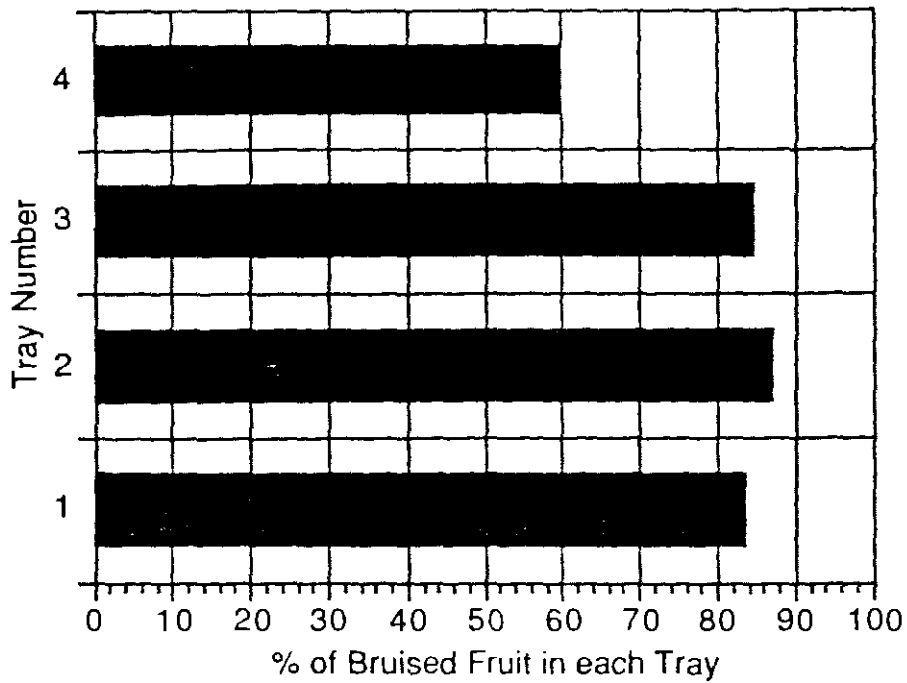


Figure 6.8 Mean % of Bruised Fruit in each Tray Count 88 at 15% MC

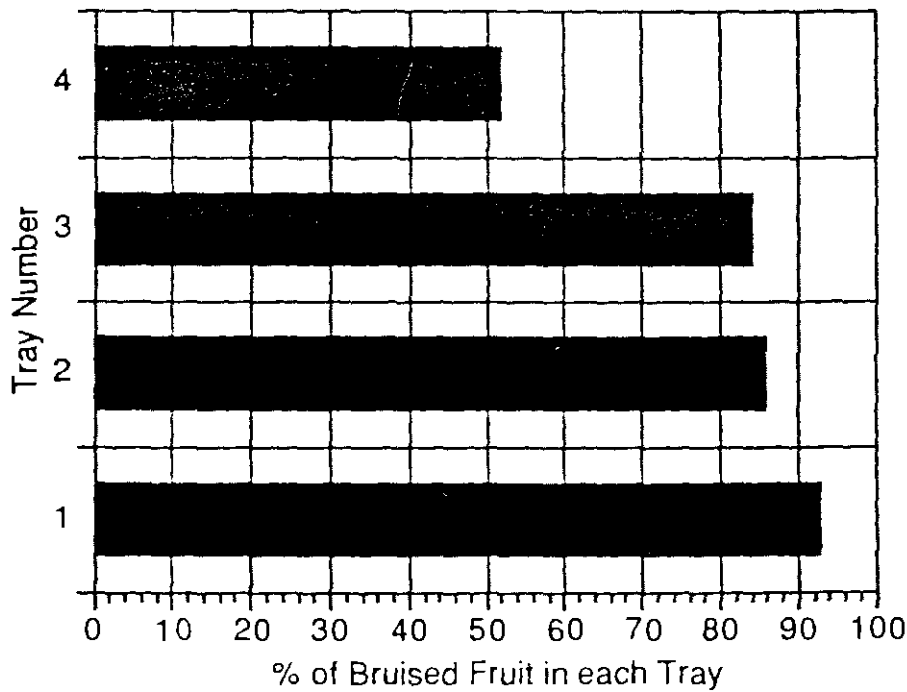


Figure 6.9 Mean % of Bruised Fruit in each Tray Count 88 at 8% MC

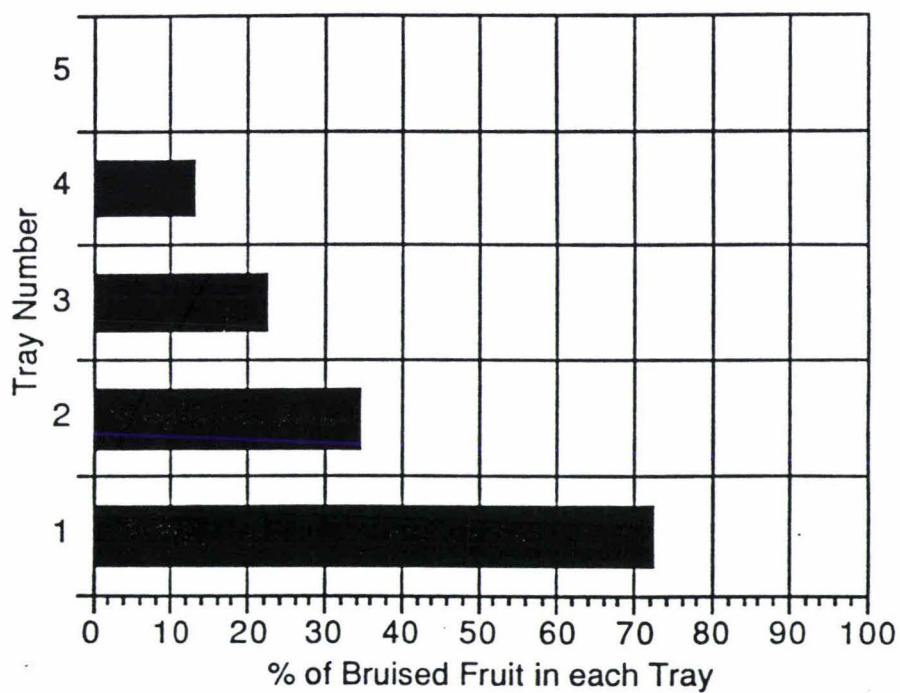


Figure 6.10 % of Bruised Fruit in each Tray Count 100 at 8% MC

6.5.6 Bruise Location

Frequency of bruises on the top and bottom of the fruit are shown in Figures 6.11, 6.12 and 6.13.

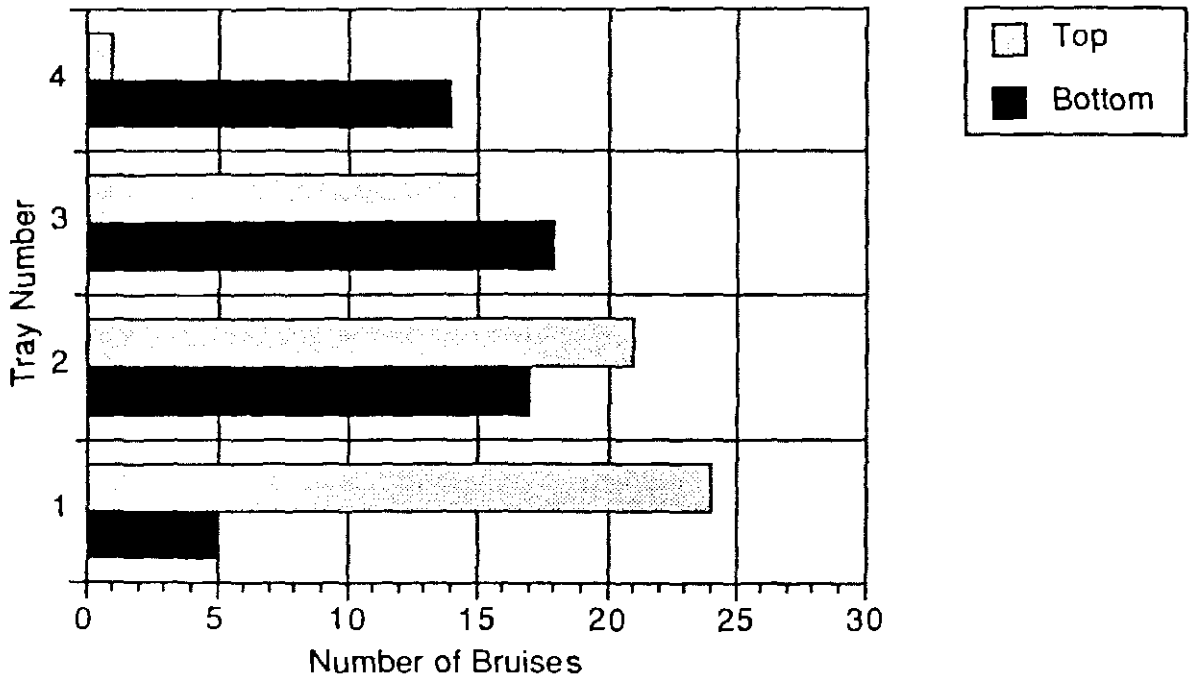


Figure 6.11 Average Number of Bruises on Top and Bottom of Fruit in each Tray Count 88 at 15 % MC

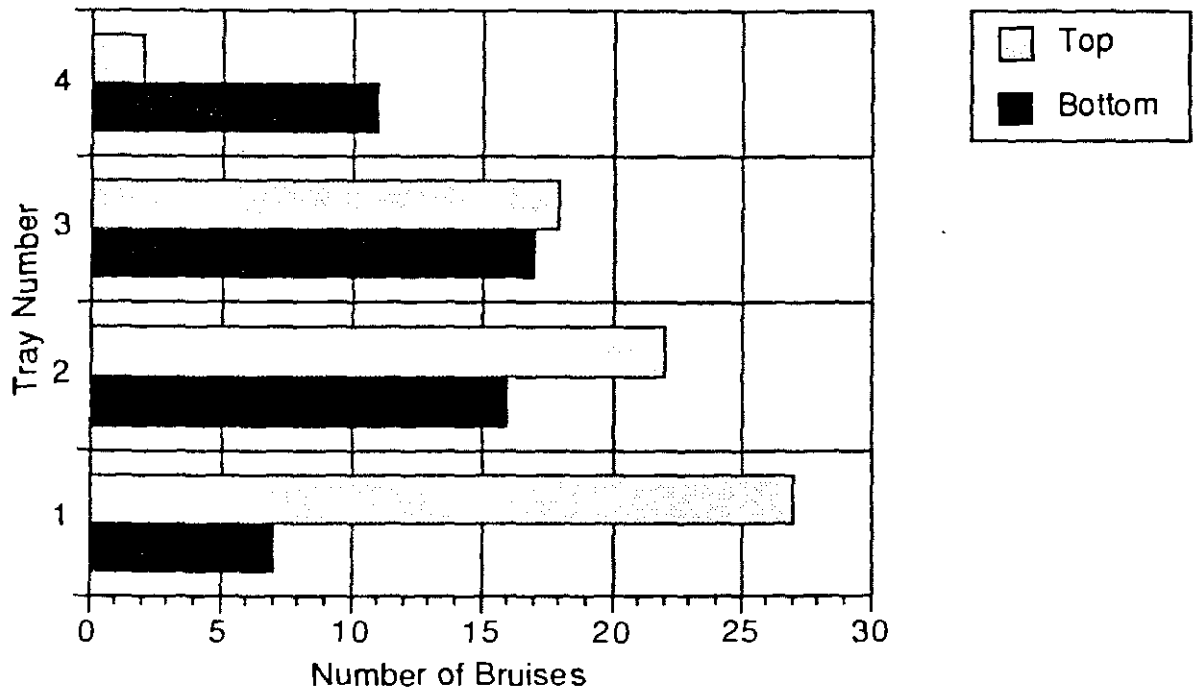


Figure 6.12 Average Number of Bruises on Top and Bottom of Fruit in each Tray Count 88 at 8 % MC

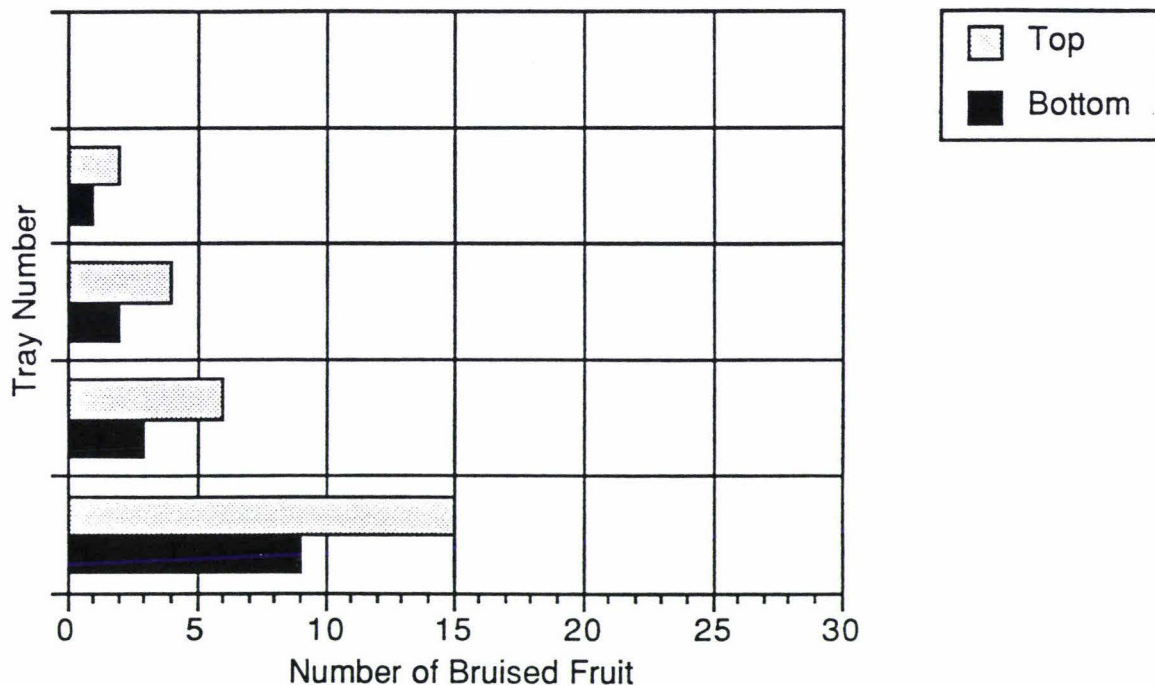


Figure 6.13 Average Number of Bruises on Top and Bottom of Fruit in each Tray Count 100 at 8 % MC

6.5.7 Bruising Patterns on Individual Apples

Count 88 fruit consistently showed bruising to occur in the positions shown in the photographs in Figure 6.14 . To illustrate this the apples were cut and dipped in ascorbic acid to prevent browning of non-bruised regions, and then arranged in cross section to demonstrate the pattern. The bruises were in bands 2 and 5 on the fruit where the fruit directly abutted the fruit below. In some instances the bruises formed as 'kissing lesions' where both fruit were bruised, and in other cases only one of the two abutting fruit was bruised.

Count 100 however offered a different bruise pattern with bruising confined to bands 1,3 4 and 6 corresponding to the positions where the fruit touched one another. Figure 6.15 shows typical bruise positions on the top of Count 100 fruit indicated by circles drawn in black pen. Crosses indicate existing bruises prior to the experiments being undertaken.



Photograph 1 Bruise Patterns Count 88 fruit Vertical section A



Photograph 2 Bruise Patterns Count 88 fruit Vertical section B.

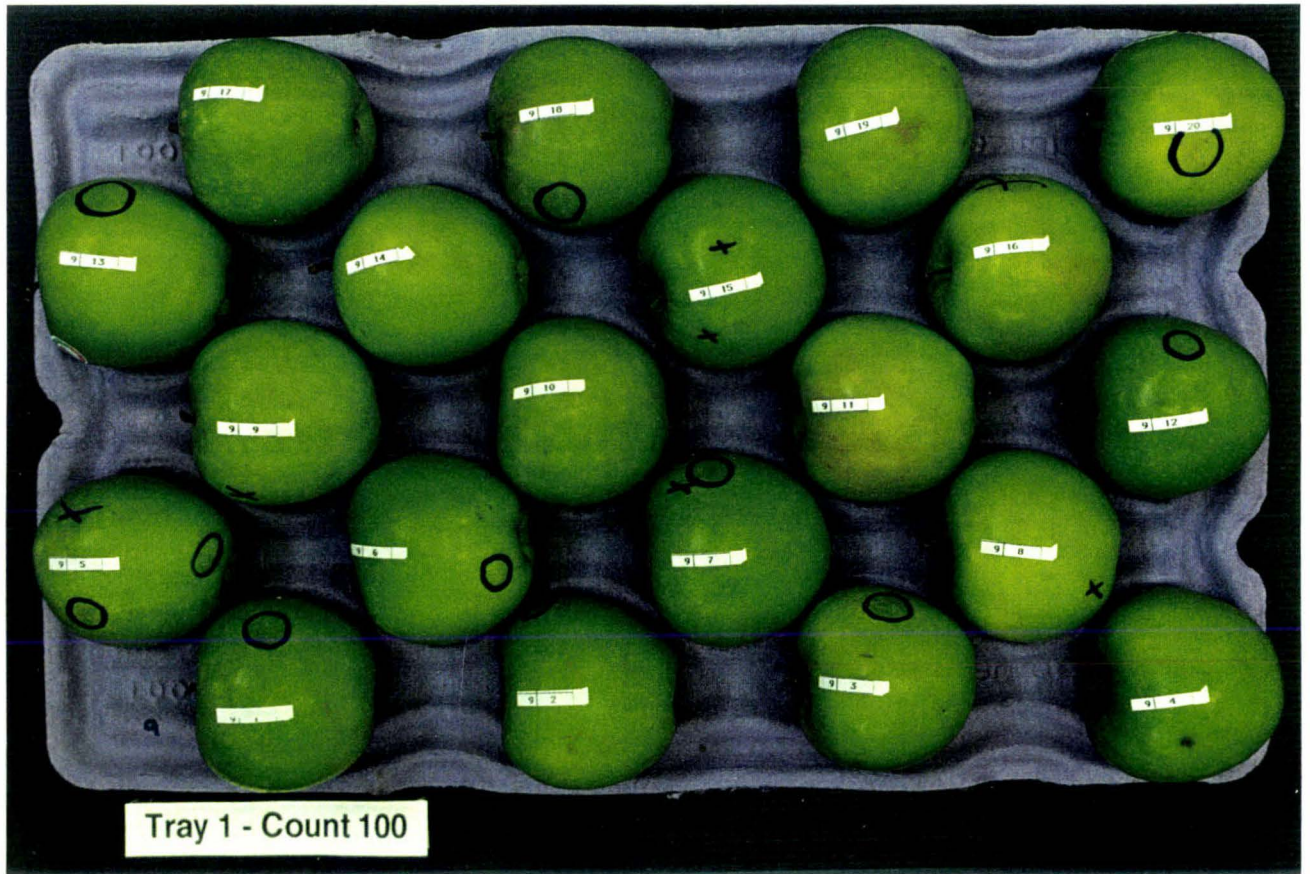


Photograph 3 Bruise Patterns Count 88 fruit Vertical section C

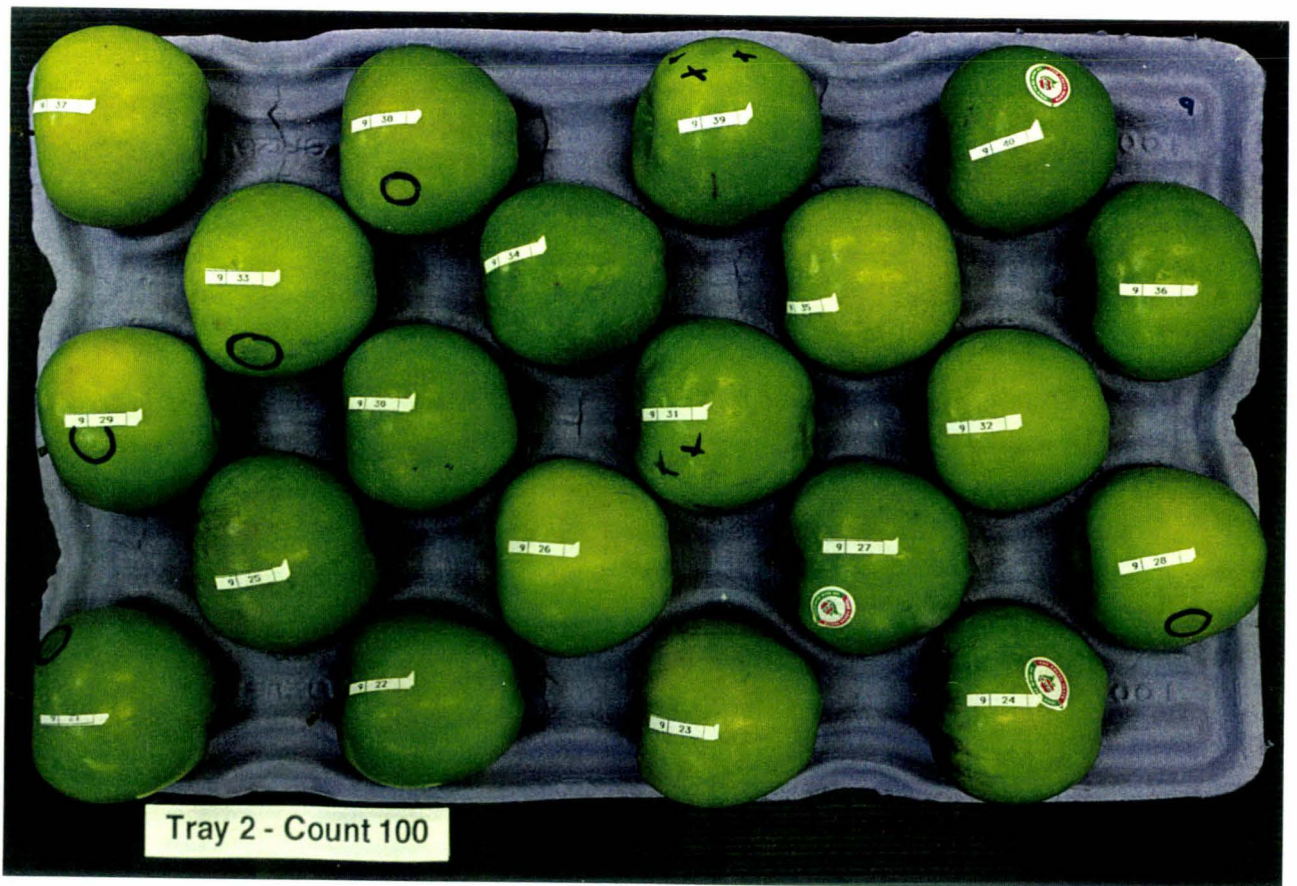


Photograph 4 Bruise Patterns Count 88 fruit Vertical section D

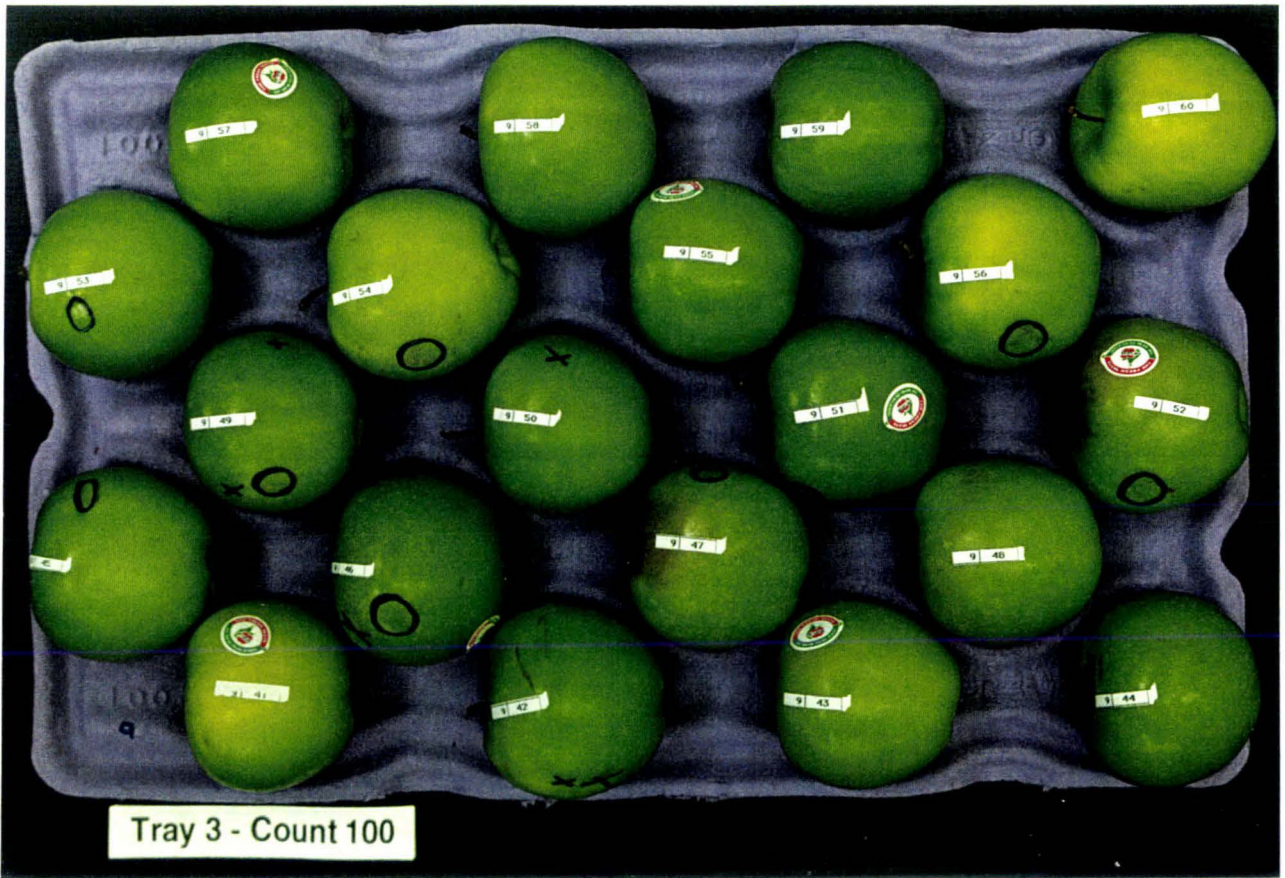
Figure 6.14 Bruising Patterns in Vertical Section Count 88 Fruit



Photograph 1 Bruise Patterns Count 100 fruit Tray 1



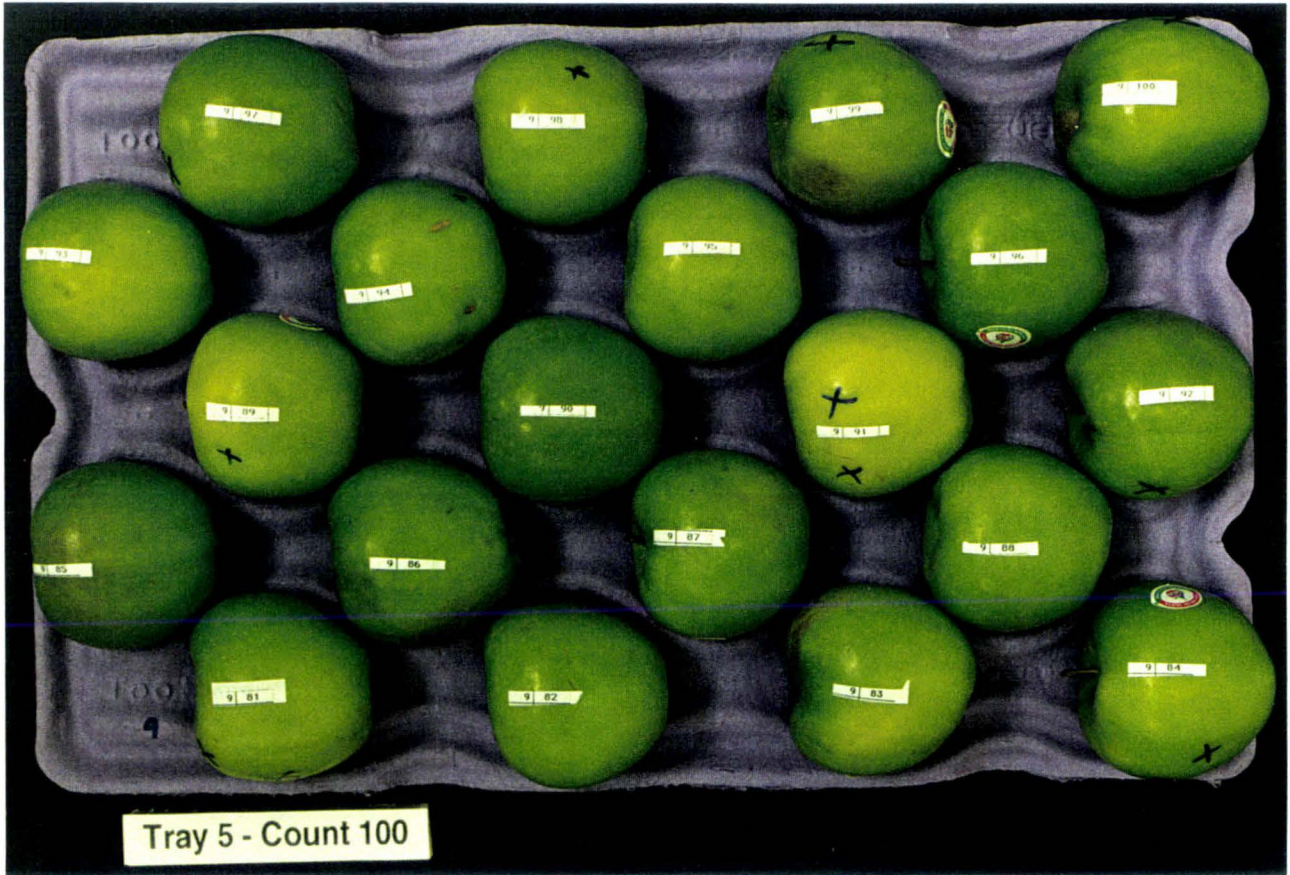
Photograph 2 Bruise Patterns Count 100 fruit Tray 2



Photograph 3 Bruise Patterns Count 100 fruit Tray 3



Photograph 4 Bruise Patterns Count 100 fruit Tray 4



Photograph 5 Bruise Patterns Count 100 fruit Tray 5

Figure 6.15 Typical Bruise Patterns by Trays Count 100 Fruit

Note Crosses indicate existing bruises

6.5.8 Fruit Diameter and Weight

The diameter of each apple measured in the vertical plane plotted against the weight is given in graphs as shown in Figure 6.16 and 6.17 .

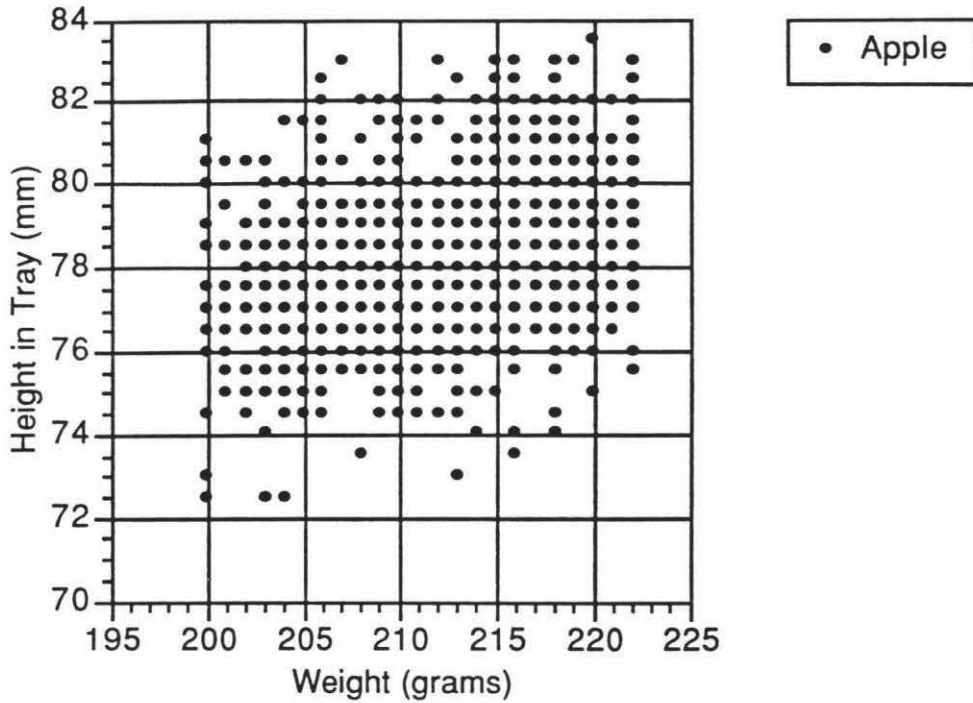


Figure 6.16 Graph of Diameter (Height in Tray) vs Weight Count 88 Fruit

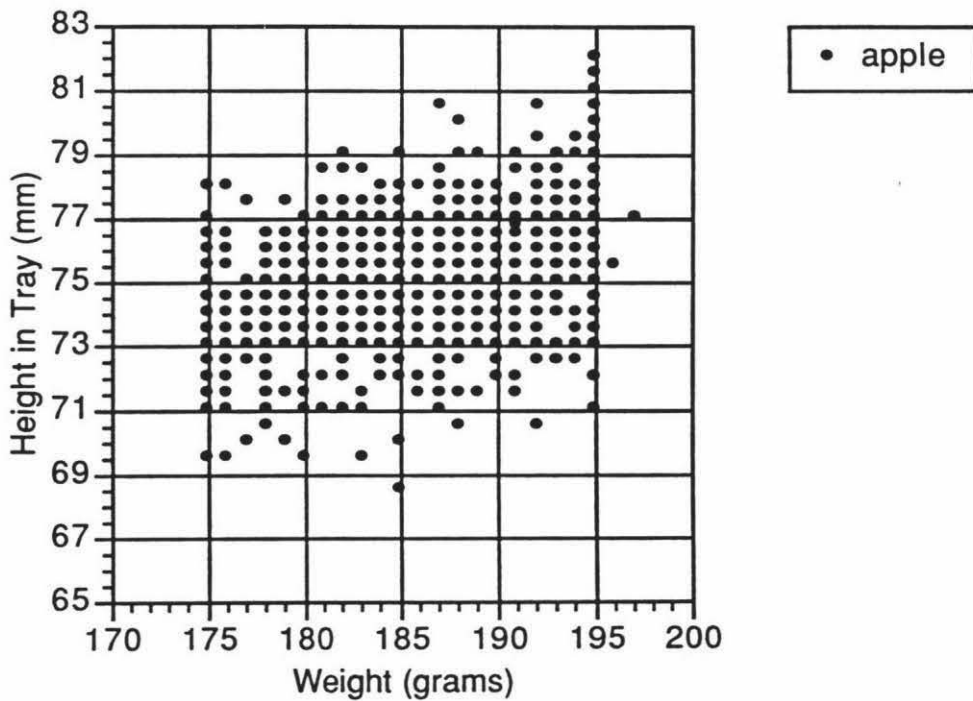


Figure 6.17 Graph of Diameter (Height in Tray) vs Weight Count 100 Fruit

Table 6.2 gives correlation values for diameter and weight of one carton and 1000 fruit in each count size to show the effect of increasing sample size from one carton to 1000 fruit.

		Correlation	Variance
Count 88	88 Fruit	0.263	0.069
	1000 Fruit	0.323	0.069
Count 100	100 Fruit	0.426	0.182
	1000 Fruit	0.429	0.184

Table 6.2 Correlation and Variance for Diameter and Weight for samples of one carton and 1000 fruit

6.5.9 Tray Splits per Carton

The mean number of tray splits per carton for each series of experiments is given in Table 6.3. All cartons at 8% MC showed tray splits, while only 4 of the 10 cartons tested at 15% MC displayed splits. Full details of split lengths and positions in each carton are given in Appendix 9.

	Mean Number of Splits per Carton	Mean Length of Splits mm per Carton
Count 88 15% MC	mean 0.50	21.0
	se 0.22	1.8
Count 88 8% MC	mean 7.43	26.45
	se 1.41	1.08
Count 100 8% MC	mean 16.7	26.12
	se 1.4	0.58

Table 6.3 Mean Number of Tray Splits and Length of Splits per Carton.

6.5.10 Energy Absorbed in Bruising and Tray Splits

The energy absorbed by bruising in each carton was correlated against the summed length of all splits in each carton at 8 % moisture content. A correlation at 15% moisture content was not calculated as there were only 5 splits over 10 cartons. Correlation and variance values are given in Table 6.4.

	Correlation	Variance
Count 88	-0.18	0.032
Count 100	0.78	0.006

Table 6.4 Correlation and Variance of Total length of Tray splits against Energy Absorbed in Bruising .

6.5.11 Carton Movement on Impact

Cartons of Count 88 fruit showed no appreciable rebound on impact, whereas the Count 100 fruit lifted and rocked a number of times after impact. Videos of the impact of five of the Count 100 cartons were recorded at 25 frames per second. A typical example of one of the cartons (Carton 9) was then viewed, and frames were captured at 0.2 second intervals. The pictures showed that on impact the carton rebounded approximately 20 mm and then rocked back and forth approximately 4 times before becoming stationary.

Once the carton of fruit was released from the drop tester air resistance caused the lid of the carton to move downwards slightly slower than the fruit. During impact the fruit settled by around 6 mm from the height of initial overfill when the fruit was positioned on the drop tester. The average initial overfill was 51 mm, and the final settled overfill was 45 mm.

Pictures of the carton falling showing the resistance of the lid are given in Figure 6.18. The rebound and rocking motion at impact is shown in Figure 6.19.

The rebound displayed by Count 100 cartons had the overall effect of reducing the amount of energy that was available to be absorbed elsewhere. It was calculated that a 20 mm rebound equated to approximately 3.5 J of energy being dissipated (from $E = mgh$).



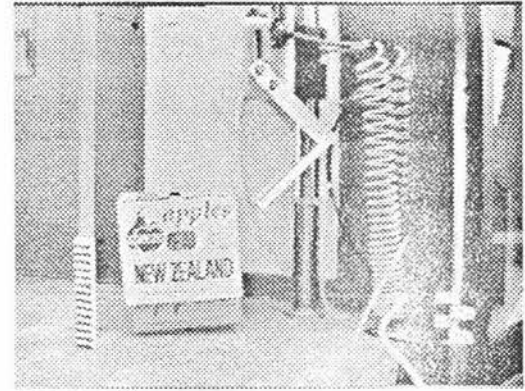
Frame 1



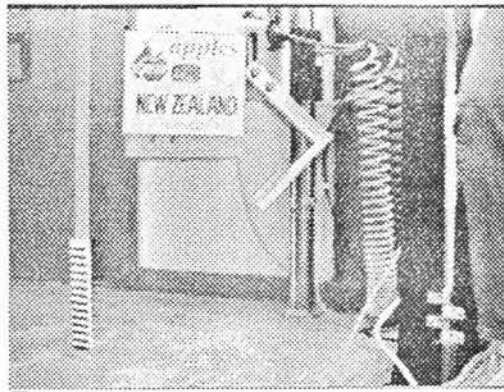
Frame 5



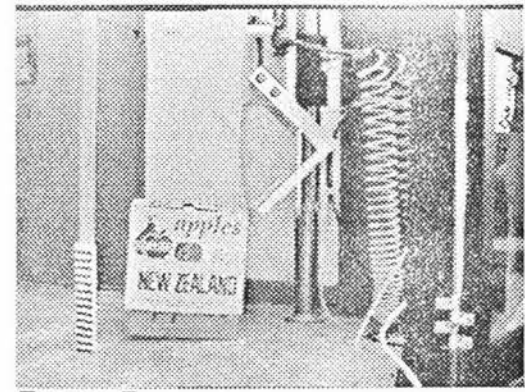
Frame 2



Frame 6



Frame 3



Frame 7

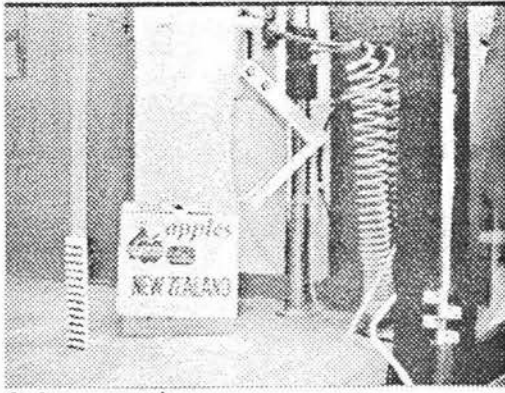


Frame 4

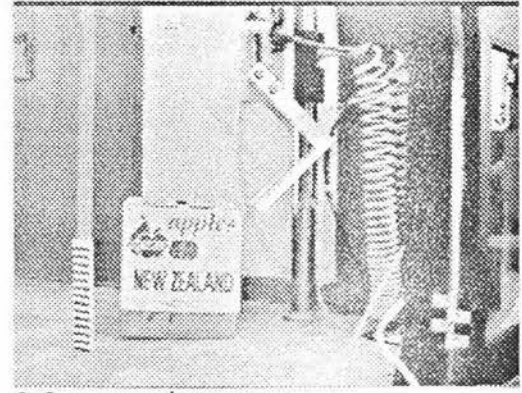


Frame 8

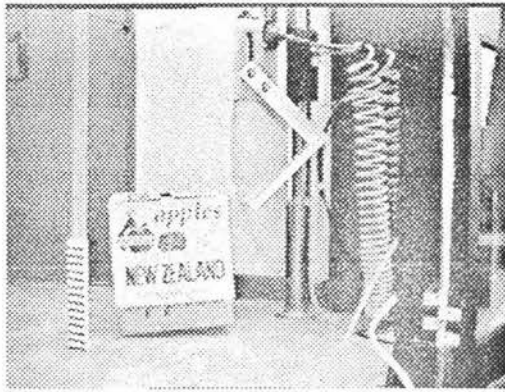
Figure 6.18 Count 100 Apple Carton During Descent
Video frame exposure 0.001 sec



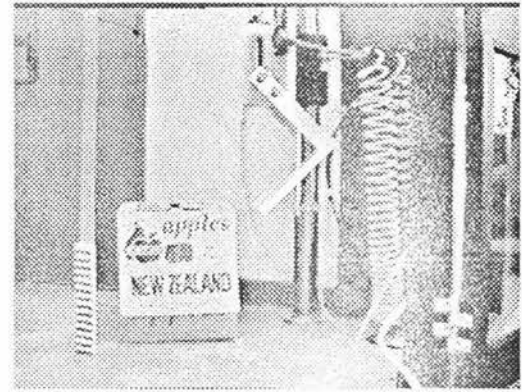
0.0 seconds



0.8 seconds



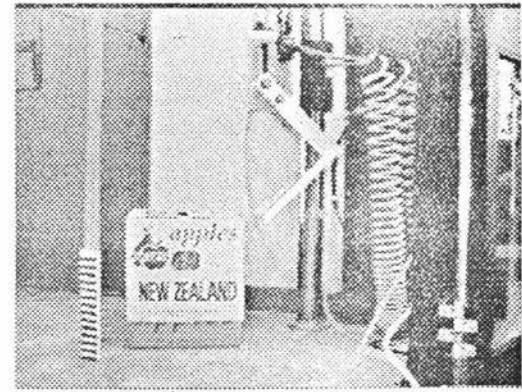
0.2 seconds



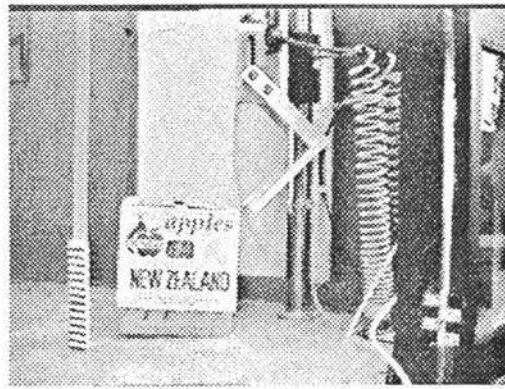
1.0 seconds



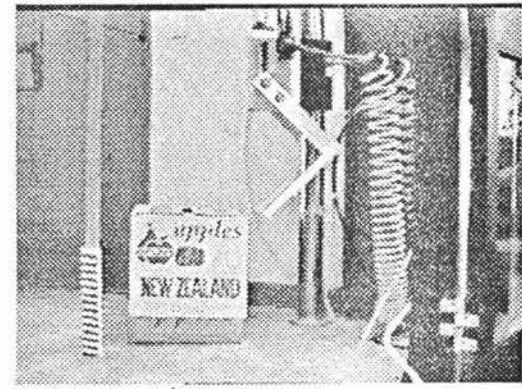
0.4 seconds



1.2 seconds



0.6 seconds



1.4 seconds

Figure 6.19 Apple box Bouncing on Impact
Video frame exposure 0.001 sec

6.5.12 One Off Tests

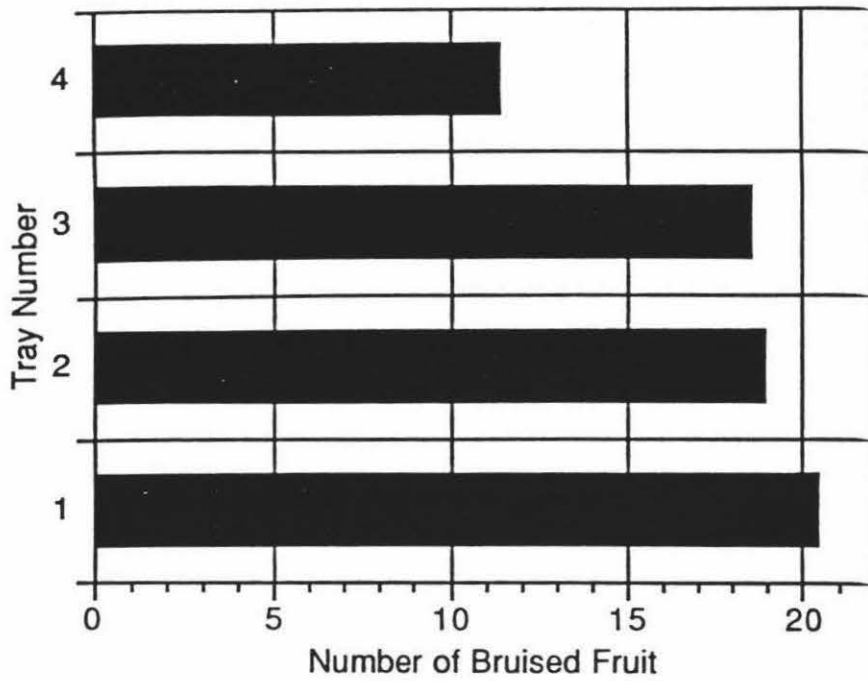
The three one off tests with Count 88 fruit using double trays, thickened trays and rigid trays were undertaken purely for comparative purposes. It should be noted that these results are only indicative of the likely performance and are not statistically valid as just one carton was assessed each time (Refer Appendix 6.4 and 7.4)

	No of Bruised Fruit	No of Indiv Bruises	E Abs in Bruising (j)
Standard Trays	69.2	119.7	13.28
Double Trays	46	58	5.23
Thickened Trays	58	93	6.52
Rigid Trays	70	98	16.34

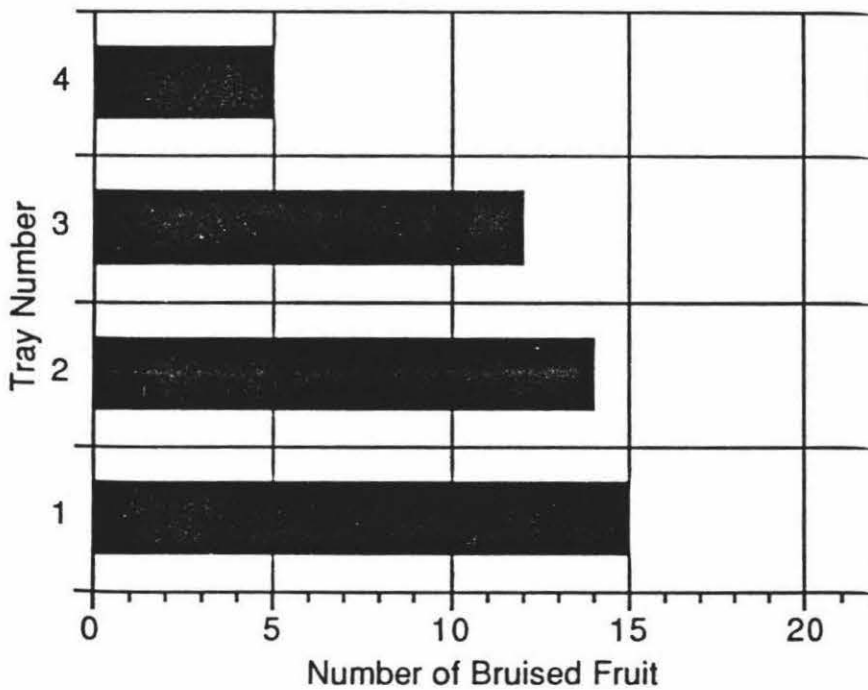
Table 6.5 One Off Trial Data

Bruise distribution patterns within each carton are shown in graphs in Figure 6.20 and Figure 6.21.

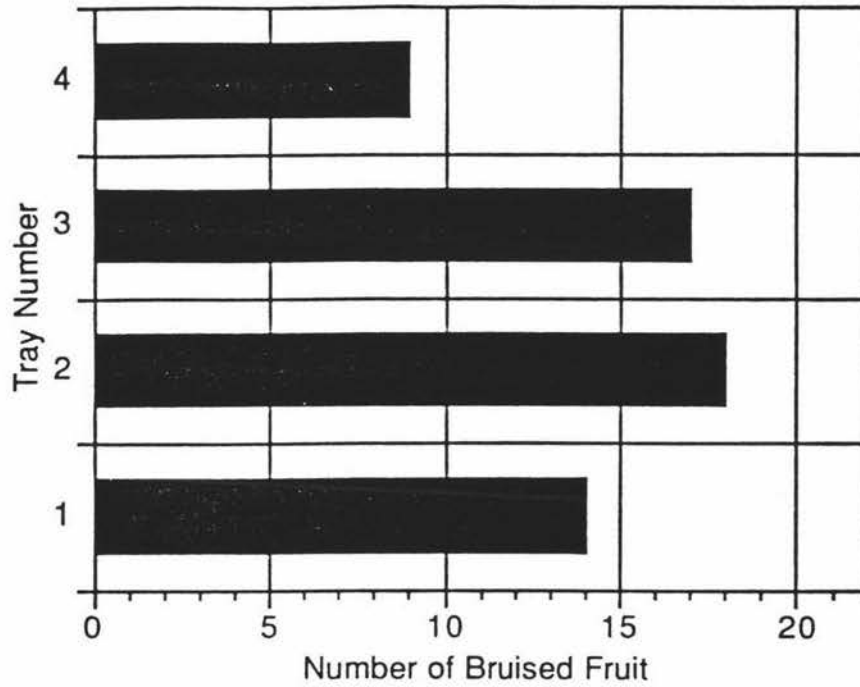
Bruise distribution patterns within each carton are shown in graphs in Figure 6.20 and Figure 6.21.



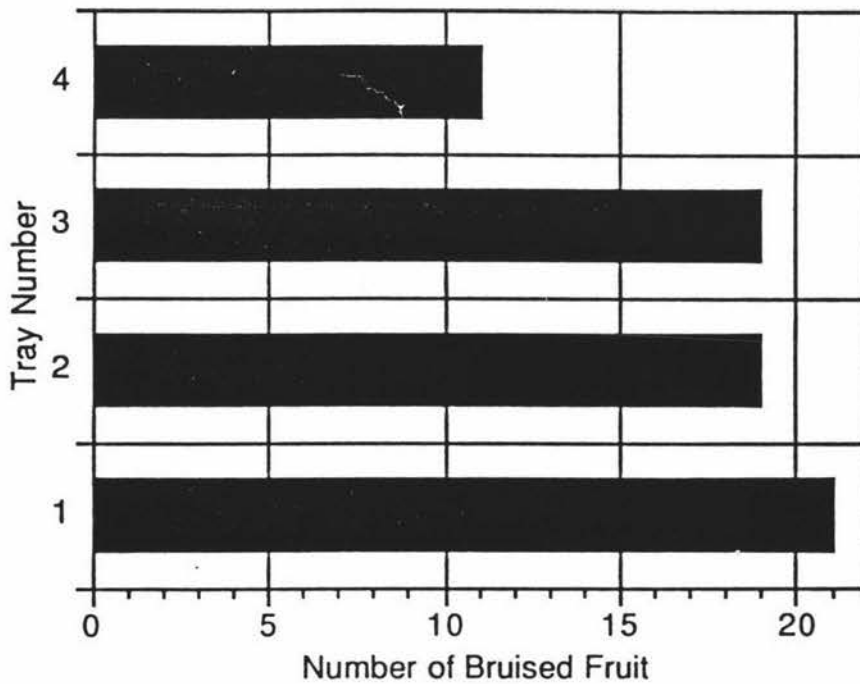
Graph 1 Number of Bruised Fruit in each Tray for Standard Trays



Graph 2 Number of Bruised Fruit in each Tray for Double Trays

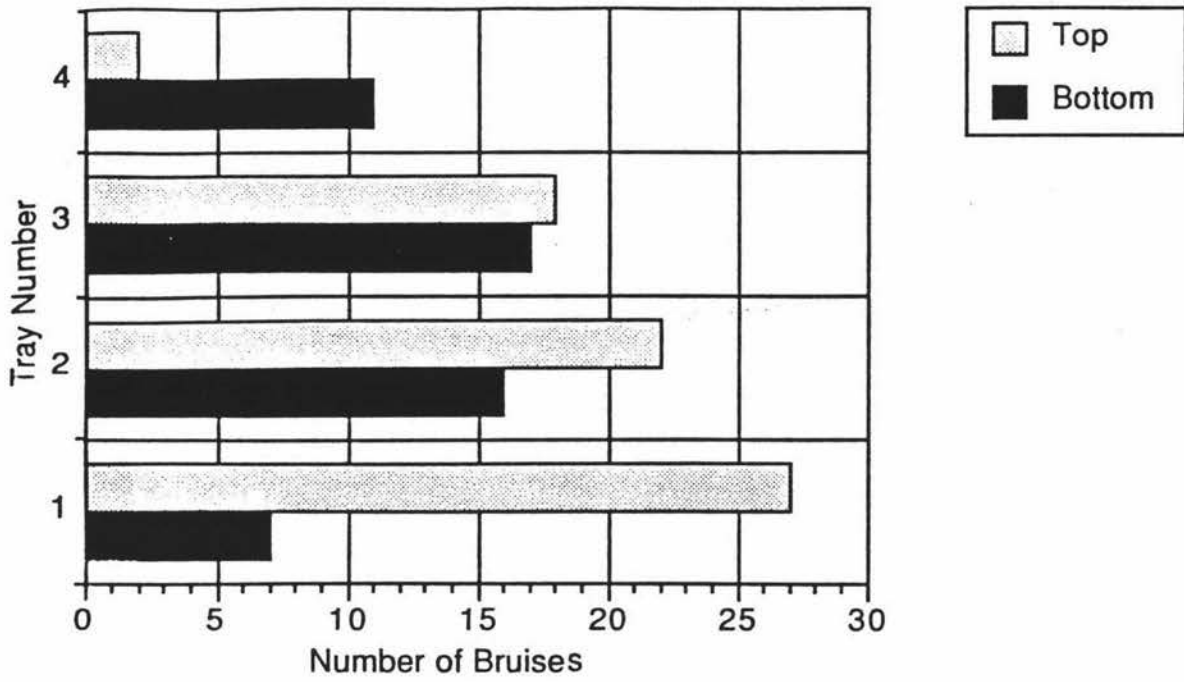


Graph 3 Number of Bruised Fruit in each Tray for Thickened Trays

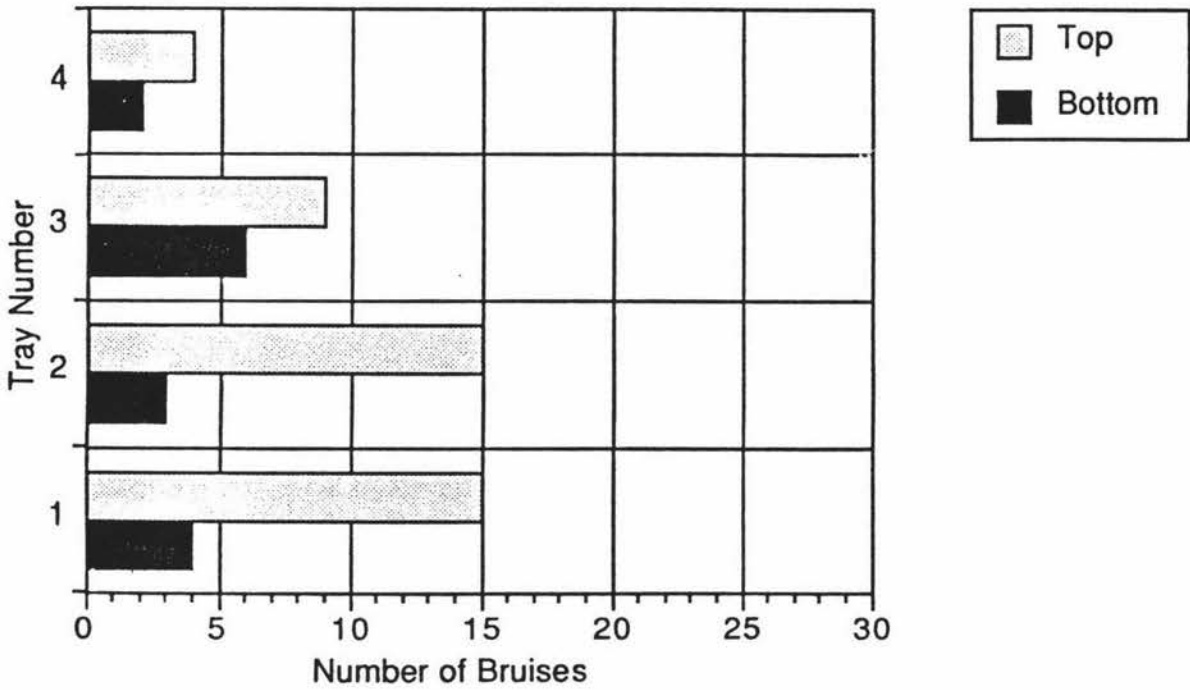


Graph 4 Number of Bruised Fruit in each Tray for Rigid Trays

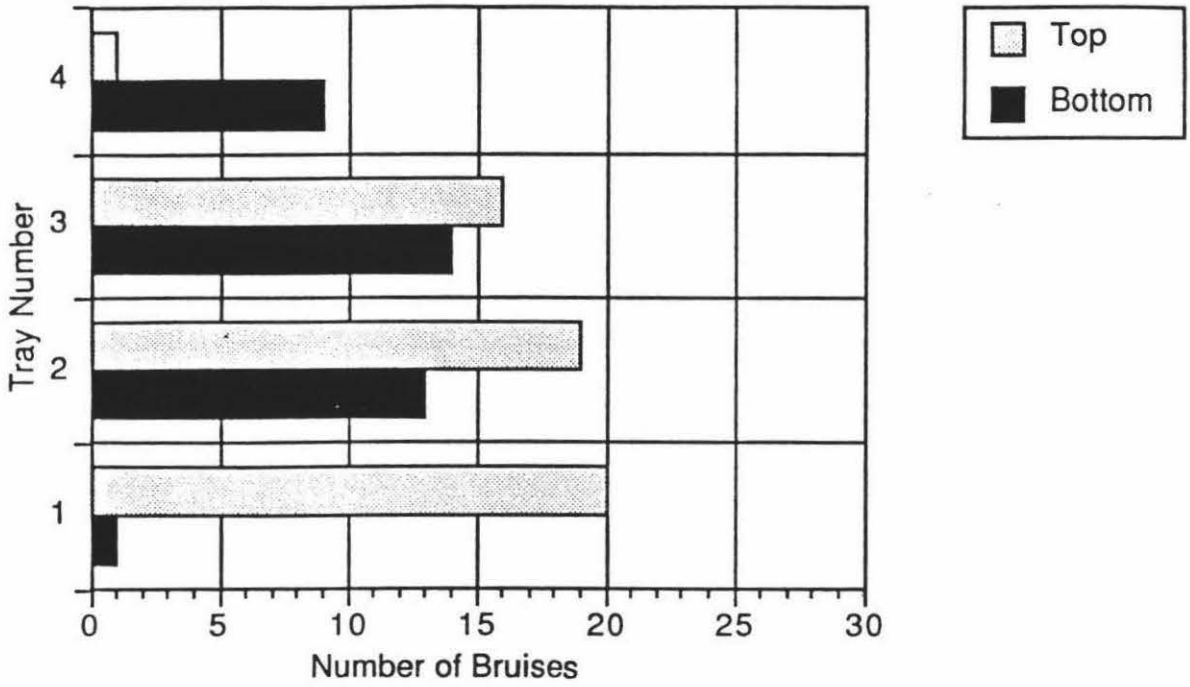
Figure 6.20 Graphs of Numbers of Bruised Fruit in One Off Tests with Count 88 Fruit



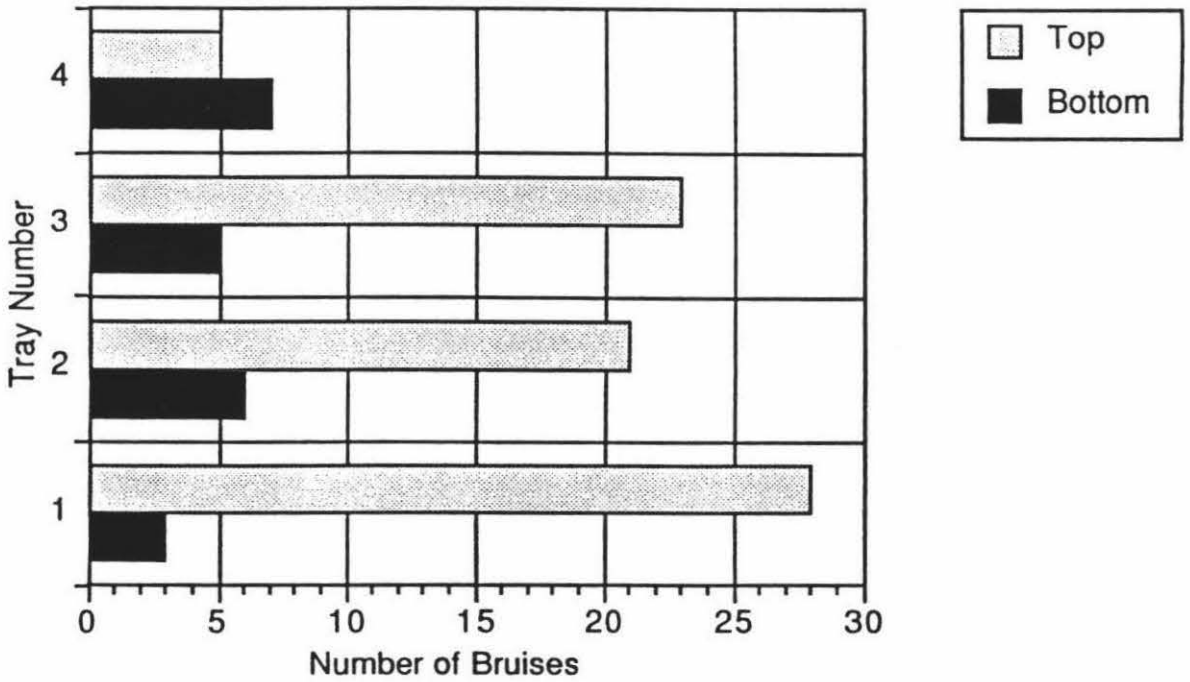
Graph 1 Number of Individual Bruises in each Tray for Standard Trays



Graph 2 Number of Individual Bruises in each Tray for Double Trays



Graph 3 Number of Individual Bruises in each Tray for Thickened Trays



Graph 4 Number of Individual Bruises in each Tray for Rigid Trays

Figure 6.21 Graphs of Numbers of Individual Bruises in One Off Tests with Count 88 Fruit

Chapter 7

ANALYSIS OF DROP TEST RESULTS

7.1 BRUISING ON THE FRUIT

The Count 88 cartons showed no significant difference in the number of bruised fruit between the two moisture contents ($t= 0.13$, $p=0.899$, $d.f.= 9$). However the extent of bruising varied significantly between the two count sizes. Comparisons showed that 79% of the Count 88 fruit were bruised compared to 27.5% of the Count 100 fruit. A t-test comparing Count 88 and Count 100 fruit confirmed that there was a significant difference between the performance of the two packs in terms of numbers of bruised fruit ($t=17.916$, $p=0.0001$, $d.f.= 9$).

Count 88 had approximately two thirds more bruised fruit and based on the energy dissipated in bruising the fruit, Count 88 apples each absorbed twice as much energy as the Count 100 fruit.

7.2 ENERGY BALANCE WITHIN THE CARTON AT IMPACT

Each carton of apples dropped from 0.6 m had a kinetic energy of approximately 110 joules which had to be dissipated by some means at impact. A proportion of this energy was dissipated in the form of bruising. Data for the Count 88 experiments showed no significant difference between the two treatments in terms of numbers of bruises or energy absorbed. Fruit with trays at 15% MC absorbed 13% of the kinetic energy in bruising compared to 12% for fruit with trays at 8% MC. A t-test of the energy absorbed in bruising confirmed that moisture content of the trays had no effect on tray performance as there was no statistically significant difference between the means ($t=1.021$, $p=0.333$, $d.f.= 9$).

The balance of the energy in Count 88 cartons was dissipated in a number of ways. Evidence of bruising on the top of the fruit in the top layer of the carton, presumably from fruit impacting against the lid, showed that some energy was absorbed through fruit movement within the carton (refer to Figures 6.18 and 6.19). A certain amount of energy was absorbed through fruit movement which was below the bruise threshold.

The two Count 88 experiments were conducted under identical conditions with tray moisture content being the variable tested. Tray splits were much more common in the 8% MC cartons than the 15% MC cartons. However this

appeared to account only for a small amount of energy as the extent of bruising was the same at both moisture contents. It is difficult to comment precisely on the relative benefits of tray splitting as an energy absorptive mechanism, although it seems highly probable that stretching or bending of the trays absorbed a significant proportion of the impact energy. Holt and Schoorl (1984) claimed that under impact the tray absorbed energy by stretching between the pockets in two horizontal directions.

The base of the cartons showed indentations where the bottom tray compressed the carton on impact, so further energy was dissipated through the corrugated cardboard being crushed.

As there was no appreciable bulk rebound of the Count 88 cartons, no energy could be readily accounted for through rebound as the carton appeared to land firmly and did not bounce. However it is likely that individual apples rebounded inside the carton, but failed to cause the whole carton to lift.

The Count 100 cartons demonstrated slightly different energy absorbing characteristics. The fruit absorbed only 2.5% of the energy which was significantly less than the Count 88 fruit. The apples also absorbed an amount of energy which was below the threshold to cause bruising. Unlike Count 88 cartons, rebound occurred absorbing a further 2.5% of the energy. Tray splitting and stretching accounted for a reasonable amount of energy absorption, with twice the number of splits per carton than the Count 88 cartons at 8% MC. Some energy was absorbed through the movement of fruit within the carton as there was a certain amount of 'give' in the 'hammock' style configuration. A large amount of this appeared to be below the bruise threshold as there was no evidence of bruising in the top tray. Indentations were also observed on the bottom of the carton where the fruit had compressed it on impact. The balance of energy was taken up in the cardboard carton and other mechanisms which were not defined.

A t-test comparing energy absorption by the fruit in Count 88 and Count 100 cartons at 8% MC confirmed that there was a significant difference between the performance of the two packs in terms of energy absorption ($t=14.909$, $p=0.0001$, $d.f.=9$).

7.3 EFFECT OF MOISTURE CONTENT IN TERMS OF TRAY STRENGTH AND FRUIT DAMAGE

Tray splits occurred most extensively in the Count 100 cartons as detailed in Table 6.3 and Appendix 9. The mean split length was similar to that of the Count 88 cartons at the same moisture content, although the mean number of splits per carton was significantly higher. Of the Count 88 cartons at 15% MC, only 4 of the ten cartons had tray splits.

The position of tray splits appeared to be random, (details of split positions are given in Appendix 9). The tensile strength tests in Chapter 5 showed positions E and O to be significantly weaker than the other split sites. This did not appear to affect the extent of splitting under impact as out of the Count 88 trials, splits occurred once at position E and twice at position O.

Count 88 cartons at 8% MC gave a very weak negative correlation between tray splits and extent of bruising, showing that there was essentially no relationship between tray splits and reduction in the amount of energy dissipated in creating bruises.

Count 100 cartons had a correlation of 0.78 indicating that there might possibly be some relationship between tray splitting and bruising. However the extent of the correlation is not strong enough to be able to cast judgements of great statistical validity with this size of sample.

Tensile strength tests showed that tray material at 15% MC had a tensile strength that was approximately 16% less than when it was at 8% MC. In terms of tray MC this did not appear to have any effect on the extent of bruising in Count 88 fruit which was the same at both moisture contents. However the trays at 15% MC did not show the same frequency of tray splits with only 5 split positions over 10 cartons of fruit (average 0.5 splits per carton) compared to an average of 7 split positions per carton at 8% MC. It would appear that since damper trays exhibit more stretch prior to failure (as demonstrated by the tensile strength tests), then under impact they tended to stretch rather than rupture.

Bruise distribution patterns varied between the 8% MC and the 15% MC cartons although the sum total of bruised fruit was the same in each carton. Trays 2 and 3 had a similar amount of bruised fruit at both moisture contents. The balance between bruising in the top and bottom trays varied with an average of 2 more apples bruised in the bottom tray, and an average of 2 apples less in the top tray at 8% MC when compared to the 15% MC cartons (refer to Figures 6.8 and 6.9). The total bruise volume in each layer progressively decreased up the pack. Cartons at 8% MC showed a 20% increase in bruise volume in the bottom tray

when compared to cartons at 15% MC, but displayed less bruise volume in all the other trays. This pattern could be related to the different characteristics of the trays at different moisture contents. It is possible that the trays at 15% MC absorbed more energy under compression than those at 8%. However under extension when the fruit moved in the tray, the energy absorbing characteristics of the trays at 8% MC were greater, possibly due to more energy being dissipated through tray splits than through stretching. However, overall, the net effect of stretching versus splitting in terms of fruit damage was difficult to quantify in precise terms within the scope of these experiments, but appeared to have no effect on the net result of number of bruised apples in cartons under single impact situations.

7.4 FRUIT DIAMETER AND WEIGHT

The measurements of diameter and weight of Count 88 fruit gave a weak correlation over 1000 fruit (Table 6.2). This became even weaker with a single carton. The variance showed that less than 10% of the variation in height of the fruit could be accounted for by the weight. Count 100 fruit showed similar trends, and although it was slightly stronger than the Count 88 data, the correlation was still weak. The weakness of the correlations of weight and diameter showed that both variables needed to be considered in the statistical analysis of bruise and split data.

7.5 RELATIONSHIP BETWEEN BRUISES, SPLITS, WEIGHT AND HEIGHT

When investigating the effects of bruises, tray splits and apple dimensions, the following questions were considered:

Was there less bruising on fruit beneath a tray split?

Did fruit with a larger vertical diameter than one of its neighbours bruise more frequently?

Did more splits occur immediately above fruit with a larger vertical diameter?

Was an apple below two heavier fruit more likely to be bruised?

Was tray splitting more common between pairs of heavier fruit?

7.5.1 Chi Squared Tests of Parameters

A series of Chi Squared Tests were undertaken to determine the independence of the different variables. Test statistic values are given in Appendix 11.

i Tray Splitting and Bruised Fruit

The presence of bruising on fruit directly below the split was determined. An example of the relationship is shown by apple c and split x in Figure 7.1 .

ii Tray Splitting and Fruit Weight

Tray splitting when the two fruit on either side of a split had a combined weight of greater than twice the mean weight of an apple in the count size was assessed. To be overweight the two Count 88 fruit required a combined weight of 422 g or more, and two Count 100 fruit needed a combined weight of 370 g or more. Pairs of fruit weighing less than this were deemed underweight. Positions of fruit in relation to split are shown as apples a and b with split x between in figure 7.1

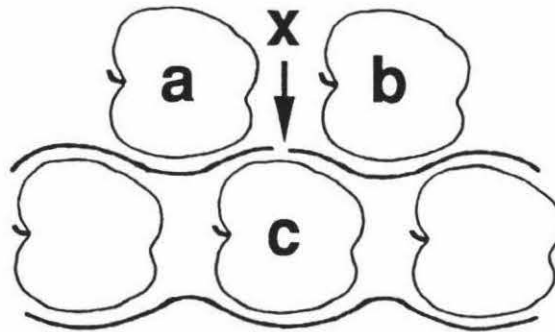


Figure 7.1 Relationship between Apples, Bruises and Splits

iii Bruising and Fruit Weight

The presence of bruising on an apple below when the two above were overweight was assessed as shown in Figure 7.1 with apples a and b over apple c.

iv Bruising and Fruit Height

The presence of bruising on an apple when there was a height difference between two adjacent fruit in the same row on a tray. The

vertical diameter was considered to be higher or lower if there was a 5 mm or greater difference between it and one of its neighbours. Fruit within a 5 mm range was considered to be of the same height .

7.5.2 Tray Splitting and Fruit Height

The only parameters that could not be determined by a Chi Squared test were with both the Count 88 treatments on Tray Splitting and Fruit Height, as 97% of the fruit had no height difference and all the splits occurred over these fruit. Tray splitting in relation to the height of the fruit directly beneath the split was determined as shown in Figure 7.1 by split x and apple c.

7.5.3 Conclusions

The Chi Squared Tests showed that none of the factors listed caused a significant effect ($p > 0.05$) in all instances for both the Count 88 and Count 100 fruit.

Therefore it can be concluded that the effect of tray splitting as an energy absorptive mechanism did not relate to the fruit in close proximity. The presence of heavier fruit above an apple did not cause more bruising nor did it put the tray under a tension great enough to split the tray on impact. Fruit with a larger diameter (within the count size) were not susceptible to more bruising nor did they act as a pivot forcing the tray above to stretch to the point of failure.

7.6 CARTON CONFIGURATIONS AND TRAY MATERIAL

The literature revealed that various synthetic materials such as polystyrene and polyurethane did not perform well in reducing damage to cartons of fruit under impact. In a number of instances these materials, which appear to have more shock absorbing characteristics than paper pulp, did show a reduction in bruising on the bottom layer of the carton (which is subjected to a direct upward force when the carton impacts the ground). However the trays did not function well at other layers in the carton. Trials impacting cartons onto polybubble

sheets on a concrete floor showed a good reduction in bruising in the carton as a whole, and especially in the bottom tray (Anderson 1983).

Using double trays in one carton of Count 88 fruit (whilst not statistically significant), did show a marked decrease in the reduction of bruises by 33%, and the energy absorbed in bruising was reduced by 8.05 J to 5.23 J. This effect could possibly be attributed to the cushioning effects and energy absorptive mechanisms of the two trays.

Using thickened trays showed a decrease in the number of bruises by 17% and the energy absorbed in bruising was reduced to 6.52 J. While the performance was not as good as double trays the effect was quite marked.

Rigid trays (which had no flexibility and were very hard) showed the same number of bruises as normal trays with the energy absorbed in bruising at 16.34J. The validity of this figure for comparative purposes is questionable as it falls within the range of the data for normal trays. The pattern of bruise distribution on the fruit was quite different with these rigid trays, in that large amounts of bruising were found on the top of the fruit (Figure 6.21, Graph 4) where it appears that on impact the fruit rebounded within the carton and hit an inflexible barrier. This indicated that not only the cushioning properties of the tray, but that the flexibility of the tray, were very important in terms of protecting the fruit from damage after impact. This appears to be especially crucial for packages of this configuration where the fruit directly abut one another.

However, it should be noted that the Count 100 configuration still performed the best with a 65% decrease in the number of bruised fruit in comparison to Count 88 cartons.

Chapter 8

GENERAL DISCUSSION AND CONCLUSIONS

8.1 DISCUSSION

The carton configurations of Count 88 and Count 100 apples were assessed through visual observation and by computed tomography to determine the spatial relationship of fruit within the packs. The Count 88 cartons had fruit in a 2x2 configuration and the apples were tightly packed. The fruit were in firm apposition with two contact points above and below for central fruit and one for those on the ends of the pack. The Count 100 cartons had fruit in a 3x2 configuration. The apples were more widely spaced on the trays, with the fruit being, to some degree, 'hammocked' by the Friday Tray with less direct pressure on adjacent fruit in the static state. However, under dynamic loading it was shown that force was transmitted between fruit at four contact points above and below for central fruit and at a lesser number for those on the periphery of the pack.

Count 88 apples packed in a 2x2 configuration showed significantly more damage from high energy impacts when compared to Count 100 apples packed in a 3x2 configuration. The dissipation of energy takes place through a number of mechanisms. It is believed that because the Count 88 fruit are tightly packed in a 2x2 configuration, energy is predominantly absorbed by direct impact of the fruit, the force of which is frequently above the bruise threshold. With the Count 100 configuration there is more space between the fruit and it is believed that significant energy is absorbed by the mechanism of the 'hammock effect' of the Friday Trays leaving less for direct impact which may on occasion be below the bruise threshold. The number of contact points which each apple has with its neighbours will also affect the distribution of the energy dissipated and is higher with Count 100 than Count 88 packs. Peleg (1985) noted that the greater the number of contact points supporting each fruit in a pack, the less the pressure at each point since the forces are distributed over a larger area of the fruit.

There is evidence to suggest that Count 88 fruit packed in the 2x2 configuration may have less bruising if a more energy absorptive tray material were used. From the literature and the results of these trials it is apparent that the optimum physical properties of the tray material will vary with the configuration of the pack. Tightly packed Count 88 apples require tray material with good cushioning and

energy absorptive characteristics. Count 100 packs with their more widely spaced arrangement require trays that have some elasticity to allow controlled movement of fruit within the carton. Crosby (1984) showed that double trays reduced the bruising in Count 88 cartons by 50% compared to only 20% in Count 100 cartons. This supports the suggestion that less energy is dissipated by direct impact between fruit in a Count 100 configuration. Anderson (1983) showed that polystyrene trays performed favourably on the bottom tray and trays 3 and 4 in Count 88 packs. In her work, Count 113 cartons with a 3x2 configuration showed less bruising in the bottom tray but more bruising in the other trays. In association with the knowledge that polystyrene is less elastic and more brittle, these findings support the concept of the 'hammock effect' and that a tray with some 'give' in it has benefit in the more widely spaced 3x2 configurations, whereas the Count 88 packs need the cushioning effect of the tray material as the fruit is so tightly packed.

The effects of carton rebound was studied. Count 88 cartons did not display any appreciable rebound and it is assumed that the tightness of the Count 88 pack caused it to land squarely on the floor. The Count 100 cartons lifted significantly after impact and rocked several times before reaching equilibrium. It was postulated that the larger free space in this packing arrangement allowed the fruit to move more readily than in the Count 88 carton. However on measurement the energy absorbed by rebound was shown to be small.

The tensile strength of samples of Friday trays showed that they were 16% stronger at 8% moisture content (MC) than at 15% MC. A comparison of the amount of energy absorption by the trays at these two moisture contents was made, with all other factors being kept constant. This showed that whilst tray splitting was more common with trays at 8% MC the total energy absorbed was not altered and it is presumed that variation in some other physical property, such as the ability to stretch, may have been responsible for this.

The literature showed that increasing the weight of the trays had an effect on the bruise distribution by decreasing bruising in the bottom two layers but increasing it in the top two layers in Count 80 2x2 packs (Byrom 1983). A possible explanation is that the increased thickness in the bottom tray absorbed energy under direct impact but made the trays between the upper layers less flexible and so reduced the amount of 'give' or 'stretch' which would have aided in the energy dissipation. However these trials were with Count 80 cartons which are not as tightly packed as Count 88 cartons.

One off tests showed a reduction in energy absorbed in bruising using double trays and thickened trays in Count 88 packs, and further investigation is warranted. The production of thickened trays would not be difficult as tray thickness is directly related to the number of holes in the die and the length of time that it is in the vat of pulp. An additional series of holes could be added at the centre of the pockets to increase thickness in a localised area at minimal expense, or alternatively an overall thicker tray could be produced. However any increase in the thickness of the trays will result in additional overfill of the carton which may have adverse effects. Associated alteration in flexibility may be important and should be subject to careful investigation.

Redesign of the Count 88 pack, to utilise a 3x2 configuration, may have benefits in terms of bruise reduction under impact. as the previously described 'hammock effect' appears to be a protective mechanism in the Count 100 pack, but the closer spacing of the present Count 88 pack precludes this. To achieve a five layer Count 88 pack an additional tray would be required. Using a and b style trays of 18 and 17 apples respectively, the fruit would assume a configuration similar to that of the Count 100 pack (refer Chapter 2 Figure 2.6). Under this configuration each of the central apples in a carton would be supported at four contact points, with fruit on the edges being supported at three, and fruit on the corners being supported at two. In view of the evidence showing reduction in bruising in the five layer Count 100 pack it is therefore suggested that this concept be applied experimentally to the Count 88 pack. It is not possible to predict the results as Count 88 fruit are larger than Count 100 fruit and the spacing between the apples would be less. The 'hammock effect' would thereby be reduced and it is likely that the extent of bruising would still be greater than that displayed in Count 100 packs.

8.2 CONCLUSIONS

It is concluded from this study that:

The tighter packing of Count 88 fruit in the 2x2 configuration did not offer the same protection as the more widely spaced packing of Count 100 fruit in a 3x2 configuration under high energy impact situations. Looser packs, where the apples are positioned in 'hammocks' between fruit, appeared to be beneficial. With this arrangement a substantial proportion of the forces of impact are dissipated at a level below the bruise threshold.

Increasing the number of contact points that each apple has with its neighbours will reduce the point loading and raise the probability that the force at each will be less than the bruise threshold.

Tray material at 15% moisture content (MC) exhibited more stretch prior to rupture and displayed a lower tensile strength than that at 8% MC. When tested under standard impact conditions trays at 15% MC split less readily than those at 8% MC but the overall net result in terms of energy absorbed (as shown by bruising of the fruit) was the same, indicating that the energy absorptive mechanisms between trays of different moisture contents may differ. The effects of tray elasticity or stretching is probably a more important factor in terms of energy absorption. Tray splitting however did not absorb large amounts of energy at impact. In Count 88 and Count 100 cartons, providing that fruit are within the correct weight range for the count size, their dimensions did not influence the formation of splits in trays or bruises on the fruit.

The cushioning properties of tray material interposed between the fruit is important in the 2x2 configuration Count 88 pack where fruit directly abut on one another, and there may be less bruising on impact if a more energy absorptive tray material were used. This was noted in the one-off tests, and also in the literature (Anderson 1883; Crosby 1984) where there was a reduction in bruising in 2x2 configuration cartons packed with double trays and polystyrene trays. It is also supported by the findings that 3x2 configuration cartons subjected to the same conditions showed a much less marked reduction in bruising.

Of the energy available at impact, mechanisms of the packaging in Count 88 cartons dissipated 87%, whilst Count 100 cartons dissipated 97.5%. Count 88 cartons showed no appreciable rebound at impact, however measurement of rebound of Count 100 cartons showed that this was only a relatively small energy absorbing process.

Count 88 fruit used in this research project was of local market grade supplied in plastic crates and Count 100 fruit was of export grade supplied in export cartons. Problems were noted with regard to fruit weight and bruising on arrival. Approximately 25% of the apples had to be graded out for exceeding the weight limit in each count size or for excessive bruising. There is evidence in the literature that apples have been packed with bruising above the NZAPMB specification of 6% (Lenting 1989b, 1989c) indicating that this is not a new problem. The effect of putting larger apples in a carton was not tested but has been mentioned by Crosby et al (1983) as being a causal agent in damaged produce on out-turn overseas.

Chapter 9

RECOMMENDATIONS FOR FURTHER RESEARCH

There are a number of areas where further investigation is warranted. These include:

Drop Test Experiments using Count 100 cartons of fruit with trays at 15% moisture content, and Count 80 cartons at both 8% and 15% moisture content for comparative purposes with the data obtained in this report.

An assessment of 2x2 and 3x2 pack performance through computerised modelling to assess suitability of a 5 layer Count 88 configuration which includes both static and dynamic load modelling of tray configurations. If this appears promising trays would need to be produced and extensive drop tests undertaken to assess the performance in practice.

A study of packing densities in different pack sizes and the effect of this on fruit damage.

The definition of underfill and overfill in relation to count size or packing configuration needs to be defined and the implication of this on count size and configuration should be examined.

Investigation of the variation of size in fruit due to mis-grading, the reasons for this, and the effect it has on fruit damage. The extent of bruising immediately after packing, prior to export or coolstorage should be documented.

An investigation into wider aspects of how impact damage on fruit can be reduced during picking, grading and handling between the grower and consumer.

It should also be noted that in packaging research involving fruit, adequate scale trials are essential to ensure that the results achieve statistically sound data as detailed in Appendix 12.

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Appendix 1

THE THEORY OF BRUISING IN APPLES

1.1 MECHANISMS OF BRUISING IN APPLES

When apples are subjected to a stress from either a static load or an impact, energy is absorbed. If the stress is of sufficient force, cells will burst resulting in a bruised region. Holt and Schoolt (1977) found that the bruise volume was correlated with the energy absorbed by the fruit. They then proposed a simple model to explain the behaviour of apple tissue. This assumed that apple tissue was comprised of liquid filled spherical cells, bounded by thin visco-elastic membranes with air filled interstitial spaces. When this idealised apple was compressed, individual cells near the contact surface distorted resulting in cell wall distension, from the assumption that the cell liquid was incompressible and could not penetrate the walls quickly. Initially this distortion was elastic and the whole apple behaved like an elastic body. Under further compression, the walls of the cells near the contact surface reached the limit of their elasticity and broke releasing cell contents. The elastic region was then established some further distance into the apple along a constant shear stress surface. This process continued until all the impinging energy was either dissipated by the cell breakage or stored by the elastic membrane distension. The subsequent bruise volume and shape were determined by the amount of energy dissipated and the distribution of shearing stress in the apple (Holt and Schoolt 1977).

Bruise volumes were higher at slow strain rates when compared with those under impact conditions. This can be explained by visco-elastic behaviour of the cell wall material. According to Holt and Schoolt (1977), Preston (1955) reported that the cellulose microfibrils in cell walls could fail by slipping or breaking across, fracturing primary valence bonds. It was postulated that under slow strain rates the sinuous microfibrils straightened out and then slipped relative to each other. Under dynamic conditions, however, they straightened out and snapped, with more energy being dissipated in breaking, and hence bruising was decreased.

Apple bruising caused by impact is a complex phenomenon. Different researchers have differing views on the mechanisms involved. Several researchers have used the elastic model developed by Hertz (1881) to describe the stress distribution, and then used different failure criterion to describe bruising. Segerlind and Dal Fabbro

(1978) attributed bruising to normal stress or strain failure, while Diehl (1979) and Peleg (1976) believed it was due to shear stress failure. Dal Fabbro (1980) felt that increased strain rates reduced stress levels when failure occurred, while Chen (1972) believed the converse to be true. Holt and Schoorl (1982) proposed that bruising was a shear phenomenon occurring when the difference in principal stresses reached some limit.

In 1977 Holt and Schoorl showed that due to the good correlation between bruise volume and energy absorbed by a bruise, distortion energy could be used in bruise predictions. Zhang et al (1990) combined both the Hertz Contact Theory and the Distortion Energy Theory and described impact induced bruising in apples as a time function, and that failure was a coincident result of tensile, compressive and shear stresses.

1.2 BRUISE RESISTANCE, BRUISE VOLUMES AND ENERGY CALCULATIONS

Apple varieties vary in their capacity to resist bruising. To be able to compare the effects of stresses placed on different varieties Holt and Schoorl (1978), and Schoorl and Holt (1980) suggested various methods to determine bruise resistance, bruise volumes and energy absorbed that enable comparisons with different cultivars to be made.

Holt and Schoorl (1977) showed that energy absorbed during compression for both impact and slow compression was a good predictor of the extent of bruising in apples. They considered that the converse of was also true.

Susceptibility to bruising varied with each cultivar and the severity of bruising that an apple could sustain was related to the humidity of the cool store and temperature, length of time in storage and flesh temperature (Holt and Schoorl 1978; Schoorl and Holt 1980; Zhang et al 1992; Klein 1987).

In 1980 Schoorl and Holt reported a method to determine energy absorption by means of a Bruise Resistance Coefficient coupled with bruise volume measurements. This enabled data from different lines of fruit, or different experiments to be compared. Their earlier work showed that there was a strong linear correlation between bruise volume and energy absorbed by apples under both dynamic and static loads. The relationship was in the form $V = A E_a + B$. The intercept B was small and resulted from curve fitting, and Schoorl and Holt (1980)

suggested that it did not appear to be otherwise meaningful, and could be ignored for practical purposes. Therefore the coefficient A became a measurement of the resistance of the apple flesh to bruising in mL/J. Schoolt and Holt (1980) found that bruise boundaries coincided with surfaces of constant shear stress and postulated that the bruise resistance coefficient may be a measure of the shear strength of the apple flesh. The larger the coefficient the more prone the apple was to bruising, smaller values indicated a high resistance to bruising or a high shear strength.

1.2.1 Bruise Volume

The Holt and Schoolt (1977) method to determine bruise volumes was based on the diameter and depth of the bruise when cut through the centre of the bruised region in line with the flower-stalk axis. The shape of a bruise was approximately spherical above and below the contact plane as shown in Figure 1.1.

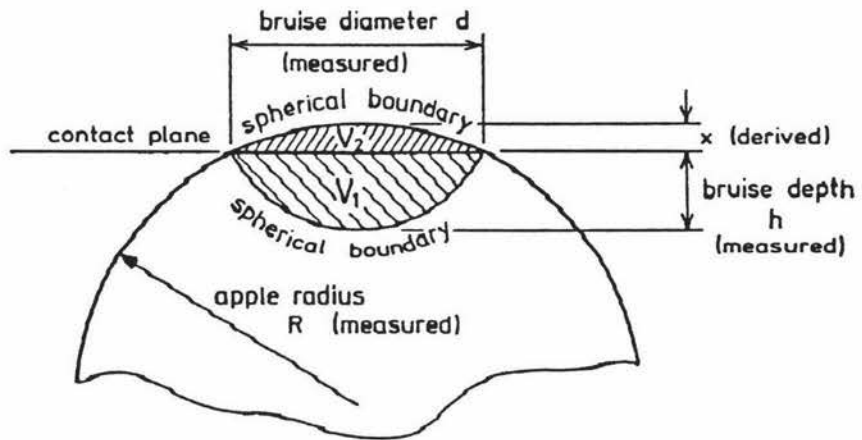


Figure 1.1 Idealised bruise from Schoolt and Holt (1980)

Total bruise volumes can be calculated from measuring the diameter and depth (Mohsenin 1970, and Holt and Schoorl 1977) using the following equation:

$$V_{\text{total}} = V_1 + V_2$$

Where

V_1 = bruise volume below the contact plane

V_2 = bruise volume above the contact plane

As these volumes were assumed to be spherical segments, they could be calculated from the bruise dimensions

$$V_1 = \pi h/24(3d^2+4h^2)$$

$$V_2 = \pi x/24(3d^2+4h^2)$$

$$V_{\text{total}} = \pi h/24(3d^2+4h^2) + \pi x/24(3d^2+4h^2)$$

Where

V= bruise volume in mL

$$x = R - \sqrt{R^2 - d^2/4}$$

R= radius of apple in mm

h= depth of bruising below contact plane in mm

1.2.2 Energy Absorbed

Schoorl and Holt (1980) demonstrated that under high energy conditions bruising was related to the amount of energy that an apple absorbed at impact. For single apples or for cartons dropped onto a solid surface, the energy absorbed could be calculated (Schoorl and Holt 1980):

$$E_a = mg(h_1 - h_2)$$

Where

E_a = energy absorbed (J)

m = mass of apple or carton (kg)

g = gravitational constant 9.81 m/s^2

h_1 = drop height (m)

h_2 = rebound height (m)

1.2.3 Bruise Resistance Coefficient C

The Bruise Resistance Coefficient can be calculated from the energy absorbed by the bruise divided by the volume of the bruise. (Holt and Schoolt, 1984):

$$C = E_a / V_{\text{total}}$$

Where

C = Bruise Resistance Coefficient (mL/J)

$$V_{\text{total}} = Cmgh$$

Note. C must be calculated using a sample of the apples in concern at the same temperature as in the experiments. Schoolt and Holt (1980) stated that for a 10% accuracy ($p=0.1$), the average of 10 impacts was sufficient to determine a value for C . Pang et al (1992) noted that if an apple was unbruised, the value for C was infinite, their work proposed Bruise Susceptibility, which is the inverse of C , as an alternative measurement for bruising.

Appendix 2

THE PROPERTIES AND STRENGTH OF PAPER AND PAPER PRODUCTS

2.1 PROPERTIES OF PAPER

The physical properties of paper have been discussed by Britt (1970). Paper is made up of cellulosic fibres that are hygroscopic, that is, they are capable of absorbing water from the surrounding atmosphere. The amount of water absorbed depends on the relative humidity and temperature of the air in contact with the paper. However, the cellulosic fibres exhibit hysteresis and so a sample of paper under the same temperature and relative humidity may display differing moisture contents depending on whether the sample approached these conditions from a more dry or more moist state (Britt 1970).

Most physical properties of paper undergo change as a result of variations in moisture content. Water has the effect of plasticising the cellulose fibres as well as relaxing and weakening the interfibre bonding, and so moisture content has a marked effect on many paper properties. Paper becomes notably stiffer and less flexible under dry conditions (Britt 1970). At relatively high humidities of 80-90% properties such as folding endurance, tearing strength and stretch are at their greatest. These decrease at lower humidities as the fibres become more stiff and brittle. Tensile strength is at its greatest under low humidity conditions and decreases steadily with increasing moisture content, presumably due to the weakening of interfibre bonding.

2.2 FACTORS AFFECTING TENSILE STRENGTH

There are four interacting factors that determine the tensile strength properties of paper. These factors are strength of individual fibres, length of fibres, the inherent bonding ability of the fibre surface in terms of bonded area and strength per unit of bonded area, and the structure and formation of the paper.

Interfibre bonding in paper is a predominant factor in tensile strength, with fibre strength playing a secondary role (Britt 1970). This was shown in by a study in which the percentage of ruptured fibres in a paper break was determined and Van

der Akker (1960) concluded that fibre bonding is a substantial component of fibre strength.

Fibre length affects the strength of paper to a certain degree. The strongest paper is made from relatively long fibres of 3-6 mm in length. There is a limit to which longer fibres will contribute to paper strength as they result in paper with uneven formation which is inherently weak.

Paper pulps vary in their tendency to form interfibre bonds. The beating and refining action in paper manufacture has the effect of swelling the fibre. This increases the imbibition of water by rupturing and fibrillating the fibre surface and rendering the fibre more flexible and better able to mat and contact neighbouring fibres. Pressure exerted on the wet sheet is also important in promoting bonding. The bonding of a paper stock can be increased by the addition of adhesive agents that the fibre surface absorbs and then acts as a cementing agent between fibres.

Appendix 3

MANUFACTURE OF PULP TRAYS

3.1 INTRODUCTION

Extensive library searches revealed no published details on the production of recycled paper pulp trays. Two visits were therefore undertaken to the Auckland branch of Printpac UEB and to Chequer Moulded Pulp to investigate the production process. Specific information pertaining to the production of Friday Trays is held confidential within each firm and details in this section are based purely on personal communications with G Smith (1993) and J Lavalette (1993) as well as observations made during the plant tour.

The NZAPMB draws trays from three plants in New Zealand, the majority being produced by Printpac UEB Moulded Fibre in their Auckland and Nelson plants. In 1991 Chequer Moulded Pulp Ltd in Auckland started to produce a limited range of Friday Trays. There is some variation in the design of the dies used at each plant, but they all adhere to the same manufacturing specifications provided by The Board regarding weight, dimensions and other factors as outlined in Appendix 4 . It should be noted that within this specification, there are no criteria pertaining to the strength of the tray.

3.2 RAW PRODUCT

At the time of the visit, Friday Trays were being made wholly from recycled paper. The Printpac UEB plants have a contract with a waste paper collection company (Paper Chase) and take all the paper from road side recycling programmes in Auckland and Christchurch. The bulk of their supply was newspapers. Chequer Moulded Pulp had a contract with Telecom and used recycled telephone books in combination with Kraft paper.

The type of paper used ultimately affects the final product strength and characteristics. Glossy paper, carton manufacturers waste, and paper with a high wet strength if used large quantities will lead to an inferior product. Kraft paper has relatively long fibres which is believed to increase the cushioning properties of the trays (Smith 1993).

3.3 MANUFACTURING PROCESS

Rendering waste paper into pulp was done by either a shredding process or through a rotating drum operating in a similar manner to a concrete mixer. The paper, once reduced to 4% pulp, was fed through a rotating screen to remove any foreign matter. Various chemicals were added depending on the nature of the pulp mix and may include kymenes and rosins to give wet strength to the pulp, dyes and dye fixatives, defoamers, acid to raise the pH, alum to bond the chemicals, and wax for water repulsion in the final product (Lavalette 1993).

Dies to make the trays rotate through a vat of pulp. The dies consisted of a brass former covered in one or two layers of 0.8 mm mesh. The brass former had holes in it through which a suction of 0.8 bar pressure was used to suck pulp onto the die. Placement of these holes dictated the thickness of the pulp in specific regions of the tray. As the loaded die moved out of the vat, warm water was sprayed onto the back of it to force fine particles into the tray, to remove any feathering round the edges and to also give a smoother finish. By reversing the suction, the tray was blown off the die onto another rotating roller which dropped it onto a conveyor and into the drying oven. The ovens were gas fired and ran at 200°C taking approximately 4 minutes for the trays to dry.

3.4 QUALITY CONTROL

Quality control procedures operated to ensure that the trays were produced to the correct weight. Because of the drying time, it took approximately 5 minutes of a production run to check any changes made. It appeared that any necessary changes were made very much on a trial and error basis. If the trays were too heavy either the speed of the rotating dies was increased or water was added to the pulp mix. Conversely if the trays were too light the speed was adjusted so that the dies spent longer in the pulp vat.

Tests were also conducted on water resistance and a colour to ensure that these specification were met.

Appendix 4

NZAPMB TRAY MANUFACTURING SPECIFICATIONS



SPECIFICATION - FIBRE TRAYS

1.0 PURPOSE

The purpose of this procedure is to define the way Fibre Trays made for NZAPMB shall be produced.

2.0 POLICY

It shall be the policy of NZAPMB that all Fibre Trays produced for them shall meet this specification.

3.0 RESPONSIBILITY

It shall be the responsibility of the Fibre Tray manufacturers to ensure that trays produced for NZAPMB meet this specification.

4.0 SPECIFICATION

4.1 Weight:

80 ± 5g oven dry (Averaged over four trays). Test method based on AS1301.401s-78.

4.2 Dimensions:

Fibre Products	500 x 300mm
PRINTPAC-UEB	500 x 304mm

4.3 Moisture Content:

Aim 10%, Max 13% when packed (Averaged over four trays).
Test Method based on AS1301.401s-78.

4.4 Ventilation Spaces/Hand Holds:

Hand holds shall be provided at the ends of each tray.

4.5 Colour:

To be confirmed.

4.6 Tray Finish:

Top Side - Area in contact with the fruit shall be smooth and free from all lumps and foreign matter which will damage the fruit.

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SPECIFICATION - FIBRE TRAYS

Underside - To be confirmed.

4.7 Foreign Matter:

Foreign matter shall not be permitted in areas which will cause damage to the fruit. No more than 20 flecks/tray shall be permitted. These must be clearly discernable on the upper surface of the tray, held at arms length. The flecks must be at least 2mm long.

4.8 Edges:

Excessive flash which prevents the tray fitting into the case neatly shall not be permitted. Trays with folded or rolled edges must not be in bundles.

4.9 Identification:

Each tray shall be clearly identified with the count number.

4.10 Tears:

No tears or holes off machine shall be permitted.

4.11 Packaging:

Each bundle shall be strapped and contain 125 trays. Each bundle shall have its own count label and a manufacturing date. All palletised trays shall be shrowded.

4.12 Palletising:

Each pallet shall contain 63 bundles, 9 bundles per layer, 7 bundles high. The pallet shall be covered using a protective shroud to stabilise the pallet load and to give protection for 1 years outside storage. The pallet is to be sufficiently stabilised to allow movement of the unwrapped pallet. The count size label with manufacturing date is to be weather proof and clearly visible from the outside of the pallet shroud. Pallet size is 1500 x 1080mm.

4.13 Hygiene:

To be confirmed.

4.14 Chemical Additives:

All chemical additives used in the manufacture of moulded pulp trays must comply with the following or their equivalent:

FDA Regulation 176:170 - Components of paper and paperboard in contact with aqueous and fatty foods.

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SPECIFICATION - FIBRE TRAYS

FDA Regulation 176:180 - Components of paper and paperboard in contact with dry food.

The USFDA has not granted specific approval for any dyestuff used in paper colouration. The usage of the dyestuff used at present is based on a history of safe use which is recognised by the FDA and demonstrable non-migration as determined by appropriate testing.

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Appendix 5

BRUISE RESISTANCE COEFFICIENT TEST DATA

Bruise Resistance Coefficient Data as Calculated for Count 88 Cartons 1 -10 and One-off Tests

Apple:	Wt	D 1	D 2	D Av	R		RBA	Ht	d	h	X	Vol	E	B Co	RBB	Ht	d	h	X	Vol	E	B Co	
1	210	74.0	74.0	74.0	37.0		0.49	0.035	23.5	7.00	1.92	2.16	0.22	10.0	0.49	0.035	24.5	7.50	2.09	2.54	0.22	11.8	
2	213	78.5	78.5	78.5	39.2		0.51	0.038	25.5	7.50	2.13	2.74	0.21	12.9	0.53	0.041	25.5	8.00	2.13	2.92	0.21	14.2	
3	214	75.0	75.0	75.0	37.5		0.49	0.035	24.5	7.50	2.06	2.53	0.22	11.5	0.52	0.040	23.5	7.00	1.89	2.15	0.21	10.2	
4	200	74.5	74.5	74.5	37.2		0.49	0.035	22.5	6.00	1.74	1.68	0.21	8.2									
5	200	78.5	78.5	78.5	39.2		0.49	0.035	23.0	6.50	1.72	1.89	0.21	9.2	0.48	0.034	22.5	7.00	1.65	1.94	0.21	9.3	
6	207	75.5	75.5	75.5	37.8										0.49	0.035	25.5	7.00	2.22	2.59	0.21	12.2	
7	210	76.5	76.5	76.5	38.2		0.48	0.034	24.0	6.50	1.93	2.09	0.22	9.6	0.50	0.037	24.0	7.50	1.93	2.41	0.21	11.3	
8	217	80.0	80.0	80.0	40.0																		
9	200	80.5	80.5	80.5	40.2		0.50	0.037	20.5	7.00	1.33	1.59	0.20	7.8									
10	210	82.5	82.5	82.5	41.2		0.49	0.035	21.5	6.50	1.43	1.61	0.22	7.5	0.51	0.038	23.0	6.50	1.64	1.87	0.21	8.9	
11	220	79.0	79.0	79.0	39.5										0.50	0.037	22.0	6.00	1.56	1.58	0.22	7.1	
12	204	78.0	78.0	78.0	39.0		0.50	0.037	20.5	6.50	1.37	1.47	0.21	7.1	0.49	0.035	20.0	7.00	1.30	1.52	0.21	7.2	
13	220	80.0	80.0	80.0	40.0		0.48	0.034	23.5	6.00	1.76	1.83	0.23	8.0	0.50	0.037	23.5	7.00	1.76	2.12	0.22	9.5	
14	211	76.0	76.0	76.0	38.0		0.49	0.035	23.5	7.50	1.86	2.30	0.22	10.6									
15	217	76.5	76.5	76.5	38.2		0.49	0.035	27.0	5.50	2.46	2.40	0.22	10.8	0.51	0.038	22.0	8.00	1.62	2.15	0.22	9.9	
16	216	78.0	78.0	78.0	39.0		0.50	0.037	24.0	6.00	1.89	1.93	0.22	8.8	0.50	0.037	21.0	6.50	1.44	1.55	0.22	7.1	
17	212	76.5	76.5	76.5	38.2		0.49	0.035	23.5	6.50	1.85	1.99	0.22	9.2	0.50	0.037	21.5	7.00	1.54	1.77	0.21	8.2	
18	217	78.5	78.5	78.5	39.2		0.50	0.037	22.0	6.50	1.57	1.71	0.22	7.8	0.46	0.031	23.0	7.00	1.72	2.03	0.23	8.8	
19	220	78.0	78.0	78.0	39.0		0.46	0.031	21.5	5.50	1.51	1.38	0.24	5.9	0.49	0.035	24.0	7.00	1.89	2.24	0.23	9.9	
20	232	78.0	83.0	80.5	40.2		0.49	0.035	28.0	8.50	2.51	3.81	0.24	16.0	0.56	0.046	22.0	5.50	1.53	1.45	0.21	6.8	
21	212	80.5	77.5	79.0	39.5		0.52	0.040	26.0	7.00	2.20	2.68	0.21	12.8	0.50	0.037	24.0	7.00	1.87	2.23	0.21	10.4	
22	200	74.5	74.5	74.5	37.2		0.51	0.038	22.5	5.50	1.74	1.55	0.20	7.8									
																	9.06	B Co		2.23	sd		

Table 5.1 Bruise Resistance Coefficient for Count 88 Cartons 1 to 10 and the One-off Tests
Bruise Resistance Coefficient 9.06, standard deviation 2.23

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, RBA -horizontal rebound distance on side A of apple in m (off video), RBB - horizontal rebound distance on side B of apple in m (off video), Ht- rebound distance converted into vertical height, d-Diameter of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise, B Co-Bruising Coefficient (as calculated). Blanks indicate invalid data.

Bruise Resistance Coefficient Data as Calculated for Count 88 Cartons 11 -20

Apple	Wt	D 1	D 2	D Av	R	RBA	Ht	d	h	X	Vol	E	B Co	RBB	Ht	d	h	X	Vol	E	B Co
1	209	75	79	77.0	38.5	0.52	0.040	24	8	1.92	2.57	0.21	12.5	0.52	0.040	25	8	2.09	2.81	0.21	13.7
2	209	75.5	80	77.8	38.9	0.51	0.038	21.5	6.5	1.52	1.63	0.21	7.8	0.51	0.038	23	7	1.74	2.04	0.21	9.8
3	206	81	75	78.0	39.0	0.51	0.038	25.5	7.5	2.14	2.74	0.21	13.3	0.52	0.040	26	8	2.23	3.06	0.20	15.1
4	217	77	81	79.0	39.5	0.49	0.035	22	4	1.56	1.10	0.22	4.9	0.49	0.035	20.5	7	1.35	1.59	0.22	7.1
5	217	78	76	77.0	38.5	0.49	0.035	21.5	6	1.53	1.51	0.22	6.8	0.52	0.040	22.5	8	1.68	2.25	0.21	10.5
6	213	77.5	77.5	77.5	38.8	0.54	0.043	23	8	1.75	2.35	0.20	11.6	0.5	0.037	23	8	1.75	2.35	0.22	10.9
7	209	79	78	78.5	39.2	0.51	0.038	23.5	8.5	1.80	2.62	0.21	12.6	0.51	0.038	20.5	7.5	1.36	1.72	0.21	8.3
8	214	78	73	75.5	37.8	0.51	0.038	23.5	7.5	1.88	2.31	0.21	10.8	0.48	0.034	21	7	1.49	1.69	0.22	7.6
9	210	76	77	76.5	38.2	0.49	0.035	23	8	1.77	2.36	0.22	10.9	0.49	0.035	22.5	6.5	1.69	1.81	0.22	8.4
10	216	77.5	76	76.8	38.4	0.52	0.040	22.5	7	1.69	1.95	0.21	9.2	0.5	0.037	24.5	7	2.01	2.35	0.22	10.8
11	212	77	77	77.0	38.5	0.53	0.041	23	7.5	1.76	2.19	0.21	10.7	0.51	0.038	23	7.5	1.76	2.19	0.21	10.4
12	216	74	78	76.0	38.0	0.51	0.038	25	6.5	2.11	2.30	0.22	10.7	0.51	0.038	25	8	2.11	2.82	0.22	13.1
13	214	77	78	77.5	38.8	0.53	0.041	23	7	1.75	2.04	0.21	9.8	0.51	0.038	23.5	6.5	1.82	1.99	0.21	9.3
14	214	75	78	76.5	38.2	0.45	0.030	21.5	7.5	1.54	1.91	0.23	8.2	0.51	0.038	26.5	7.5	2.37	3.01	0.21	14.1
15	207	75	76	75.5	37.8	0.52	0.040	22	8	1.64	2.15	0.20	10.6	0.52	0.040	19.5	8	1.28	1.70	0.20	8.3
16	208	80	76	78.0	39.0	0.54	0.043	22	6.5	1.58	1.71	0.20	8.7	0.48	0.034	21	7.5	1.44	1.81	0.22	8.4
17	210	77	79	78.0	39.0	0.52	0.040	24.5	8	1.97	2.68	0.21	13.0	0.53	0.041	21	7	1.44	1.68	0.20	8.3
18	210	82	76	79.0	39.5	0.49	0.035	23	7	1.71	2.03	0.22	9.4	0.47	0.032	23	5.5	1.71	1.61	0.22	7.3
19	219	75	76	75.5	37.8	0.5	0.037	23	7.5	1.79	2.20	0.22	9.9	0.5	0.037	26.5	8	2.40	3.22	0.22	14.5
20	217	77	80	78.5	39.2	0.5	0.037	23	7.5	1.72	2.19	0.22	9.9	0.52	0.040	25	7	2.04	2.45	0.21	11.5
21	216	76.5	78	77.2	38.6	0.52	0.040	21.5	8.5	1.53	2.20	0.21	10.3	0.5	0.037	22.5	7.5	1.67	2.09	0.22	9.6
22	207	76	78	77.0	38.5	0.5	0.037	24.5	8	2.00	2.69	0.21	12.8	0.5	0.037	25	8.5	2.09	3.00	0.21	14.3
															10.36	B Co		2.33	sd		

Table 5.2 Bruise Resistance Coefficient for Count 88 Cartons 11 to 20
Bruise Resistance Coefficient 10.36, standard deviation 2.33

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, RBA -horizontal rebound distance on side A of apple in m (off video), RBB - horizontal rebound distance on side B of apple in m (off video), Ht- rebound distance converted into vertical height, d-Diameter of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise, B Co-Bruising Coefficient (as calculated). Blanks indicate invalid data.

Bruise Resistance Coefficient Data as Calculated for Count 100 Cartons 1 -10

Apple	Wt	D 1	D 2	D Av	R		RBA	Ht	d	h	X	Vol	E	B Co	RBB	Ht	d	h	X	Vol	E	B Co
1	298	76	73	74.5	37.2		0.48	0.034	23.5	6	1.90	1.86	0.31	6.0	0.47	0.032	23	6.5	1.82	1.91	0.31	6.1
2	204	76	78	77.0	38.5		0.48	0.034	25.5	7.5	2.17	2.75	0.21	13.0	0.48	0.034	22.5	7.5	1.68	2.09	0.21	9.9
3	201	78	77.5	77.8	38.9		0.48	0.034	22.5	7.5	1.66	2.09	0.21	10.0	0.5	0.037	22	8	1.59	2.14	0.20	10.5
4	197	77.5	77.5	77.5	38.8		0.46	0.031	22	7	1.59	1.85	0.21	8.8	0.48	0.034	20	7	1.31	1.52	0.21	7.4
5	199	74	76	75.0	37.5		0.44	0.028	19.5	6	1.29	1.23	0.22	5.6	0.5	0.037	21.5	6.5	1.57	1.64	0.20	8.2
6	202	75	77	76.0	38.0		0.49	0.035	22	7	1.63	1.86	0.21	9.0	0.46	0.031	22	7	1.63	1.86	0.22	8.6
7	199	80	75	77.5	38.8		0.5	0.037	21	7.5	1.45	1.81	0.20	9.0	0.49	0.035	20	7.5	1.31	1.64	0.20	8.0
8	200	75	78	76.5	38.2		0.45	0.030	19.5	6.5	1.26	1.33	0.22	6.1	0.48	0.034	24	7	1.93	2.25	0.21	10.8
9	199	76	78	77.0	38.5		0.48	0.034	22.5	5.5	1.68	1.54	0.21	7.4	0.48	0.034	23.5	6.5	1.84	1.99	0.21	9.6
10	210	76	78	77.0	38.5		0.48	0.034	24	8	1.92	2.57	0.22	11.8	0.45	0.030	23.5	7	1.84	2.14	0.23	9.4
11	212	75	80	77.5	38.8		0.5	0.037	20.5	7	1.38	1.60	0.21	7.4	0.5	0.037	21.5	7.5	1.52	1.90	0.21	8.9
12	203	77	77	77.0	38.5		0.49	0.035	21.5	8	1.53	2.05	0.21	9.8	0.5	0.037	21	6.5	1.46	1.55	0.21	7.6
13	198	75	74	74.5	37.2		0.49	0.035	21.5	6.5	1.58	1.65	0.20	8.1	0.45	0.030	22.5	8	1.74	2.26	0.21	10.6
14	198	71	79	75.0	37.5		0.45	0.030	22.5	7	1.73	1.96	0.21	9.1	0.45	0.030	23	7	1.81	2.05	0.21	9.6
15	205	76	77	76.5	38.2		0.46	0.031	21	7	1.47	1.68	0.22	7.7	0.46	0.031	24	5.5	1.93	1.80	0.22	8.2
16	202	74	78	76.0	38.0		0.45	0.030	24.5	6.5	2.03	2.20	0.22	10.1	0.46	0.031	24.5	7	2.03	2.36	0.22	10.9
17	200	77	77	77.0	38.5		0.45	0.030	23	6.5	1.76	1.90	0.22	8.8	0.45	0.030	22.5	6	1.68	1.67	0.22	7.7
18	198	77	75	76.0	38.0		0.48	0.034	21	6.5	1.48	1.56	0.21	7.6	0.49	0.035	23	7	1.78	2.05	0.20	10.1
19	198	73	73	73.0	36.5		0.46	0.031	22	7	1.70	1.88	0.21	8.9	0.47	0.032	25	7.5	2.21	2.67	0.21	12.8
20	207	78	77	77.5	38.8		0.48	0.034	23	7.5	1.75	2.19	0.22	10.2	0.49	0.035	23.5	7.5	1.82	2.30	0.21	10.8
21	201	76	78	77.0	38.5		0.45	0.030	24	7	1.92	2.24	0.22	10.3	0.45	0.030	23.5	7	1.84	2.14	0.22	9.9
22	205	76	77	76.5	38.2		0.48	0.034	22	6.5	1.62	1.72	0.21	8.1	0.48	0.034	22	7	1.62	1.86	0.21	8.7
																	9.02	B Co		1.66	sd	

Table 5.3 Bruise Resistance Coefficient for Count 100 Cartons 1 to 10
Bruise Resistance Coefficient 9.02, standard deviation 1.66

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, RBA -horizontal rebound distance on side A of apple in m (off video), RBB - horizontal rebound distance on side B of apple in m (off video), Ht- rebound distance converted into vertical height, d-Diameter of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise, B Co-Bruising Coefficient (as calculated). Blanks indicate invalid data.

Appendix 6

DROP TEST DATA

The following abbreviations are used in appendix 6. These are also detailed as footnotes on each spreadsheet.

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mLs, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mLs, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mLs, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mLs, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises.

**ABLES 6.1 FULL RESULTS OF DROP TEST DATA COUNT 88
ARTONS 1 - 10 AT 15% MOISTURE CONTENT**

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 1

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	215	75	81.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
2	212	79	80.5	79.8	39.88	2A	13.5	6.5	0.58	0.66	0.07	2C	19.5	4	1.21	0.82	0.09	1.48	0.16
3	218	74	78	76.0	38.00				0.00	0.00	0.00						0.00	0.00	0.00
4	214	76.5	81	78.8	39.38	2A	17	4.5	0.93	0.67	0.07	2C	15	5	0.72	0.58	0.06	1.25	0.14
5	213	76.5	81.5	79.0	39.50	2A	16	4.5	0.82	0.59	0.07				0.00	0.00	0.00	0.59	0.07
6	210	75	76	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
7	214	80.5	78.5	79.5	39.75	2B	18	6.5	1.03	1.12	0.12	2C	26	10.5	2.19	4.10	0.45	5.22	0.58
8	209	78	77	77.5	38.75	2C	22.5	7	1.67	1.94	0.21				0.00	0.00	0.00	1.94	0.21
9	215	81	79.5	80.2	40.12	2A	21	7.5	1.40	1.80	0.20	2C	12	4	0.45	0.29	0.03	2.09	0.23
10	226	80	80.5	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
11	211	77.5	78	77.8	38.88	1A	19.5	6.5	1.24	1.33	0.15	1C	18	6	1.06	1.03	0.11	2.36	0.26
12	214	76.5	83	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
13	217	77	80	78.5	39.25	2A	21	7	1.43	1.68	0.18	2C	13	3.5	0.54	0.29	0.03	1.97	0.22
14	222	79	79	79.0	39.50	2A	15	3.5	0.72	0.40	0.04	2C	15	4.5	0.72	0.52	0.06	0.92	0.10
15	211	75	80	77.5	38.75	2A	13.5	5.5	0.59	0.53	0.06	3A	21.5	10	1.52	2.69	0.30	3.23	0.36
16	209	77	78.5	77.8	38.88	2B	21	6	1.44	1.43	0.16				0.00	0.00	0.00	1.43	0.16
17	206	78	78	78.0	39.00	2A	17	6	0.94	0.92	0.10				0.00	0.00	0.00	0.92	0.10
18	206	75	74.5	74.8	37.38	2A	23.5	8.5	1.90	2.65	0.29	2C	18.5	6	1.16	1.10	0.12	3.74	0.41
19	220	78.5	82.5	80.5	40.25	2C	20.5	7	1.33	1.59	0.18				0.00	0.00	0.00	1.59	0.18
20	215	77.5	81.5	79.5	39.75	2A	18	5.5	1.03	0.93	0.10				0.00	0.00	0.00	0.93	0.10
21	213	75.5	80.5	78.0	39.00	2B	13.5	5	0.59	0.47	0.05				0.00	0.00	0.00	0.47	0.05
22	216	80	80.5	80.2	40.12	2A	22	7.5	1.54	1.98	0.22				0.00	0.00	0.00	1.98	0.22
Total	4706									20.7	2.28					11.4	1.26	32.121	3.5453

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

88:1/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 1

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	5B	21	7.5	1.41	1.80	0.20				0.00	0.00	0.00	1.80	0.20	3.29	0.36	Tray 1
3	5B	20	4	1.34	0.88	0.10				0.00	0.00	0.00	0.88	0.10	0.88	0.10	Weight(kg)
4	5C	18	4.5	1.04	0.76	0.08				0.00	0.00	0.00	0.76	0.08	2.02	0.22	4.71
5	6B	20.5	4.5	1.35	1.03	0.11				0.00	0.00	0.00	1.03	0.11	1.62	0.18	Vol Top
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.12
7	5B	26.5	6.5	2.27	2.61	0.29				0.00	0.00	0.00	2.61	0.29	7.83	0.86	Vol Bottom
8				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.94	0.21	20.73
9	5B	24	5	1.84	1.64	0.18				0.00	0.00	0.00	1.64	0.18	3.73	0.41	Vol Total
10	4B	17	4	0.91	0.60	0.07				0.00	0.00	0.00	0.60	0.07	0.60	0.07	52.85
11				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.36	0.26	
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	5C	22.5	6	1.65	1.66	0.18				0.00	0.00	0.00	1.66	0.18	3.63	0.40	Ea Top
14				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.92	0.10	3.55
15				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.23	0.36	Ea Bottom
16	5B	24.5	6.5	1.98	2.19	0.24				0.00	0.00	0.00	2.19	0.24	3.61	0.40	2.29
17	5B	24.5	7	1.97	2.34	0.26				0.00	0.00	0.00	2.34	0.26	3.26	0.36	
18	5B	25	6	2.15	2.15	0.24				0.00	0.00	0.00	2.15	0.24	5.90	0.65	
19	5B	20	5	1.26	1.07	0.12				0.00	0.00	0.00	1.07	0.12	2.65	0.29	
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.93	0.10	
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.47	0.05	
22	5B	26	5	2.16	1.99	0.22				0.00	0.00	0.00	1.99	0.22	3.98	0.44	
Total					20.7	2.29				0	0	0	20.7	2.29	52.851	5.8334	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 1

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
23	200	76.5	78	77.2	38.62	2A	20	6	1.32	1.29	0.14	2C	14	4.5	0.64	0.45	0.05	1.74	0.19
24	208	78	77.5	77.8	38.88	2D	19.5	6.5	1.24	1.33	0.15				0.00	0.00	0.00	1.33	0.15
25	216	79	76.5	77.8	38.88	2A	16.5	4.5	0.89	0.63	0.07	2C	15	3	0.73	0.35	0.04	0.98	0.11
26	218	78	79.5	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
27	203	76	80	78.0	39.00	2B	10.5	3	0.35	0.16	0.02	2C	14	4	0.63	0.40	0.04	0.56	0.06
28	211	77	77	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
29	210	78	78	78.0	39.00	2A	18	5	1.05	0.85	0.09	2C	22.5	6.5	1.66	1.80	0.20	2.65	0.29
30	221	80	81	80.5	40.25	2A	11.5	3	0.41	0.19	0.02	2C	17	5.5	0.91	0.83	0.09	1.02	0.11
31	218	77	75.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
32	208	78.5	79.5	79.0	39.50	2B	19	5	1.16	0.95	0.11				0.00	0.00	0.00	0.95	0.11
33	211	80	78	79.0	39.50	2B	13	2	0.54	0.17	0.02				0.00	0.00	0.00	0.17	0.02
34	218	76	77	76.5	38.25	2B	17	5	0.96	0.75	0.08	2C	21.5	5.5	1.54	1.39	0.15	2.14	0.24
35	209	76	82.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
36	222	80.5	81	80.8	40.38	3C	19.5	5.5	1.19	1.11	0.12				0.00	0.00	0.00	1.11	0.12
37	220	77	81	79.0	39.50	2B	13.5	4.5	0.58	0.42	0.05				0.00	0.00	0.00	0.42	0.05
38	208	75.5	81	78.2	39.12	2A	18	6	1.05	1.03	0.11	2C	13	4.5	0.54	0.39	0.04	1.42	0.16
39	218	77.5	78	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	209	76.5	79	77.8	38.88	2B	20	6	1.31	1.29	0.14				0.00	0.00	0.00	1.29	0.14
41	205	77	77.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
42	200	78	78	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
43	217	77.5	80	78.8	39.38	2B	19	6.5	1.16	1.26	0.14				0.00	0.00	0.00	1.26	0.14
44	217	78.5	78	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4667									11.4	1.26					5.60	0.62	17.021	1.8786

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed In Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 1

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
23	5B	15.5	4	0.79	0.49	0.05				0.00	0.00	0.00	0.49	0.05	2.23	0.25	
24	6A	19.5	7	1.24	1.44	0.16				0.00	0.00	0.00	1.44	0.16	2.77	0.31	Tray 2
25	5B	22.5	7.5	1.66	2.09	0.23				0.00	0.00	0.00	2.09	0.23	3.07	0.34	Weight(kg) 4.67
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
27				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.56	0.06	Vol Top 17.02
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 19.34
29	5B	23	9	1.73	2.68	0.30				0.00	0.00	0.00	2.68	0.30	5.33	0.59	Vol Total 36.36
30	5B	18	6	1.02	1.02	0.11				0.00	0.00	0.00	1.02	0.11	2.05	0.23	
31	5A	16.5	6	0.90	0.87	0.10				0.00	0.00	0.00	0.87	0.10	0.87	0.10	Ea Top 1.88
32	5A	19.5	6.5	1.22	1.32	0.15				0.00	0.00	0.00	1.32	0.15	2.28	0.25	Ea Bottom 2.13
33	5A	15.5	5.5	0.77	0.69	0.08				0.00	0.00	0.00	0.69	0.08	0.86	0.10	Ea Total 4.01
34	5A	21	6.5	1.47	1.56	0.17				0.00	0.00	0.00	1.56	0.17	3.70	0.41	
35	5A	15	3.5	0.72	0.40	0.04				0.00	0.00	0.00	0.40	0.04	0.40	0.04	Top Br 21
36	5B	14.5	4	0.66	0.42	0.05				0.00	0.00	0.00	0.42	0.05	1.53	0.17	Bottom Br 18
37	5A	14.5	6	0.67	0.68	0.07				0.00	0.00	0.00	0.68	0.07	1.09	0.12	Br Fruit 18
38	5B	17	5.5	0.93	0.83	0.09				0.00	0.00	0.00	0.83	0.09	2.25	0.25	
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
40	5A	19	7	1.18	1.37	0.15				0.00	0.00	0.00	1.37	0.15	2.65	0.29	
41				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
42	5B	13	3.5	0.55	0.29	0.03	5C	12.5	4.5	0.50	0.36	0.04	0.65	0.07	0.65	0.07	
43	5C	18	6	1.04	1.03	0.11				0.00	0.00	0.00	1.03	0.11	2.28	0.25	
44	5B	24	5.5	1.89	1.79	0.20				0.00	0.00	0.00	1.79	0.20	1.79	0.20	
Total					19.0	2.09					0.36	0.04	19.3	2.13	36.358	4.0130	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed In Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

88:1/4

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 1

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	216	77.5	80	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	201	80	75.5	77.8	38.88	2B	13.5	4	0.59	0.37	0.04				0.00	0.00	0.00	0.37	0.04
47	216	77	81	79.0	39.50	2C	18	5.5	1.04	0.94	0.10				0.00	0.00	0.00	0.94	0.10
48	214	78.5	78.5	78.5	39.25	3C	20	6	1.30	1.28	0.14				0.00	0.00	0.00	1.28	0.14
49	207	76	80.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
50	208	73.5	83.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	208	74	80.5	77.2	38.62	2A	14.5	4.5	0.69	0.48	0.05				0.00	0.00	0.00	0.48	0.05
52	215	78	77	77.5	38.75	2A	15	3.5	0.73	0.40	0.04	2C	17.5	5	1.00	0.80	0.09	1.20	0.13
53	211	77	80	78.5	39.25	2D	18	4.5	1.05	0.76	0.08				0.00	0.00	0.00	0.76	0.08
54	213	78.5	80	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
55	210	79	77.5	78.2	39.12	2A	15.5	4.5	0.78	0.55	0.06	2C	16.5	5.5	0.88	0.78	0.09	1.34	0.15
56	206	72.5	78	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	215	80	82	81.0	40.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
58	207	78.5	80	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
59	213	80	80	80.0	40.00	2A	13.5	5.5	0.57	0.53	0.06	2C	16	5	0.81	0.66	0.07	1.19	0.13
60	210	78.5	79	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
61	215	80	79	79.5	39.75	1A	13.5	3	0.58	0.27	0.03				0.00	0.00	0.00	0.27	0.03
62	220	81.5	77.5	79.5	39.75	2A	13	5	0.54	0.44	0.05	2C	10.5	3.5	0.35	0.19	0.02	0.63	0.07
63	210	77.5	79.5	78.5	39.25	2C	16.5	5	0.88	0.70	0.08				0.00	0.00	0.00	0.70	0.08
64	222	79	82	80.5	40.25	2C	15.5	5.5	0.75	0.69	0.08				0.00	0.00	0.00	0.69	0.08
65	222	80.5	80	80.2	40.12	2A	13	5	0.53	0.44	0.05	2C	18	5	1.02	0.84	0.09	1.28	0.14
66	212	79	76.5	77.8	38.88	2A	14	5	0.64	0.51	0.06	2C	13	4	0.55	0.34	0.04	0.85	0.09
Total	4671								8.37	0.92					3.62	0.40		11.987	1.3230

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

88:1/5

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 1

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
46	5A	13	5	0.55	0.44	0.05				0.00	0.00	0.00	0.44	0.05	0.81	0.09	Tray 3
47	5A	16.5	4.5	0.87	0.63	0.07				0.00	0.00	0.00	0.63	0.07	1.57	0.17	Weight(kg) 4.67
48	5A	19.5	4.5	1.23	0.92	0.10	5B	10	3	0.32	0.15	0.02	1.06	0.12	2.34	0.26	
49	5B	17.5	6	0.99	0.97	0.11				0.00	0.00	0.00	0.97	0.11	0.97	0.11	Vol Top 11.99
50	5A	19	5.5	1.17	1.05	0.12				0.00	0.00	0.00	1.05	0.12	1.05	0.12	Vol Bottom 25.91
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.48	0.05	Vol Total 37.90
52	5B	24	8.5	1.90	2.75	0.30				0.00	0.00	0.00	2.75	0.30	3.95	0.44	
53				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.76	0.08	Ea Top 1.32
54	5B	20.5	7.5	1.35	1.72	0.19				0.00	0.00	0.00	1.72	0.19	1.72	0.19	Ea Bottom 2.86
55	5B	22	8	1.58	2.14	0.24				0.00	0.00	0.00	2.14	0.24	3.48	0.38	Ea Total 4.18
56	5C	16.5	4.5	0.92	0.64	0.07				0.00	0.00	0.00	0.64	0.07	0.64	0.07	Tray 3
57	5B	22	8.5	1.52	2.28	0.25				0.00	0.00	0.00	2.28	0.25	2.28	0.25	Top Br 20
58	5A	19	6	1.16	1.15	0.13	5C	14	4.5	0.62	0.45	0.05	1.60	0.18	1.60	0.18	Bottom Br 22
59	5B	23	7	1.69	2.03	0.22				0.00	0.00	0.00	2.03	0.22	3.22	0.36	Br Fruit 18
60	5A	18	5.5	1.04	0.94	0.10	5C	11.5	4	0.42	0.27	0.03	1.20	0.13	1.20	0.13	Tray 4
61	5A	22.5	6	1.63	1.66	0.18				0.00	0.00	0.00	1.66	0.18	1.93	0.21	Top Br 4
62	5C	16	6	0.81	0.81	0.09				0.00	0.00	0.00	0.81	0.09	1.44	0.16	Bottom Br 18
63	5B	22	7	1.57	1.85	0.20				0.00	0.00	0.00	1.85	0.20	2.55	0.28	Br Fruit 15
64	5B	22	6.5	1.53	1.70	0.19				0.00	0.00	0.00	1.70	0.19	2.39	0.26	Carton
65	5B	16	5	0.81	0.66	0.07				0.00	0.00	0.00	0.66	0.07	1.94	0.21	Top Br 71
66	5B	15	6	0.73	0.72	0.08				0.00	0.00	0.00	0.72	0.08	1.57	0.17	Bottom Br 71
Total				25.1	2.76					0.86	0.10		25.9	2.86	37.898	4.1830	Br Fruit 69

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

88:1/6

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 1

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	216	78	78.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	212	78	77.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	220	80.5	80	80.2	40.12	1A	14	4	0.62	0.39	0.04	2B	16	2	0.81	0.29	0.03	0.68	0.08
70	205	76.5	78	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	213	77	82	79.5	39.75	2C	9	2.5	0.26	0.10	0.01				0.00	0.00	0.00	0.10	0.01
72	206	79	77.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	213	79	77.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	206	76	79	77.5	38.75	1A	19	6.5	1.18	1.26	0.14				0.00	0.00	0.00	1.26	0.14
75	210	76.5	81	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	216	80.5	79	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	217	79.5	81.5	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	202	76	81	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	205	77	80	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	220	78	78	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	205	75.5	76	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	209	75	81	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	204	78	75	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	202	79	79	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	208	80.5	77	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	217	80	80.5	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	203	77	77	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	210	78.5	79	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4619									1.75	0.19					0.29	0.03	2.0365	0.2248

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

88:1/7

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 1

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
68	5B	17	6	0.94	0.92	0.10				0.00	0.00	0.00	0.92	0.10	0.92	0.10	Tray 4	
69	5A	21	6	1.40	1.42	0.16				0.00	0.00	0.00	1.42	0.16	2.10	0.23	Weight(kg)	4.62
70	5B	17	5.5	0.95	0.83	0.09				0.00	0.00	0.00	0.83	0.09	0.83	0.09	Vol Top	2.04
71	5A	10	3	0.32	0.15	0.02				0.00	0.00	0.00	0.15	0.02	0.24	0.03	Vol Bottom	18.01
72	5A	9.3	2.5	0.28	0.10	0.01	5B	12	3.5	0.46	0.25	0.03	0.35	0.04	0.35	0.04	Vol Total	20.04
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
74	5B	21	5	1.45	1.20	0.13				0.00	0.00	0.00	1.20	0.13	2.46	0.27		
75	5A	20.5	7.5	1.36	1.72	0.19				0.00	0.00	0.00	1.72	0.19	1.72	0.19	Ea Top	0.22
76				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	1.99
77	5A	24.5	6	1.91	2.01	0.22	5C	11.5	5	0.41	0.35	0.04	2.36	0.26	2.36	0.26	Ea Total	2.21
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
79	5A	18	6	1.05	1.03	0.11				0.00	0.00	0.00	1.03	0.11	1.03	0.11	Carton	
80	6B	20.5	6.5	1.37	1.47	0.16				0.00	0.00	0.00	1.47	0.16	1.47	0.16	Weight(kg)	18.66
81	5B	22	6	1.63	1.59	0.18	5C	20.5	7.5	1.41	1.73	0.19	3.33	0.37	3.33	0.37		
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	63.16
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	83.98
84	5B	18	5	1.04	0.85	0.09				0.00	0.00	0.00	0.85	0.09	0.85	0.09	Vol Total	147.15
85	5A	17	6.5	0.93	1.01	0.11				0.00	0.00	0.00	1.01	0.11	1.01	0.11		
86	5B	14	5.5	0.62	0.57	0.06				0.00	0.00	0.00	0.57	0.06	0.57	0.06	Ea Top	6.97
87	5B	17.5	5	1.01	0.80	0.09				0.00	0.00	0.00	0.80	0.09	0.80	0.09	Ea Bottom	9.27
88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	16.24
Total					15.7	1.73					2.33	0.26	18.0	1.99	20.043	2.2122	Ek Carton	109.85

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

88:1/8

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 2

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	209	80	76.5	78.2	39.12	2C	23.5	7	1.81	2.13	0.24				0.00	0.00	0.00	2.13	0.24
2	203	75	77.5	76.2	38.12	2D	11.5	4.5	0.44	0.31	0.03	2C	15	5	0.74	0.58	0.06	0.89	0.10
3	217	77.5	77.5	77.5	38.75	2A	12.5	3.5	0.51	0.27	0.03	2C	20.5	5.5	1.38	1.24	0.14	1.52	0.17
4	213	78	78	78.0	39.00	2A	14.5	3	0.68	0.32	0.04	2A	15	3	0.73	0.35	0.04	0.67	0.07
5	206	76	81	78.5	39.25	2A	14	5.5	0.63	0.57	0.06				0.00	0.00	0.00	0.57	0.06
6	222	79.5	79.5	79.5	39.75	2B	20	5.5	1.28	1.17	0.13				0.00	0.00	0.00	1.17	0.13
7	215	77	77.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
8	214	78	79.5	78.8	39.38	2A	15.5	4	0.77	0.49	0.05	2C	15.5	4	0.77	0.49	0.05	0.98	0.11
9	217	79	80.5	79.8	39.88	2A	10.5	5	0.35	0.30	0.03	2C	19	5	1.15	0.95	0.11	1.25	0.14
10	212	79	78.5	78.8	39.38	1B	15.5	6	0.77	0.77	0.08				0.00	0.00	0.00	0.77	0.08
11	206	77.5	78.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
12	210	77.5	76.5	77.0	38.50	2C	22	6	1.60	1.59	0.18				0.00	0.00	0.00	1.59	0.18
13	209	78.5	79.5	79.0	39.50	2B	22	8	1.56	2.14	0.24				0.00	0.00	0.00	2.14	0.24
14	203	78.5	78	78.2	39.12	2B	16.5	5	0.88	0.71	0.08	2D	16	5.5	0.83	0.74	0.08	1.44	0.16
15	209	79.5	78	78.8	39.38	2A	13.5	4	0.58	0.37	0.04	2C	16	4.5	0.82	0.59	0.07	0.96	0.11
16	207	78	80.5	79.2	39.62	2B	26.5	8	2.28	3.18	0.35	2C	16.5	5.5	0.87	0.78	0.09	3.96	0.44
17	209	75	79	77.0	38.50	2E	11.5	3	0.43	0.19	0.02				0.00	0.00	0.00	0.19	0.02
18	220	79.5	79	79.2	39.62	2A	19.5	5.5	1.22	1.11	0.12	2C	25	6.5	2.02	2.28	0.25	3.39	0.37
19	217	80	77	78.5	39.25	2C	23	6.5	1.72	1.89	0.21				0.00	0.00	0.00	1.89	0.21
20	218	81	81	81.0	40.50	2C	25	7	1.98	2.43	0.27				0.00	0.00	0.00	2.43	0.27
21	209	77	77	77.0	38.50	2A	18	5.5	1.07	0.94	0.10	2C	17.5	6	1.01	0.97	0.11	1.91	0.21
22	207	76.5	75	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4652									20.9	2.30					8.98	0.99	29.847	3.2944

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

88:2/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 2

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.13	0.24	
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.89	0.10	Tray 1
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.52	0.17	Weight(kg) 4.65
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.67	0.07	
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.57	0.06	Vol Top 29.85
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.17	0.13	Vol Bottom 2.51
7				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 32.36
8				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.98	0.11	
9	5B	21	5.5	1.41	1.30	0.14				0.00	0.00	0.00	1.30	0.14	2.56	0.28	Ea Top 3.29
10				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.77	0.08	Ea Bottom 0.28
11				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total 3.57
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.59	0.18	
13				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.14	0.24	Top Br 29
14	5B	18	4	1.05	0.68	0.08				0.00	0.00	0.00	0.68	0.08	2.13	0.23	Bottom Br 4
15	6B	17	3	0.93	0.46	0.05				0.00	0.00	0.00	0.46	0.05	1.42	0.16	Br Fruit 18
16	6B	8	2	0.20	0.06	0.01				0.00	0.00	0.00	0.06	0.01	4.02	0.44	
17				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.19	0.02	
18				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.39	0.37	
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.89	0.21	
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.43	0.27	
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.91	0.21	
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total				2.51	0.28					0	0	2.51	0.28		32.361	3.5718	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 2

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
23	221	78	80.5	79.2	39.62	2B	14	4	0.62	0.39	0.04				0.00	0.00	0.00	0.39	0.04
24	215	79	80	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
25	212	79	79.5	79.2	39.62	2B	20	6	1.28	1.28	0.14				0.00	0.00	0.00	1.28	0.14
26	209	76.5	80	78.2	39.12	2A	18.5	6.5	1.11	1.19	0.13	1C	13.5	4.5	0.59	0.42	0.05	1.61	0.18
27	215	78	85.5	81.8	40.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
28	207	76	82	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
29	207	76.5	75.5	76.0	38.00	2A	12	4.5	0.48	0.33	0.04	2C	23.5	6.5	1.86	2.00	0.22	2.33	0.26
30	209	78	79.5	78.8	39.38	2C	18.5	6.5	1.10	1.19	0.13				0.00	0.00	0.00	1.19	0.13
31	211	79.5	78	78.8	39.38	2A	18.5	5	1.10	0.90	0.10				0.00	0.00	0.00	0.90	0.10
32	209	77.5	82	79.8	39.88	2A	19.5	7.5	1.21	1.56	0.17	2B	15.5	2	0.76	0.27	0.03	1.82	0.20
33	215	77.5	80.5	79.0	39.50	2A	14.5	4	0.67	0.42	0.05				0.00	0.00	0.00	0.42	0.05
34	208	76.5	76.5	76.5	38.25	2A	20.5	8	1.40	1.87	0.21				0.00	0.00	0.00	1.87	0.21
35	205	77.5	79.5	78.5	39.25	2A	10.5	3	0.35	0.16	0.02	2C	13	3.5	0.54	0.29	0.03	0.45	0.05
36	208	76	80	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
37	214	76.5	80	78.2	39.12	2B	21.5	8	1.51	2.04	0.23	2C	20.5	6	1.37	1.35	0.15	3.40	0.37
38	211	81.5	81	81.2	40.62	2A	5.5	2	0.09	0.03	0.00	2B	17.5	5.5	0.95	0.88	0.10	0.91	0.10
39	214	78	80	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	208	75.5	80	77.8	38.88	2A	16	7	0.83	0.99	0.11				0.00	0.00	0.00	0.99	0.11
41	212	76.6	82.5	79.6	39.78	2B	14	4	0.62	0.39	0.04	2C	16.5	4.5	0.86	0.63	0.07	1.02	0.11
42	212	76.5	78.5	77.5	38.75	2A	11	3.5	0.39	0.21	0.02				0.00	0.00	0.00	0.21	0.02
43	219	77.5	80	78.8	39.38	2B	19	5.5	1.16	1.05	0.12				0.00	0.00	0.00	1.05	0.12
44	212	75	82.5	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4653									14.0	1.55					5.84	0.64	19.846	2.1905

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 2

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
23	5B	19	5.5	1.16	1.05	0.12				0.00	0.00	0.00	1.05	0.12	1.44	0.16	
24	5A	19	4	1.15	0.77	0.09				0.00	0.00	0.00	0.77	0.09	0.77	0.09	Tray 2
25	5B	19	6	1.16	1.15	0.13				0.00	0.00	0.00	1.15	0.13	2.43	0.27	Weight(kg) 4.65
26	5B	23	8	1.73	2.35	0.26				0.00	0.00	0.00	2.35	0.26	3.95	0.44	
27					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 19.85
28					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 32.32
29	5A	24.5	8.5	2.03	2.88	0.32				0.00	0.00	0.00	2.88	0.32	5.21	0.58	Vol Total 52.17
30	5A	19.5	7	1.23	1.44	0.16				0.00	0.00	0.00	1.44	0.16	2.63	0.29	
31	4B	20	5.5	1.29	1.17	0.13				0.00	0.00	0.00	1.17	0.13	2.07	0.23	Ea Top 2.19
32	5B	21	7	1.41	1.67	0.18				0.00	0.00	0.00	1.67	0.18	3.49	0.39	Ea Bottom 3.57
33	5B	22.5	9	1.64	2.56	0.28				0.00	0.00	0.00	2.56	0.28	2.99	0.33	Ea Total 5.76
34	5B	27	7.5	2.46	3.14	0.35				0.00	0.00	0.00	3.14	0.35	5.01	0.55	
35	5B	22	6	1.57	1.58	0.17				0.00	0.00	0.00	1.58	0.17	2.04	0.22	Top Br 23
36	5B	26.5	9	2.32	3.60	0.40				0.00	0.00	0.00	3.60	0.40	3.60	0.40	Bottom Br 21
37	5A	19	6	1.17	1.15	0.13				0.00	0.00	0.00	1.15	0.13	4.55	0.50	Br Fruit 20
38	5A	20.5	6.5	1.31	1.46	0.16				0.00	0.00	0.00	1.46	0.16	2.37	0.26	
39	5A	11	2.5	0.38	0.15	0.02				0.00	0.00	0.00	0.15	0.02	0.15	0.02	
40	5B	21.5	6	1.52	1.51	0.17				0.00	0.00	0.00	1.51	0.17	2.49	0.28	
41	5B	14	2	0.62	0.21	0.02				0.00	0.00	0.00	0.21	0.02	1.23	0.14	
42	4A	11	4	0.39	0.25	0.03	5B	21	6.5	1.45	1.55	0.17	1.80	0.20	2.01	0.22	
43	5A	20	7	1.29	1.51	0.17				0.00	0.00	0.00	1.51	0.17	2.56	0.28	
44	5B	20	5.5	1.29	1.17	0.13				0.00	0.00	0.00	1.17	0.13	1.17	0.13	
Total					30.8	3.40					1.55	0.17	32.3	3.57	52.170	5.7583	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 2

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	210	77	83	80.0	40.00	2B	12.5	2	0.49	0.16	0.02				0.00	0.00	0.00	0.16	0.02
46	208	78	79.5	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
47	215	79	76.4	77.7	38.85	2B	15.5	5.5	0.78	0.69	0.08				0.00	0.00	0.00	0.69	0.08
48	213	79	80	79.5	39.75	2B	15	4.5	0.71	0.52	0.06				0.00	0.00	0.00	0.52	0.06
49	216	79.5	79.5	79.5	39.75	2A	14	4.5	0.62	0.45	0.05				0.00	0.00	0.00	0.45	0.05
50	207	74.5	82	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	207	78	78.5	78.2	39.12	2B	16	5	0.83	0.66	0.07	2C	22	8	1.58	2.14	0.24	2.80	0.31
52	208	76	69.5	72.8	36.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
53	210	77.5	78.5	78.0	39.00	2C	17.5	5.5	0.99	0.88	0.10				0.00	0.00	0.00	0.88	0.10
54	220	79.5	80.5	80.0	40.00	2B	19.5	5.5	1.21	1.11	0.12				0.00	0.00	0.00	1.11	0.12
55	213	76.5	76.5	76.5	38.25	2B	18.5	5.5	1.14	1.00	0.11				0.00	0.00	0.00	1.00	0.11
56	214	78.5	80.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	205	78	79	78.5	39.25	2B	14.5	2.5	0.68	0.27	0.03	2C	19	5	1.17	0.95	0.11	1.23	0.14
58	210	77.5	80.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
59	222	78.5	78	78.2	39.12	2A	18	5.5	1.05	0.94	0.10				0.00	0.00	0.00	0.94	0.10
60	210	80	81.5	80.8	40.38	2A	19	8	1.13	1.60	0.18				0.00	0.00	0.00	1.60	0.18
61	208	76	78	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	203	75	80	77.5	38.75	2A	12.5	4	0.51	0.31	0.03				0.00	0.00	0.00	0.31	0.03
63	205	79	83	81.0	40.50	2B	17.5	6.5	0.96	1.06	0.12	2C	18	5	1.01	0.84	0.09	1.90	0.21
64	209	79	79	79.0	39.50	3A	10.5	3	0.35	0.16	0.02	2C	15	4.5	0.72	0.52	0.06	0.68	0.07
65	211	80.5	77	78.8	39.38	2A	17	5.5	0.93	0.83	0.09				0.00	0.00	0.00	0.83	0.09
66	213	80	81	80.5	40.25	1B	12	2.5	0.45	0.18	0.02				0.00	0.00	0.00	0.18	0.02
Total	4637									10.8	1.19					4.45	0.49	15.269	1.6853

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed In Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 2

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
45	2D	16.5	4.5	0.86	0.63	0.07					0.00	0.00	0.00	0.63	0.07	0.79	0.09	
46	5A	18	5	1.04	0.85	0.09					0.00	0.00	0.00	0.85	0.09	0.85	0.09	Tray 3
47	5B	20	6	1.31	1.29	0.14					0.00	0.00	0.00	1.29	0.14	1.98	0.22	Weight(kg) 4.64
48				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.52	0.06	
49	6B	19	5	1.15	0.95	0.11					0.00	0.00	0.00	0.95	0.11	1.40	0.15	Vol Top 15.27
50	5B	18.5	7	1.11	1.30	0.14					0.00	0.00	0.00	1.30	0.14	1.30	0.14	Vol Bottom 26.42
51	5A	19	6.4	1.17	1.24	0.14					0.00	0.00	0.00	1.24	0.14	4.04	0.45	Vol Total 41.69
52	5B	22.5	7	1.78	1.97	0.22					0.00	0.00	0.00	1.97	0.22	1.97	0.22	
53	5B	23	7	1.73	2.04	0.22					0.00	0.00	0.00	2.04	0.22	2.92	0.32	Ea Top 1.69
54				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	1.11	0.12	Ea Bottom 2.92
55	5B	11.5	4.5	0.43	0.31	0.03					0.00	0.00	0.00	0.31	0.03	1.30	0.14	Ea Total 4.60
56	5C	15.5	4	0.76	0.49	0.05	4B	12.5	3	0.49	0.23	0.03	0.72	0.08	0.72	0.08	Tray 3	
57	5A	19	6	1.17	1.15	0.13					0.00	0.00	0.00	1.15	0.13	2.38	0.26	Top Br 20
58	5B	22	7	1.56	1.85	0.20					0.00	0.00	0.00	1.85	0.20	1.85	0.20	Bottom Br 23
59	5B	16	4.5	0.83	0.59	0.07					0.00	0.00	0.00	0.59	0.07	1.53	0.17	Br Fruit 22
60	5A	23.5	9	1.75	2.79	0.31					0.00	0.00	0.00	2.79	0.31	4.39	0.48	Tray 4
61	5A	20.5	7.5	1.39	1.73	0.19					0.00	0.00	0.00	1.73	0.19	1.73	0.19	Top Br 2
62				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.31	0.03	Bottom Br 19
63	5C	12.5	2	0.49	0.16	0.02	5B	24	8.5	1.82	2.72	0.30	2.88	0.32	4.79	0.53	Br Fruit 17	
64	5B	18.3	4.5	1.07	0.79	0.09	5D	11	5	0.38	0.33	0.04	1.12	0.12	1.79	0.20	Carton	
65	5B	19	5.5	1.16	1.05	0.12					0.00	0.00	0.00	1.05	0.12	1.88	0.21	Top Br 74
66	5A	22	7	1.53	1.84	0.20	5B	11	2.5	0.38	0.15	0.02	1.99	0.22	2.16	0.24	Bottom Br 67	
Total					23.0	2.54						3.43	0.38	26.4	2.92	41.688	4.6013	Br Fruit 77

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed In Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

88:2/6

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 2

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	214	77	80	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	210	79	80	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	214	80.5	79.5	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	221	78	83.5	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	215	78	77.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	222	80	81	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	214	76	81	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	204	76	78.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	221	73.5	82	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	218	80	83	81.5	40.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	216	78	77.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	214	76.5	79	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	210	80	79.5	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	216	77.5	84	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	215	77.5	79.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	218	76	76.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	200	77	73.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	220	77.5	80.5	79.0	39.50	1A	3.5	3.5	0.04	0.04	0.00				0.00	0.00	0.00	0.04	0.00
85	214	77	80	78.5	39.25	1B	10	2	0.32	0.10	0.01				0.00	0.00	0.00	0.10	0.01
86	222	79	78	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	203	74.5	81	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	203	78	79	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4704								0.14	0.01					0	0		0.1356	0.0150

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 2

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
68	5B	18	7.5	1.03	1.34	0.15				0.00	0.00	0.00	1.34	0.15	1.34	0.15	Tray 4
69	5A	14.5	4.5	0.66	0.48	0.05				0.00	0.00	0.00	0.48	0.05	0.48	0.05	Weight(kg) 4.70
70	5B	22.5	6	1.60	1.65	0.18				0.00	0.00	0.00	1.65	0.18	1.65	0.18	
71	5B	15	5	0.73	0.58	0.06				0.00	0.00	0.00	0.58	0.06	0.58	0.06	Vol Top 0.14
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 15.87
73	5B	21	5.5	1.43	1.31	0.14				0.00	0.00	0.00	1.31	0.14	1.31	0.14	Vol Total 16.00
74	5B	19.5	6	1.25	1.22	0.13	5C	14.5	5	0.69	0.54	0.06	1.76	0.19	1.76	0.19	
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top 0.01
76	5B	13	4	0.52	0.34	0.04				0.00	0.00	0.00	0.34	0.04	0.34	0.04	Ea Bottom 1.75
77	5B	20.5	4.5	1.38	1.03	0.11				0.00	0.00	0.00	1.03	0.11	1.03	0.11	Ea Total 1.77
78	5B	15.5	2.5	0.78	0.32	0.04				0.00	0.00	0.00	0.32	0.04	0.32	0.04	
79	5B	18	5.5	1.03	0.93	0.10				0.00	0.00	0.00	0.93	0.10	0.93	0.10	Carton
80	5B	18.5	5	1.07	0.90	0.10				0.00	0.00	0.00	0.90	0.10	0.90	0.10	Weight(kg) 18.65
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
82	5B	22	5	1.62	1.34	0.15				0.00	0.00	0.00	1.34	0.15	1.34	0.15	Vol Top 65.10
83	4B	11	2	0.40	0.12	0.01	6A	11	3.5	0.40	0.21	0.02	0.33	0.04	0.33	0.04	Vol Bottom 77.12
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.04	0.00	Vol Total 142.22
85	5B	17	5.5	0.93	0.83	0.09	5D	8.5	3	0.23	0.11	0.01	0.94	0.10	1.03	0.11	
86	4B	17	4.5	0.93	0.67	0.07				0.00	0.00	0.00	0.67	0.07	0.67	0.07	Ea Top 7.19
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 8.51
88	5B	22.5	7	1.65	1.94	0.21				0.00	0.00	0.00	1.94	0.21	1.94	0.21	Ea Total 15.70
Total					15.0	1.66				0.86	0.10		15.9	1.75	16.003	1.7663	Ek Carton 109.75

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 3

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	209	73	77	75.0	37.50	2C	11.5	4	0.44	0.27	0.03				0.00	0.00	0.00	0.27	0.03
2	219	78	79	78.5	39.25	2A	13.5	5	0.58	0.47	0.05				0.00	0.00	0.00	0.47	0.05
3	216	82.5	81	81.8	40.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
4	212	82.5	79	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
5	215	79.5	78.5	79.0	39.50	2B	15.5	3	0.77	0.37	0.04				0.00	0.00	0.00	0.37	0.04
6	216	78.5	81.5	80.0	40.00	2A	13.5	2.5	0.57	0.23	0.03				0.00	0.00	0.00	0.23	0.03
7	218	77.5	77	77.2	38.62	2A	19	5.5	1.19	1.05	0.12				0.00	0.00	0.00	1.05	0.12
8	219	80	76	78.0	39.00	2A	15.5	5	0.78	0.62	0.07	2C	24	7.5	1.89	2.40	0.26	3.02	0.33
9	211	73.5	81.5	77.5	38.75	2A	14	5	0.64	0.51	0.06				0.00	0.00	0.00	0.51	0.06
10	209	77.5	76	76.8	38.38	2A	19	6	1.19	1.15	0.13	2C	16	3.5	0.84	0.46	0.05	1.62	0.18
11	202	79.5	78.5	79.0	39.50	2A	19.5	6.5	1.22	1.32	0.15	2C	17	5	0.93	0.75	0.08	2.07	0.23
12	215	81	80	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
13	216	80	78	79.0	39.50	2B	13.5	5.5	0.58	0.53	0.06				0.00	0.00	0.00	0.53	0.06
14	213	76.5	78.5	77.5	38.75	2C	19	3	1.18	0.61	0.07				0.00	0.00	0.00	0.61	0.07
15	220	80.5	77.5	79.0	39.50	2A	18	6.5	1.04	1.13	0.12	2C	10	3	0.32	0.15	0.02	1.27	0.14
16	210	79	76.5	77.8	38.88	2A	19.5	6.5	1.24	1.33	0.15				0.00	0.00	0.00	1.33	0.15
17	207	76	78.5	77.2	38.62	2A	13.5	3.5	0.59	0.32	0.04				0.00	0.00	0.00	0.32	0.04
18	210	80	78	79.0	39.50	2A	17	3.5	0.93	0.53	0.06				0.00	0.00	0.00	0.53	0.06
19	216	76.5	80	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
20	218	76.5	78	77.2	38.62	2B	17.5	4	1.00	0.64	0.07				0.00	0.00	0.00	0.64	0.07
21	204	78.5	78	78.2	39.12	2B	15	4.5	0.73	0.52	0.06				0.00	0.00	0.00	0.52	0.06
22	221	80	84	82.0	41.00	2A	11.5	4.5	0.41	0.31	0.03	2C	12.5	3.5	0.48	0.27	0.03	0.58	0.06
Total	4696									11.9	1.32					4.03	0.44	15.944	1.7598

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 3

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.27	0.03	
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.47	0.05	Tray 1
3	5B	28.5	9	2.56	4.18	0.46				0.00	0.00	0.00	4.18	0.46	4.18	0.46	Weight(kg) 4.70
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.37	0.04	Vol Top 15.94
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.23	0.03	Vol Bottom 6.99
7				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.05	0.12	Vol Total 22.93
8				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.02	0.33	
9				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.51	0.06	Ea Top 1.76
10	5B	13.5	3.5	0.60	0.32	0.04				0.00	0.00	0.00	0.32	0.04	1.94	0.21	Ea Bottom 0.77
11				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.07	0.23	Ea Total 2.53
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.53	0.06	Top Br 23
14				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.61	0.07	Bottom Br 3
15	5B	27.5	5.5	2.47	2.49	0.28				0.00	0.00	0.00	2.49	0.28	3.76	0.42	Br Fruit 19
16				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.33	0.15	
17				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.32	0.04	
18				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.53	0.06	
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.64	0.07	
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.52	0.06	
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.58	0.06	
Total					6.99	0.77					0	0	6.99	0.77	22.933	2.5312	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 3

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
23	205	76	78.5	77.2	38.62	2A	15	4.5	0.74	0.52	0.06				0.00	0.00	0.00	0.52	0.06
24	213	82	81.5	81.8	40.88	2B	17.5	6.5	0.95	1.06	0.12				0.00	0.00	0.00	1.06	0.12
25	220	75.5	81.5	78.5	39.25	2A	17.5	6.5	0.99	1.07	0.12	2C	17.5	3.5	0.99	0.57	0.06	1.63	0.18
26	203	74	80.5	77.2	38.62	1A	11.5	3	0.43	0.19	0.02				0.00	0.00	0.00	0.19	0.02
27	211	79.5	79.5	79.5	39.75	2A	15	4.5	0.71	0.52	0.06				0.00	0.00	0.00	0.52	0.06
28	220	80.5	75.5	78.0	39.00					0.00	0.00				0.00	0.00	0.00	0.00	0.00
29	210	77.5	79.5	78.5	39.25	2C	18	5	1.05	0.85	0.09				0.00	0.00	0.00	0.85	0.09
30	220	79	80	79.5	39.75	2A	8	2.5	0.20	0.08	0.01	2C	16	4.5	0.81	0.59	0.07	0.67	0.07
31	217	80	81	80.5	40.25	2A	14	3.5	0.61	0.34	0.04				0.00	0.00	0.00	0.34	0.04
32	218	79.5	78.5	79.0	39.50	2A	19	6	1.16	1.15	0.13	2C	20	7	1.29	1.51	0.17	2.66	0.29
33	213	80	76.5	78.2	39.12	2A	12	2.5	0.46	0.18	0.02				0.00	0.00	0.00	0.18	0.02
34	212	77	79.5	78.2	39.12	2A	19	5.5	1.17	1.05	0.12	2C	18.5	4	1.11	0.73	0.08	1.78	0.20
35	216	78	80	79.0	39.50	2A	15.5	6	0.77	0.77	0.08	2C	17.5	5.5	0.98	0.88	0.10	1.65	0.18
36	219	77	78	77.5	38.75	2C	13.5	3.5	0.59	0.32	0.04				0.00	0.00	0.00	0.32	0.04
37	202	80	80	80.0	40.00	2A	19	6	1.14	1.15	0.13	2C	14.5	4.5	0.66	0.48	0.05	1.63	0.18
38	206	77	78	77.5	38.75	2A	17.5	4.5	1.00	0.72	0.08	2C	16	6	0.83	0.82	0.09	1.54	0.17
39	209	82	78.5	80.2	40.12					0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	208	78.5	77	77.8	38.88	2A	17	6.5	0.94	1.01	0.11	2C	19	6.5	1.18	1.26	0.14	2.27	0.25
41	219	80	81.5	80.8	40.38					0.00	0.00				0.00	0.00	0.00	0.00	0.00
42	214	80	81	80.5	40.25					0.00	0.00				0.00	0.00	0.00	0.00	0.00
43	202	75	79	77.0	38.50	2C	15.5	3.5	0.79	0.43	0.05				0.00	0.00	0.00	0.43	0.05
44	206	78	77.5	77.8	38.88	1A	11.5	3	0.43	0.19	0.02	2A	13	4.5	0.55	0.39	0.04	0.58	0.06
Total	4663									11.6	1.28				7.23	0.80		18.809	2.0760

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

88:3/3

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 3

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary		
23	5B	17	4.5	0.95	0.68	0.07					0.00	0.00	0.00	0.68	0.07	1.19	0.13		
24					0.00	0.00					0.00	0.00	0.00	0.00	0.00	1.06	0.12	Tray 2	
25	5B	21.5	6.5	1.50	1.63	0.18					0.00	0.00	0.00	1.63	0.18	3.26	0.36	Weight(kg)	4.66
26	5B	19	5.5	1.19	1.05	0.12					0.00	0.00	0.00	1.05	0.12	1.25	0.14		
27	5A	12.5	4	0.49	0.31	0.03					0.00	0.00	0.00	0.31	0.03	0.83	0.09	Vol Top	18.81
28					0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	24.81
29	5B	17.5	6	0.99	0.97	0.11					0.00	0.00	0.00	0.97	0.11	1.82	0.20	Vol Total	43.62
30	5B	18.5	5	1.09	0.90	0.10					0.00	0.00	0.00	0.90	0.10	1.56	0.17		
31					0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.34	0.04	Ea Top	2.08
32	5A	12.5	4	0.50	0.31	0.03					0.00	0.00	0.00	0.31	0.03	2.98	0.33	Ea Bottom	2.74
33	5A	20.5	6	1.37	1.35	0.15					0.00	0.00	0.00	1.35	0.15	1.53	0.17	Ea Total	4.81
34	5A	18.5	5.5	1.11	0.99	0.11					0.00	0.00	0.00	0.99	0.11	2.77	0.31		
35	5B	26	8.5	2.20	3.24	0.36					0.00	0.00	0.00	3.24	0.36	4.89	0.54	Top Br	27
36	5A	21	6.5	1.45	1.55	0.17					0.00	0.00	0.00	1.55	0.17	1.87	0.21	Bottom Br	18
37	5A	17	5.5	0.91	0.83	0.09					0.00	0.00	0.00	0.83	0.09	2.46	0.27	Br Fruit	20
38	5B	16.3	3	0.87	0.42	0.05					0.00	0.00	0.00	0.42	0.05	1.96	0.22		
39					0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00		
40	5B	25	7.5	2.06	2.63	0.29					0.00	0.00	0.00	2.63	0.29	4.89	0.54		
41	5B	24	7.5	1.82	2.38	0.26					0.00	0.00	0.00	2.38	0.26	2.38	0.26		
42	5B	22	7.5	1.53	1.98	0.22					0.00	0.00	0.00	1.98	0.22	1.98	0.22		
43	5B	19.5	6.5	1.26	1.33	0.15					0.00	0.00	0.00	1.33	0.15	1.76	0.19		
44	5B	22.5	8	1.66	2.24	0.25					0.00	0.00	0.00	2.24	0.25	2.83	0.31		
Total					24.8	2.74					0	0	24.8	2.74	43.620	4.8145			

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

88:3/4

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 3

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	222	78	82.5	80.2	40.12	2B	10.5	2.5	0.34	0.13	0.01				0.00	0.00	0.00	0.13	0.01
46	220	80.5	81	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
47	217	76	77	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
48	218	74.5	82	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
49	212	79.5	81	80.2	40.12	2B	21.5	5	1.47	1.26	0.14				0.00	0.00	0.00	1.26	0.14
50	216	77	81	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	207	73.5	79.5	76.5	38.25	2A	15	2	0.74	0.25	0.03				0.00	0.00	0.00	0.25	0.03
52	207	79	78	78.5	39.25	2C	13	2.5	0.54	0.21	0.02				0.00	0.00	0.00	0.21	0.02
53	215	79	78	78.5	39.25	2A	10	3	0.32	0.15	0.02				0.00	0.00	0.00	0.15	0.02
54	210	76.5	80.5	78.5	39.25	2A	13.5	6	0.58	0.60	0.07				0.00	0.00	0.00	0.60	0.07
55	208	76	81.5	78.8	39.38	2A	19	6.5	1.16	1.26	0.14				0.00	0.00	0.00	1.26	0.14
56	218	79	77.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	212	79	80	79.5	39.75	2A	14.5	3.5	0.67	0.37	0.04	2C	14.5	5.5	0.67	0.61	0.07	0.98	0.11
58	203	80	76.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
59	220	79	79	79.0	39.50	2A	14	5	0.63	0.51	0.06	2C	13.5	3.5	0.58	0.32	0.04	0.82	0.09
60	214	80	78.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
61	216	77.5	81.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	204	78.5	74.5	76.5	38.25	2A	18	5.5	1.07	0.94	0.10	2C	14	3.5	0.65	0.35	0.04	1.29	0.14
63	216	79	77	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
64	201	74	78	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
65	216	80	79.5	79.8	39.88	2A	18.5	8	1.09	1.53	0.17	2C	18	7	1.03	1.23	0.14	2.75	0.30
66	217	80	78	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4689									7.19	0.79					2.50	0.28	9.6855	1.0690

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

88:3/5

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 3

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
45	5C	11.5	3	0.41	0.19	0.02					0.00	0.00	0.00	0.19	0.02	0.33	0.04	
46				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3
47				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)
48	5A	15	5.5	0.73	0.65	0.07					0.00	0.00	0.00	0.65	0.07	0.65	0.07	4.69
49				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	1.26	0.14	Vol Top
50	5B	22.5	5.5	1.64	1.53	0.17					0.00	0.00	0.00	1.53	0.17	1.53	0.17	9.69
51	5A	10.5	4	0.36	0.23	0.02					0.00	0.00	0.00	0.23	0.02	0.47	0.05	Vol Bottom
52	5B	16.5	6	0.88	0.86	0.10					0.00	0.00	0.00	0.86	0.10	1.08	0.12	17.45
53	5A	19	6	1.17	1.15	0.13					0.00	0.00	0.00	1.15	0.13	1.30	0.14	Vol Total
54	5B	18.5	5.5	1.11	0.99	0.11					0.00	0.00	0.00	0.99	0.11	1.59	0.18	27.13
55	5B	20	6	1.29	1.28	0.14					0.00	0.00	0.00	1.28	0.14	2.54	0.28	Ea Top
56				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.07
57	5B	21	7.5	1.41	1.80	0.20					0.00	0.00	0.00	1.80	0.20	2.78	0.31	Ea Bottom
58	5B	22.5	7.5	1.65	2.09	0.23					0.00	0.00	0.00	2.09	0.23	2.09	0.23	1.93
59	5A	20	4.5	1.29	0.97	0.11					0.00	0.00	0.00	0.97	0.11	1.79	0.20	Ea Total
60	5A	18	5.5	1.04	0.93	0.10					0.00	0.00	0.00	0.93	0.10	0.93	0.10	2.99
61	5A	15.5	6	0.76	0.77	0.08					0.00	0.00	0.00	0.77	0.08	0.77	0.08	Tray 3
62				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	1.29	0.14	Top Br
63	5A	22.5	6	1.66	1.67	0.18					0.00	0.00	0.00	1.67	0.18	1.67	0.18	Bottom Br
64	5A	18	5	1.08	0.85	0.09					0.00	0.00	0.00	0.85	0.09	0.85	0.09	17
65	5B	19	7.5	1.15	1.48	0.16					0.00	0.00	0.00	1.48	0.16	4.23	0.47	Br Fruit
66				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	15
Total					17.4	1.93					0	0	17.4	1.93	27.134	2.9949	Br Fruit	72

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

88:3/6

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 3

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	222	78.5	82	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	204	81	79.5	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	204	76.5	82.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	211	78.5	77	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	222	77.5	80.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	218	73.5	80.5	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	212	78	78	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	206	78.5	82	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	218	79.5	79	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	204	77	79.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	215	76.5	81	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	216	77.5	78	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	214	76.5	76.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	212	80.5	79	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	204	79.5	75	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	210	77.5	76.5	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	204	75	80.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	218	81.5	79.5	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	217	80	77	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	202	80	76	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	217	79.5	79.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	208	75	77	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4658								0	0	0				0	0	0	0	0

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

88:3/7

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 3

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
68	6B	10.5	2.5	0.34	0.13	0.01				0.00	0.00	0.00	0.13	0.01	0.13	0.01	Tray 4
69	5B	18.5	4	1.09	0.73	0.08				0.00	0.00	0.00	0.73	0.08	0.73	0.08	Weight(kg) 4.66
70	5B	16	5	0.83	0.66	0.07				0.00	0.00	0.00	0.66	0.07	0.66	0.07	
71	5A	14.5	5.5	0.67	0.61	0.07				0.00	0.00	0.00	0.61	0.07	0.61	0.07	Vol Top 0.00
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 15.59
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 15.59
74	5A	16	5.5	0.81	0.73	0.08				0.00	0.00	0.00	0.73	0.08	0.73	0.08	
75	5A	17	5	0.92	0.75	0.08				0.00	0.00	0.00	0.75	0.08	0.75	0.08	Ea Top 0.00
76				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 1.72
77	5B	14.5	4.5	0.67	0.48	0.05				0.00	0.00	0.00	0.48	0.05	0.48	0.05	Ea Total 1.72
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
79	5A	15	3.5	0.74	0.40	0.04				0.00	0.00	0.00	0.40	0.04	0.40	0.04	Carton
80	5B	14	4	0.62	0.39	0.04	6B	10.5	2	0.35	0.11	0.01	0.50	0.06	0.50	0.06	Weight(kg) 18.71
81	4A	11	1.5	0.39	0.09	0.01	5B	18.5	4.5	1.12	0.82	0.09	0.91	0.10	0.91	0.10	
82	5A	25.5	8.5	2.17	3.13	0.35				0.00	0.00	0.00	3.13	0.35	3.13	0.35	Vol Top 44.44
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 64.84
84	6B	13.5	4	0.57	0.37	0.04				0.00	0.00	0.00	0.37	0.04	0.37	0.04	Vol Total 109.28
85	5A	25.5	10.5	2.13	3.95	0.44				0.00	0.00	0.00	3.95	0.44	3.95	0.44	
86	5B	17.5	5.5	0.99	0.88	0.10				0.00	0.00	0.00	0.88	0.10	0.88	0.10	Ea Top 4.90
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 7.16
88	5A	20.5	6	1.41	1.36	0.15				0.00	0.00	0.00	1.36	0.15	1.36	0.15	Ea Total 12.06
Total				14.7	1.62					0.92	0.10		15.6	1.72	15.592	1.7209	Ek Carton 110.10

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

88:3/8

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 4

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	213	78	80.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
2	221	78	82	80.0	40.00	2A	16.5	7	0.86	1.04	0.11				0.00	0.00	0.00	1.04	0.11
3	216	80.5	77	78.8	39.38	2A	15.5	4	0.77	0.49	0.05				0.00	0.00	0.00	0.49	0.05
4	215	79.5	77.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
5	207	76	76	76.0	38.00	2A	17	5	0.96	0.75	0.08				0.00	0.00	0.00	0.75	0.08
6	210	74.5	80.5	77.5	38.75	2A	15	4.5	0.73	0.52	0.06				0.00	0.00	0.00	0.52	0.06
7	211	77.5	78	77.8	38.88	2A	22	6	1.59	1.58	0.17	2C	17.5	6	1.00	0.97	0.11	2.56	0.28
8	211	78	80	79.0	39.50	2A	20	6	1.29	1.28	0.14	2C	18.5	5.5	1.10	0.99	0.11	2.27	0.25
9	207	74.5	80.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
10	214	79	79	79.0	39.50	2A	18	4	1.04	0.68	0.08				0.00	0.00	0.00	0.68	0.08
11	214	79.5	80	79.8	39.88	2B	23	6	1.69	1.74	0.19				0.00	0.00	0.00	1.74	0.19
12	212	77.5	72.5	75.0	37.50	2C	24	6	1.97	1.95	0.22				0.00	0.00	0.00	1.95	0.22
13	213	79	76	77.5	38.75	2A	14.5	6	0.68	0.68	0.07	2C	17.5	5.5	1.00	0.88	0.10	1.56	0.17
14	217	81	78.5	79.8	39.88	2A	16	2	0.81	0.29	0.03	2C	16.5	5.5	0.86	0.78	0.09	1.07	0.12
15	213	77.5	78.5	78.0	39.00	2A	13.5	4.5	0.59	0.42	0.05				0.00	0.00	0.00	0.42	0.05
16	208	80	77.5	78.8	39.38	2A	20.5	7.5	1.36	1.72	0.19	2C	13	3.5	0.54	0.29	0.03	2.02	0.22
17	212	78	79	78.5	39.25	2A	13	4	0.54	0.34	0.04				0.00	0.00	0.00	0.34	0.04
18	222	79.5	79.5	79.5	39.75	2A	19.5	7.5	1.21	1.56	0.17	2C	17.5	6.5	0.98	1.06	0.12	2.62	0.29
19	205	75.5	73.5	74.5	37.25	2A	15	3	0.76	0.35	0.04	2C	15	3	0.76	0.35	0.04	0.70	0.08
20	207	77.5	75.5	76.5	38.25	2A	16	6	0.85	0.82	0.09	2C	17	5.5	0.96	0.83	0.09	1.65	0.18
21	210	79.5	77.5	78.5	39.25	2A	14.5	4	0.68	0.42	0.05				0.00	0.00	0.00	0.42	0.05
22	220	77.5	80.5	79.0	39.50	2A	17.5	6.5	0.98	1.06	0.12				0.00	0.00	0.00	1.06	0.12
Total	4678									17.7	1.95					6.17	0.68	23.877	2.6354

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

88:4/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 4

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.04	0.11	Tray 1	
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.49	0.05	Weight(kg)	4.68
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.75	0.08	Vol Top	23.88
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.52	0.06	Vol Bottom	0.00
7				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.56	0.28	Vol Total	23.88
8				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.27	0.25		
9				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	2.64
10				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.68	0.08	Ea Bottom	0.00
11				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.74	0.19	Ea Total	2.64
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.95	0.22		
13				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.56	0.17	Top Br	27
14				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.07	0.12	Bottom Br	0
15				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.42	0.05	Br Fruit	19
16				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.02	0.22		
17				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.34	0.04		
18				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.62	0.29		
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.70	0.08		
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.65	0.18		
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.42	0.05		
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.06	0.12		
Total				0	0	0				0	0	0	0	0	23.877	2.6354		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

88:4/2

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 4

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
23	217	77.5	78.5	78.0	39.00	2A	18.5	7	1.11	1.30	0.14	2C	13.5	4.6	0.59	0.43	0.05	1.73	0.19
24	203	76	76	76.0	38.00	2A	12.5	3.5	0.52	0.27	0.03	2C	17.5	5.5	1.02	0.89	0.10	1.16	0.13
25	205	77.5	79.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
26	218	79	79.5	79.2	39.62	2A	17	6	0.92	0.92	0.10				0.00	0.00	0.00	0.92	0.10
27	211	76	81	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
28	209	77	75.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
29	209	77	77	77.0	38.50	2A	13	4.5	0.55	0.39	0.04	2C	14.5	4	0.69	0.43	0.05	0.81	0.09
30	208	76.5	75	75.8	37.88	2A	17.5	5.5	1.02	0.89	0.10	2C	22.5	7.5	1.71	2.10	0.23	2.99	0.33
31	201	80	81	80.5	40.25	2C	15.5	5	0.75	0.62	0.07				0.00	0.00	0.00	0.62	0.07
32	206	75	78	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
33	206	77	78	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
34	210	79	78	78.5	39.25	2A	14.5	6.5	0.68	0.75	0.08	2C	18	5.5	1.05	0.94	0.10	1.69	0.19
35	216	79	77.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
36	208	77	75.5	76.2	38.12	2A	12	3	0.48	0.21	0.02	2C	17	4.5	0.96	0.68	0.07	0.89	0.10
37	218	82	77	79.5	39.75	2A	17	5.5	0.92	0.83	0.09				0.00	0.00	0.00	0.83	0.09
38	215	81	80	80.5	40.25	2A	20	7	1.26	1.51	0.17				0.00	0.00	0.00	1.51	0.17
39	218	79	77.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	215	79.5	78.5	79.0	39.50	2B	21	6.5	1.42	1.55	0.17				0.00	0.00	0.00	1.55	0.17
41	210	78.5	77.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
42	217	80	78	79.0	39.50	2B	15	4.5	0.72	0.52	0.06				0.00	0.00	0.00	0.52	0.06
43	221	78	77	77.5	38.75	2A	26	10	2.25	3.89	0.43	2C	18	6	1.06	1.03	0.11	4.92	0.54
44	211	78	79	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4652									13.6	1.50					6.49	0.72	20.121	2.2209

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

88:4/3

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 4

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
23	5B	19	6	1.17	1.15	0.13	5C	14.5	4	0.68	0.43	0.05	1.58	0.17	3.30	0.36	
24				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.16	0.13	Tray 2
25	5A	13.5	2.5	0.58	0.23	0.03				0.00	0.00	0.00	0.23	0.03	0.23	0.03	Weight(kg) 4.65
26	5B	24	7	1.86	2.23	0.25				0.00	0.00	0.00	2.23	0.25	3.15	0.35	
27	5C	18.5	5.5	1.11	0.99	0.11				0.00	0.00	0.00	0.99	0.11	0.99	0.11	Vol Top 20.12
28	5C	17	5	0.96	0.75	0.08				0.00	0.00	0.00	0.75	0.08	0.75	0.08	Vol Bottom 21.15
29	5A	19	8	1.19	1.61	0.18				0.00	0.00	0.00	1.61	0.18	2.42	0.27	Vol Total 41.27
30	5B	15.5	5	0.80	0.62	0.07				0.00	0.00	0.00	0.62	0.07	3.61	0.40	
31				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.62	0.07	Ea Top 2.22
32				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 2.33
33	5A	17.5	6.5	1.00	1.07	0.12				0.00	0.00	0.00	1.07	0.12	1.07	0.12	Ea Total 4.56
34	5A	22	8	1.57	2.14	0.24				0.00	0.00	0.00	2.14	0.24	3.83	0.42	
35				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br 21
36	5A	21	7.5	1.47	1.82	0.20				0.00	0.00	0.00	1.82	0.20	2.71	0.30	Bottom Br 17
37				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.83	0.09	Br Fruit 19
38	5A	18	6.5	1.02	1.12	0.12				0.00	0.00	0.00	1.12	0.12	2.63	0.29	
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
40	5B	24	7.5	1.87	2.39	0.26				0.00	0.00	0.00	2.39	0.26	3.94	0.43	
41	5B	20.5	6.5	1.37	1.47	0.16				0.00	0.00	0.00	1.47	0.16	1.47	0.16	
42	5A	17.5	6	0.98	0.97	0.11				0.00	0.00	0.00	0.97	0.11	1.49	0.16	
43	5B	17	5	0.94	0.75	0.08				0.00	0.00	0.00	0.75	0.08	5.67	0.63	
44	5B	20	6.5	1.30	1.40	0.15				0.00	0.00	0.00	1.40	0.15	1.40	0.15	
Total					20.7	2.29					0.43	0.05	21.1	2.33	41.270	4.5552	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

88:4/4

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 4

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	217	78	80.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	205	77	81	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
47	212	77	77	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
48	222	79.5	79.5	79.5	39.75	2A	17.5	6	0.98	0.97	0.11				0.00	0.00	0.00	0.97	0.11
49	207	78	79	78.5	39.25	2C	14.5	3.5	0.68	0.37	0.04				0.00	0.00	0.00	0.37	0.04
50	218	78.5	79	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	215	77	79	78.0	39.00	2A	15	6	0.73	0.72	0.08				0.00	0.00	0.00	0.72	0.08
52	210	77	77.5	77.2	38.62	2A	21.5	5	1.53	1.27	0.14	2C	12	2	0.47	0.14	0.02	1.41	0.16
53	222	79	80.5	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
54	211	75.5	81	78.2	39.12	2A	17	8	0.93	1.31	0.14				0.00	0.00	0.00	1.31	0.14
55	205	76	80	78.0	39.00	2A	14	4.5	0.63	0.45	0.05	2C	17.5	4.5	0.99	0.72	0.08	1.17	0.13
56	213	78	83.5	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	219	80.5	79	79.8	39.88	2A	11.5	4	0.42	0.27	0.03				0.00	0.00	0.00	0.27	0.03
58	204	77.5	79.5	78.5	39.25	2B	18.5	4.5	1.11	0.81	0.09				0.00	0.00	0.00	0.81	0.09
59	203	75.5	81	78.2	39.12	2A	13.5	4.5	0.59	0.42	0.05				0.00	0.00	0.00	0.42	0.05
60	221	79.5	81	80.2	40.12	2B	18	7.5	1.02	1.33	0.15				0.00	0.00	0.00	1.33	0.15
61	223	77	80.5	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	208	77.5	81	79.2	39.62	2A	11.5	3.5	0.42	0.23	0.03	2C	17	6	0.92	0.92	0.10	1.14	0.13
63	208	80	79	79.5	39.75	2B	22.5	7	1.63	1.94	0.21				0.00	0.00	0.00	1.94	0.21
64	221	83.5	76.5	80.0	40.00	2A	10	4	0.31	0.21	0.02				0.00	0.00	0.00	0.21	0.02
65	218	80.5	77.5	79.0	39.50	2A	21	7	1.42	1.67	0.18				0.00	0.00	0.00	1.67	0.18
66	211	79	78	78.5	39.25	2A	13.5	3.5	0.58	0.32	0.04				0.00	0.00	0.00	0.32	0.04
Total	4693									12.3	1.36					1.78	0.20	14.065	1.5524

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

88:4/5

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 4

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
46	5B	20	7	1.29	1.51	0.17				0.00	0.00	0.00	1.51	0.17	1.51	0.17	Tray 3
47	5A	13.5	3	0.60	0.27	0.03				0.00	0.00	0.00	0.27	0.03	0.27	0.03	Weight(kg) 4.69
48	5B	17.5	7	0.98	1.16	0.13				0.00	0.00	0.00	1.16	0.13	2.13	0.24	
49	5A	13	4.5	0.54	0.39	0.04				0.00	0.00	0.00	0.39	0.04	0.76	0.08	Vol Top 14.06
50	5B	18.5	6.5	1.10	1.19	0.13				0.00	0.00	0.00	1.19	0.13	1.19	0.13	Vol Bottom 18.94
51	5B	15	2	0.73	0.25	0.03				0.00	0.00	0.00	0.25	0.03	0.97	0.11	Vol Total 33.01
52	5B	20.5	7	1.38	1.60	0.18				0.00	0.00	0.00	1.60	0.18	3.01	0.33	
53	5B	19	4.5	1.15	0.86	0.09				0.00	0.00	0.00	0.86	0.09	0.86	0.09	Ea Top 1.55
54	5A	19.5	6	1.23	1.22	0.13				0.00	0.00	0.00	1.22	0.13	2.53	0.28	Ea Bottom 2.09
55				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.17	0.13	Ea Total 3.64
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3
57	5A	20.5	8.5	1.34	2.00	0.22				0.00	0.00	0.00	2.00	0.22	2.26	0.25	Top Br 18
58	5B	21.5	7.5	1.50	1.90	0.21				0.00	0.00	0.00	1.90	0.21	2.71	0.30	Bottom Br 18
59	5A	14.5	4	0.68	0.43	0.05				0.00	0.00	0.00	0.43	0.05	0.84	0.09	Br Fruit 20
60	5A	13	5	0.53	0.44	0.05				0.00	0.00	0.00	0.44	0.05	1.77	0.20	Tray 4
61	5A	19	6.5	1.16	1.26	0.14				0.00	0.00	0.00	1.26	0.14	1.26	0.14	Top Br 2
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.14	0.13	Bottom Br 17
63	5B	23	8	1.70	2.34	0.26				0.00	0.00	0.00	2.34	0.26	4.27	0.47	Br Fruit 16
64	5A	19.5	6	1.21	1.21	0.13				0.00	0.00	0.00	1.21	0.13	1.42	0.16	Carton
65	5A	13	5	0.54	0.44	0.05				0.00	0.00	0.00	0.44	0.05	2.11	0.23	Top Br 68
66	5A	15.5	4	0.77	0.49	0.05				0.00	0.00	0.00	0.49	0.05	0.81	0.09	Bottom Br 52
Total					18.9	2.09				0	0	0	18.9	2.09	33.006	3.6431	Br Fruit 74

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 4

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	211	76.5	77.5	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	214	77.5	78	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	220	78.5	83	80.8	40.38	2A	18.5	6.5	1.07	1.18	0.13	2C	15	4	0.70	0.45	0.05	1.64	0.18
70	201	79.5	75.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	215	80	77	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	212	80.5	77	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	204	77.5	77	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	203	76.5	77	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	210	77.5	77.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	220	78	86	82.0	41.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	210	79	78.5	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	212	80.5	77.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	203	78.5	78	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	218	80	81	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	221	81	79.5	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	220	79	82.5	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	203	78.5	78	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	215	78	78	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	204	78	78	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	217	85	80	82.5	41.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	222	80	78.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	211	79.5	76.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4666									1.18	0.13					0.45	0.05	1.6396	0.1810

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 4

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
68	5B	16	5	0.83	0.66	0.07				0.00	0.00	0.00	0.66	0.07	0.66	0.07	Tray 4
69	5B	18	7	1.02	1.22	0.14	6A	12	5	0.45	0.38	0.04	1.60	0.18	3.24	0.36	Weight(kg) 4.67
70	5A	16.5	5.5	0.89	0.78	0.09				0.00	0.00	0.00	0.78	0.09	0.78	0.09	
71	5B	16	4	0.82	0.53	0.06				0.00	0.00	0.00	0.53	0.06	0.53	0.06	Vol Top 1.64
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 14.02
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 15.66
74	5A	15.5	3.5	0.79	0.43	0.05				0.00	0.00	0.00	0.43	0.05	0.43	0.05	
75	5B	14.5	4.5	0.68	0.48	0.05				0.00	0.00	0.00	0.48	0.05	0.48	0.05	Ea Top 0.18
76	5B	15	4.5	0.69	0.51	0.06				0.00	0.00	0.00	0.51	0.06	0.51	0.06	Ea Bottom 1.55
77	5A	13.5	3.5	0.58	0.32	0.04				0.00	0.00	0.00	0.32	0.04	0.32	0.04	Ea Total 1.73
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
79	5B	24	8	1.89	2.57	0.28				0.00	0.00	0.00	2.57	0.28	2.57	0.28	Carton
80	5B	17	4.5	0.91	0.67	0.07				0.00	0.00	0.00	0.67	0.07	0.67	0.07	Weight(kg) 18.69
81	4C	13	3	0.53	0.25	0.03				0.00	0.00	0.00	0.25	0.03	0.25	0.03	
82	5B	18	5.5	1.02	0.93	0.10				0.00	0.00	0.00	0.93	0.10	0.93	0.10	Vol Top 59.70
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 54.11
84	5B	14	3.5	0.63	0.34	0.04				0.00	0.00	0.00	0.34	0.04	0.34	0.04	Vol Total 113.81
85				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
86	5A	21	8	1.36	1.93	0.21				0.00	0.00	0.00	1.93	0.21	1.93	0.21	Ea Top 6.59
87	5B	16.5	5.5	0.87	0.78	0.09				0.00	0.00	0.00	0.78	0.09	0.78	0.09	Ea Bottom 5.97
88	5B	22	4.5	1.58	1.22	0.13				0.00	0.00	0.00	1.22	0.13	1.22	0.13	Ea Total 12.56
Total					13.6	1.51					0.38	0.04	14.0	1.55	15.660	1.7285	Ek Carton 110.00

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 11.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 5

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	205	79.5	79.5	79.5	39.75	2A	9	2.5	0.26	0.10	0.01	2C	14.5	6	0.67	0.68	0.07	0.77	0.09
2	209	76.5	79	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
3	222	82	78.5	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
4	215	79	76.5	77.8	38.88	2A	12	3	0.47	0.21	0.02				0.00	0.00	0.00	0.21	0.02
5	209	75.5	78	76.8	38.38	2A	14	3.5	0.64	0.35	0.04				0.00	0.00	0.00	0.35	0.04
6	213	82	78	80.0	40.00	2B	19	4.5	1.14	0.86	0.09				0.00	0.00	0.00	0.86	0.09
7	202	78.5	79	78.8	39.38	2A	20	6	1.29	1.28	0.14				0.00	0.00	0.00	1.28	0.14
8	213	79.5	77	78.2	39.12	2A	20	6.5	1.30	1.40	0.15				0.00	0.00	0.00	1.40	0.15
9	202	77	79.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
10	220	81.5	79	80.2	40.12	2A	24	8	1.84	2.55	0.28				0.00	0.00	0.00	2.55	0.28
11	210	74	80.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
12	211	76.5	79.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
13	217	79	80	79.5	39.75	2A	21.5	7	1.48	1.76	0.19				0.00	0.00	0.00	1.76	0.19
14	211	81	79	80.0	40.00	2A	19.5	7	1.21	1.44	0.16	2C	22.5	6	1.61	1.66	0.18	3.09	0.34
15	217	78.5	78.5	78.5	39.25	2A	14.5	2.5	0.68	0.27	0.03	2C	15	4	0.72	0.46	0.05	0.73	0.08
16	201	74.5	79	76.8	38.38	2A	12.5	3.5	0.51	0.27	0.03				0.00	0.00	0.00	0.27	0.03
17	220	80	80.5	80.2	40.12	2A	20.5	2.5	1.33	0.64	0.07				0.00	0.00	0.00	0.64	0.07
18	206	78.5	75	76.8	38.38	2A	20	5.5	1.33	1.18	0.13	2C	18.5	5.5	1.13	1.00	0.11	2.18	0.24
19	221	77.5	77	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
20	221	83	77	80.0	40.00	2A	14.5	3.5	0.66	0.37	0.04	2C	17	4	0.91	0.60	0.07	0.97	0.11
21	220	79	80.5	79.8	39.88	2A	16.5	4	0.86	0.56	0.06				0.00	0.00	0.00	0.56	0.06
22	216	78.5	80.5	79.5	39.75	2A	24	9	1.85	2.91	0.32	2C	13.5	5.5	0.58	0.53	0.06	3.45	0.38
Total	4681									16.2	1.78					4.91	0.54	21.065	2.3250

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 16.9.93

88:5/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 5

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.77	0.09	
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 1
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 4.68
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.21	0.02	
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.35	0.04	Vol Top 21.06
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.86	0.09	Vol Bottom 5.95
7				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.28	0.14	Vol Total 27.02
8				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.40	0.15	
9				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top 2.33
10	5B	29	5	2.71	2.65	0.29				0.00	0.00	0.00	2.65	0.29	5.20	0.57	Ea Bottom 0.66
11	5B	29	2.5	2.82	1.78	0.20				0.00	0.00	0.00	1.78	0.20	1.78	0.20	Ea Total 2.98
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	5B	13.5	4	0.58	0.37	0.04				0.00	0.00	0.00	0.37	0.04	2.12	0.23	Top Br 22
14				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.09	0.34	Bottom Br 5
15				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.73	0.08	Br Fruit 17
16	5B	17.5	5.5	1.01	0.89	0.10				0.00	0.00	0.00	0.89	0.10	1.16	0.13	
17				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.64	0.07	
18				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.18	0.24	
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.97	0.11	
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.56	0.06	
22	5B	17	1.5	0.92	0.28	0.03				0.00	0.00	0.00	0.28	0.03	3.72	0.41	
Total					5.95	0.66					0	0	5.95	0.66	27.015	2.9818	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 16.9.93

88:5/2

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 5

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
23	212	80	77	78.5	39.25	2A	18	5	1.05	0.85	0.09				0.00	0.00	0.00	0.85	0.09
24	208	77	78.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
25	206	81.5	82	81.8	40.88	2A	17.5	7.5	0.95	1.26	0.14				0.00	0.00	0.00	1.26	0.14
26	203	76.5	78	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
27	200	74.5	76.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
28	219	79	80	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
29	211	79	79.5	79.2	39.62	2A	17	6	0.92	0.92	0.10	2B	19	6	1.16	1.15	0.13	2.06	0.23
30	216	76.5	77	76.8	38.38	2A	11	4.5	0.40	0.28	0.03				0.00	0.00	0.00	0.28	0.03
31	219	78	77	77.5	38.75	2A	18.5	5.5	1.12	0.99	0.11	2C	15	7	0.73	0.88	0.10	1.88	0.21
32	204	77.5	76.5	77.0	38.50	2A	16	5.5	0.84	0.74	0.08				0.00	0.00	0.00	0.74	0.08
33	201	80.5	77	78.8	39.38	2A	18.5	6	1.10	1.09	0.12				0.00	0.00	0.00	1.09	0.12
34	212	77	83	80.0	40.00	2A	22	9	1.54	2.45	0.27	2C	18	4.5	1.03	0.76	0.08	3.21	0.35
35	219	78	81.5	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
36	214	77	77	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
37	213	79	81	80.0	40.00	2A	11	2.5	0.38	0.15	0.02	2C	16.5	5.5	0.86	0.78	0.09	0.93	0.10
38	211	77	76.5	76.8	38.38	2A	14	4	0.64	0.40	0.04				0.00	0.00	0.00	0.40	0.04
39	220	78.5	81	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	203	76.5	79	77.8	38.88	2A	19.5	7	1.24	1.44	0.16				0.00	0.00	0.00	1.44	0.16
41	201	76.5	81.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
42	207	78.5	78.5	78.5	39.25	2A	18.5	5.5	1.11	0.99	0.11				0.00	0.00	0.00	0.99	0.11
43	201	77.5	76.5	77.0	38.50	2A	14	2	0.64	0.21	0.02				0.00	0.00	0.00	0.21	0.02
44	207	74	81	77.5	38.75	2A	12	3.5	0.47	0.25	0.03				0.00	0.00	0.00	0.25	0.03
Total	4607									12.0	1.33					3.57	0.39	15.587	1.7204

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 16.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 5

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
23				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.85	0.09		
24				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 2	
25	5C	22.5	6	1.58	1.65	0.18				0.00	0.00	0.00	1.65	0.18	2.91	0.32	Weight(kg)	4.61
26	5A	13.5	4	0.59	0.37	0.04				0.00	0.00	0.00	0.37	0.04	0.37	0.04		
27				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	15.59
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	16.17
29	5B	16.5	6	0.87	0.86	0.10				0.00	0.00	0.00	0.86	0.10	2.93	0.32	Vol Total	31.76
30				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.28	0.03		
31	5C	20.5	5.5	1.38	1.24	0.14				0.00	0.00	0.00	1.24	0.14	3.12	0.34	Ea Top	1.72
32	5A	19.5	6	1.26	1.22	0.13				0.00	0.00	0.00	1.22	0.13	1.96	0.22	Ea Bottom	1.78
33	5A	25	8.5	2.04	2.98	0.33				0.00	0.00	0.00	2.98	0.33	4.07	0.45	Ea Total	3.51
34	5B	18.5	5.5	1.08	0.99	0.11				0.00	0.00	0.00	0.99	0.11	4.20	0.46		
35	5A	19	5.5	1.15	1.05	0.12				0.00	0.00	0.00	1.05	0.12	1.05	0.12	Top Br	18
36	5A	21	7	1.46	1.68	0.19				0.00	0.00	0.00	1.68	0.19	1.68	0.19	Bottom Br	14
37	4B	14	3	0.62	0.30	0.03				0.00	0.00	0.00	0.30	0.03	1.22	0.13	Br Fruit	17
38	5A	17.5	5	1.01	0.80	0.09				0.00	0.00	0.00	0.80	0.09	1.20	0.13		
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
40				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.44	0.16		
41				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
42	5A	23.5	8	1.80	2.45	0.27				0.00	0.00	0.00	2.45	0.27	3.44	0.38		
43	5A	13.5	4.5	0.60	0.42	0.05				0.00	0.00	0.00	0.42	0.05	0.63	0.07		
44	5A	11.5	2.5	0.43	0.16	0.02				0.00	0.00	0.00	0.16	0.02	0.41	0.05		
Total				16.2	1.78					0	0	16.2	1.78		31.759	3.5054		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 16.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 5

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	206	81.5	78.5	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	203	77	79	78.0	39.00	2B	24	6.5	1.89	2.08	0.23				0.00	0.00	0.00	2.08	0.23
47	203	78	79	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
48	209	77.5	78.5	78.0	39.00	2B	20	6.5	1.30	1.40	0.15				0.00	0.00	0.00	1.40	0.15
49	211	80	81	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
50	218	81	82	81.5	40.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	220	82.5	77.5	80.0	40.00	2A	13	3	0.53	0.25	0.03	2C	24	6	1.84	1.92	0.21	2.17	0.24
52	213	74.5	80	77.2	38.62	2C	21	6	1.45	1.43	0.16				0.00	0.00	0.00	1.43	0.16
53	219	79	77.5	78.2	39.12	2A	15.5	5.5	0.78	0.69	0.08				0.00	0.00	0.00	0.69	0.08
54	215	76.5	80	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
55	209	74.5	80	77.2	38.62	2A	18.5	6	1.12	1.09	0.12				0.00	0.00	0.00	1.09	0.12
56	214	81.5	77.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	219	78	80	79.0	39.50	2A	17	5.5	0.93	0.83	0.09				0.00	0.00	0.00	0.83	0.09
58	211	76.5	79.5	78.0	39.00	2C	21	5	1.44	1.20	0.13				0.00	0.00	0.00	1.20	0.13
59	207	74.5	79.5	77.0	38.50	2A	20.5	7.5	1.39	1.73	0.19				0.00	0.00	0.00	1.73	0.19
60	222	79	78	78.5	39.25	2A	17	5	0.93	0.75	0.08				0.00	0.00	0.00	0.75	0.08
61	204	78	75	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	218	75	79	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	218	76.5	80.5	78.5	39.25	2A	25	7	2.04	2.45	0.27				0.00	0.00	0.00	2.45	0.27
64	210	78.5	75.5	77.0	38.50	2A	23	7.5	1.76	2.19	0.24				0.00	0.00	0.00	2.19	0.24
65	214	81	80	80.5	40.25	2B	22.5	7	1.60	1.93	0.21				0.00	0.00	0.00	1.93	0.21
66	206	76	79.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4669									18.0	1.99					1.92	0.21	19.949	2.2018

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 16.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 5

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
46	5B	24	7.5	1.89	2.40	0.26				0.00	0.00	0.00	2.40	0.26	4.48	0.49	Tray 3	
47	5A	17	5.5	0.93	0.83	0.09				0.00	0.00	0.00	0.83	0.09	0.83	0.09	Weight(kg)	4.67
48	5B	20	7	1.30	1.52	0.17				0.00	0.00	0.00	1.52	0.17	2.91	0.32		
49	5A	17.5	6	0.96	0.97	0.11				0.00	0.00	0.00	0.97	0.11	0.97	0.11	Vol Top	19.95
50	5B	20.5	7.5	1.31	1.71	0.19				0.00	0.00	0.00	1.71	0.19	1.71	0.19	Vol Bottom	24.32
51	5B	14	4.5	0.62	0.45	0.05				0.00	0.00	0.00	0.45	0.05	2.62	0.29	Vol Total	44.27
52	5A	12	2.5	0.47	0.18	0.02				0.00	0.00	0.00	0.18	0.02	1.61	0.18		
53				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.69	0.08	Ea Top	2.20
54	5A	19	5	1.17	0.96	0.11				0.00	0.00	0.00	0.96	0.11	0.96	0.11	Ea Bottom	2.68
55				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.09	0.12	Ea Total	4.89
56	5C	23	5.5	1.70	1.61	0.18				0.00	0.00	0.00	1.61	0.18	1.61	0.18	Tray 3	
57	5B	18.5	7.5	1.10	1.41	0.16				0.00	0.00	0.00	1.41	0.16	2.24	0.25	Top Br	14
58	5B	24	9	1.89	2.92	0.32				0.00	0.00	0.00	2.92	0.32	4.12	0.46	Bottom Br	16
59	5B	24.6	8.5	2.02	2.90	0.32				0.00	0.00	0.00	2.90	0.32	4.62	0.51	Br Fruit	19
60	5A	17	6.5	0.93	1.01	0.11				0.00	0.00	0.00	1.01	0.11	1.76	0.19	Tray 4	
61	5B	27	7	2.46	2.95	0.33				0.00	0.00	0.00	2.95	0.33	2.95	0.33	Top Br	2
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	13
63	5A	18	4.5	1.05	0.76	0.08				0.00	0.00	0.00	0.76	0.08	3.21	0.35	Br Fruit	13
64				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.19	0.24	Carton	
65	5B	21.5	7	1.46	1.75	0.19				0.00	0.00	0.00	1.75	0.19	3.68	0.41	Top Br	56
66				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	48
Total					24.3	2.68					0	0	24.3	2.68	44.268	4.8861	Br Fruit	66

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 16.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 5

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top	
67	207	80	79	79.5	39.75	2B	11.5	3.5	0.42	0.23	0.03					0.00	0.00	0.00	0.23	0.03
68	216	78	80	79.0	39.50				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
69	217	78	81	79.5	39.75				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
70	213	78.5	75.5	77.0	38.50				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
71	215	79	79	79.0	39.50				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
72	216	77.5	82	79.8	39.88				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
73	213	78.5	80.5	79.5	39.75				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
74	204	77.5	76.5	77.0	38.50				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
75	201	72	76	74.0	37.00				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
76	211	76	77.5	76.8	38.38				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
77	214	78.5	80.5	79.5	39.75				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
78	217	79.5	81	80.2	40.12				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
79	220	79	79.5	79.2	39.62				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
80	217	76	77.5	76.8	38.38				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
81	221	82.5	81	81.8	40.88				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
82	210	76.5	82	79.2	39.62				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
83	219	78.5	83.5	81.0	40.50				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
84	216	81	82	81.5	40.75				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
85	221	82	79.5	80.8	40.38	2A	13.5	3.5	0.57	0.32	0.03					0.00	0.00	0.00	0.32	0.03
86	208	74.5	75.5	75.0	37.50				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
87	207	77	78	77.5	38.75				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
88	220	79.5	81.5	80.5	40.25				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
Total	4703									0.55	0.06					0	0	0.5456	0.0602	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 16.9.93

88:5/7

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 5

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.23	0.03		
68	5A	14	5.5	0.63	0.57	0.06				0.00	0.00	0.00	0.57	0.06	0.57	0.06	Tray 4	
69	5B	18	6	1.03	1.03	0.11				0.00	0.00	0.00	1.03	0.11	1.03	0.11	Weight(kg)	4.70
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
71	5A	20.5	5.5	1.35	1.24	0.14				0.00	0.00	0.00	1.24	0.14	1.24	0.14	Vol Top	0.55
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	16.61
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	17.15
74	5A	20	6.5	1.32	1.40	0.15				0.00	0.00	0.00	1.40	0.15	1.40	0.15		
75	5A	24	8.5	2.00	2.77	0.31	5C	19.5	8	1.31	1.70	0.19	4.47	0.49	4.47	0.49	Ea Top	0.06
76	5A	18	5	1.07	0.85	0.09	5C	16.5	5.5	0.90	0.78	0.09	1.64	0.18	1.64	0.18	Ea Bottom	1.83
77	5A	17	6.5	0.92	1.01	0.11				0.00	0.00	0.00	1.01	0.11	1.01	0.11	Ea Total	1.89
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
79	5A	20	6	1.28	1.28	0.14				0.00	0.00	0.00	1.28	0.14	1.28	0.14	Carton	
80				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	18.66
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
82	5B	22.5	7	1.63	1.94	0.21				0.00	0.00	0.00	1.94	0.21	1.94	0.21	Vol Top	57.15
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	63.05
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	120.20
85				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.32	0.03		
86	5A	15	5.5	0.76	0.85	0.07				0.00	0.00	0.00	0.65	0.07	0.65	0.07	Ea Top	6.31
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	6.96
88	5B	20	6.5	1.26	1.39	0.15				0.00	0.00	0.00	1.39	0.15	1.39	0.15	Ea Total	13.27
Total					14.1	1.56					2.49	0.27	16.6	1.83	17.153	1.8932	Ek Carton	109.83

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 16.9.93

88:5/8

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 6

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	222	77.5	81	79.2	39.62	2B	11	3.5	0.38	0.21	0.02	2C	13.5	3.5	0.58	0.32	0.04	0.53	0.06
2	208	78	77.5	77.8	38.88				0.00	0.00	0.00					0.00	0.00	0.00	0.00
3	204	75	80	77.5	38.75				0.00	0.00	0.00					0.00	0.00	0.00	0.00
4	204	79.5	75	77.2	38.62	2B	22	7.5	1.60	2.00	0.22					0.00	0.00	0.00	2.00
5	222	78	79	78.5	39.25	2A	23	6	1.72	1.75	0.19	2C	12	4.5	0.46	0.33	0.04	2.08	0.23
6	219	83	75	79.0	39.50	2A	15.5	5	0.77	0.62	0.07					0.00	0.00	0.00	0.62
7	218	82	80.5	81.2	40.62	2A	20	6	1.25	1.27	0.14					0.00	0.00	0.00	1.27
8	207	78	75	76.5	38.25	2B	19.5	5	1.26	1.02	0.11					0.00	0.00	0.00	1.02
9	210	77.5	80	78.8	39.38				0.00	0.00	0.00					0.00	0.00	0.00	0.00
10	210	78	74.5	76.2	38.12	2C	15	4.5	0.74	0.52	0.06					0.00	0.00	0.00	0.52
11	213	76.5	79	77.8	38.88	2A	27.5	6.5	2.51	2.87	0.32	2C	25	7.5	2.06	2.63	0.29	5.50	0.61
12	204	75.5	80.5	78.0	39.00				0.00	0.00	0.00					0.00	0.00	0.00	0.00
13	206	80	76	78.0	39.00				0.00	0.00	0.00					0.00	0.00	0.00	0.00
14	210	81	77	79.0	39.50	2A	23.5	11	1.79	3.58	0.40					0.00	0.00	0.00	3.58
15	203	77.5	79	78.2	39.12	2B	16.5	5	0.88	0.71	0.08					0.00	0.00	0.00	0.71
16	215	83	78.5	80.8	40.38	2A	24.5	9	1.90	3.03	0.33					0.00	0.00	0.00	3.03
17	203	76.5	76.5	76.5	38.25				0.00	0.00	0.00					0.00	0.00	0.00	0.00
18	206	75.5	78.5	77.0	38.50	2A	20.5	6.5	1.39	1.48	0.16					0.00	0.00	0.00	1.48
19	217	75.5	79.5	77.5	38.75	2A	20	6.5	1.31	1.40	0.15					0.00	0.00	0.00	1.40
20	220	78	78	78.0	39.00	2B	18	7.5	1.05	1.34	0.15					0.00	0.00	0.00	1.34
21	218	83	82	82.5	41.25	2B	18.5	7	1.05	1.29	0.14					0.00	0.00	0.00	1.29
22	209	77.5	80	78.8	39.38	2B	19.5	7.5	1.23	1.56	0.17					0.00	0.00	0.00	1.56
Total	4648									24.6	2.72					3.28	0.36	27.917	3.0814

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 16.9.93

88:6/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 6

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.53	0.06	
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 1
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 4.65
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.00	0.22	
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.08	0.23	Vol Top 27.92
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.62	0.07	Vol Bottom 7.35
7				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.27	0.14	Vol Total 35.27
8				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.02	0.11	
9	5B	14.5	3	0.67	0.32	0.04				0.00	0.00	0.00	0.32	0.04	0.32	0.04	Ea Top 3.08
10				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.52	0.06	Ea Bottom 0.81
11	5B	29	5	2.81	2.68	0.30				0.00	0.00	0.00	2.68	0.30	8.18	0.90	Ea Total 3.89
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br 19
14				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.58	0.40	Bottom Br 3
15				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.71	0.08	Br Fruit 17
16	5C	29	9	2.69	4.36	0.48				0.00	0.00	0.00	4.36	0.48	7.39	0.82	
17				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
18				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.48	0.16	
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.40	0.15	
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.34	0.15	
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.29	0.14	
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.56	0.17	
Total				7.35	0.81					0	0		7.35	0.81	35.272	3.8932	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 16.9.93

88:6/2

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 6

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
23	214	77	84	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
24	207	76.5	78.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
25	210	78.5	80	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
26	203	81	79	80.0	40.00	2A	18	7.5	1.03	1.34	0.15				0.00	0.00	0.00	1.34	0.15
27	214	76.5	82	79.2	39.62	2A	10.5	2	0.35	0.11	0.01				0.00	0.00	0.00	0.11	0.01
28	214	81.5	77	79.2	39.62	2A	20	5.5	1.28	1.17	0.13				0.00	0.00	0.00	1.17	0.13
29	215	78	80.5	79.2	39.62	2A	19	7	1.16	1.36	0.15				0.00	0.00	0.00	1.36	0.15
30	216	81	83	82.0	41.00	2C	21	5.5	1.37	1.30	0.14				0.00	0.00	0.00	1.30	0.14
31	219	79	82	80.5	40.25	2A	9.5	4.5	0.28	0.22	0.02				0.00	0.00	0.00	0.22	0.02
32	219	78	81	79.5	39.75	2A	25	8	2.02	2.79	0.31				0.00	0.00	0.00	2.79	0.31
33	204	76.5	78	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
34	215	75.5	80	77.8	38.88	2A	23	6.5	1.74	1.89	0.21				0.00	0.00	0.00	1.89	0.21
35	216	78.5	78.5	78.5	39.25	2A	15	6	0.72	0.72	0.08				0.00	0.00	0.00	0.72	0.08
36	212	81	75	78.0	39.00	2A	21.5	1	1.51	0.46	0.05				0.00	0.00	0.00	0.46	0.05
37	208	78.5	79.5	79.0	39.50	2A	25	6.5	2.03	2.28	0.25				0.00	0.00	0.00	2.28	0.25
38	213	79	80	79.5	39.75	2A	14.5	3.5	0.67	0.37	0.04				0.00	0.00	0.00	0.37	0.04
39	215	78.5	77	77.8	38.88	2A	14.5	1.5	0.68	0.18	0.02				0.00	0.00	0.00	0.18	0.02
40	221	79	76.5	77.8	38.88	2A	24.5	9.5	1.98	3.25	0.36				0.00	0.00	0.00	3.25	0.36
41	221	79.5	81	80.2	40.12	2B	13	3	0.53	0.25	0.03				0.00	0.00	0.00	0.25	0.03
42	211	80	80.5	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
43	217	82.5	78	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
44	218	80.5	81	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4702									17.7	1.95					0	0	17.691	1.9527

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 16.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 6

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
23	5A	25.5	10	2.07	3.71	0.41				0.00	0.00	0.00	3.71	0.41	3.71	0.41		
24	5A	22.5	7	1.67	1.94	0.21				0.00	0.00	0.00	1.94	0.21	1.94	0.21	Tray 2	
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	4.70
26	5A	17.5	6	0.97	0.97	0.11				0.00	0.00	0.00	0.97	0.11	2.30	0.25		
27	5A	19.5	3.5	1.22	0.73	0.08				0.00	0.00	0.00	0.73	0.08	0.84	0.09	Vol Top	17.69
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.17	0.13	Vol Bottom	27.04
29	5A	24.5	10.5	1.94	3.65	0.40				0.00	0.00	0.00	3.65	0.40	5.01	0.55	Vol Total	44.73
30	5A	20	6	1.24	1.27	0.14				0.00	0.00	0.00	1.27	0.14	2.57	0.28		
31				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.22	0.02	Ea Top	1.95
32	5A	21	9	1.41	2.24	0.25				0.00	0.00	0.00	2.24	0.25	5.04	0.56	Ea Bottom	2.98
33	5B	18.5	5.5	1.12	0.99	0.11				0.00	0.00	0.00	0.99	0.11	0.99	0.11	Ea Total	4.94
34	5A	16	2.5	0.83	0.35	0.04				0.00	0.00	0.00	0.35	0.04	2.24	0.25		
35	5B	17.5	5.5	0.99	0.88	0.10				0.00	0.00	0.00	0.88	0.10	1.60	0.18	Top Br	15
36	5C	13	4.5	0.55	0.39	0.04				0.00	0.00	0.00	0.39	0.04	0.85	0.09	Bottom Br	16
37	5C	37.5	6.5	4.73	6.45	0.71				0.00	0.00	0.00	6.45	0.71	8.73	0.96	Br Fruit	20
38	5A	18	4	1.03	0.68	0.08				0.00	0.00	0.00	0.68	0.08	1.05	0.12		
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.18	0.02		
40	5A	19	7	1.18	1.37	0.15				0.00	0.00	0.00	1.37	0.15	4.62	0.51		
41				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.25	0.03		
42	5B	17.5	5.5	0.97	0.88	0.10				0.00	0.00	0.00	0.88	0.10	0.88	0.10		
43	5B	16	4	0.81	0.52	0.06				0.00	0.00	0.00	0.52	0.06	0.52	0.06		
44				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Total					27.0	2.98					0	0	27.0	2.98	44.731	4.9372		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 16.9.93

88:6/4

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 6

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	201	74.5	77.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	214	79	80	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
47	210	82	78	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
48	221	84	81	82.5	41.25	2B	10.5	2.5	0.34	0.13	0.01				0.00	0.00	0.00	0.13	0.01
49	209	78	80	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
50	206	79.5	77.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	211	80.5	75.5	78.0	39.00	2A	14.5	5	0.68	0.54	0.06				0.00	0.00	0.00	0.54	0.06
52	204	77	77.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
53	213	79.5	80	79.8	39.88	1A	13.5	4	0.58	0.37	0.04				0.00	0.00	0.00	0.37	0.04
54	215	75.5	79.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
55	207	75.5	80.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
56	214	76.5	80	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	213	81.5	80.5	81.0	40.50	2A	21.5	10	1.45	2.68	0.30	2C	18	5.5	1.01	0.93	0.10	3.61	0.40
58	202	74.5	77	75.8	37.88	2C	22.5	6	1.71	1.68	0.19				0.00	0.00	0.00	1.68	0.19
59	217	81.5	79	80.2	40.12	2A	21	7.5	1.40	1.80	0.20	2C	19	7	1.14	1.36	0.15	3.16	0.35
60	206	77.5	75.5	76.5	38.25	2B	11.5	3.5	0.43	0.23	0.03				0.00	0.00	0.00	0.23	0.03
61	211	80.5	80	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	208	77	80	78.5	39.25	2A	17	5	0.93	0.75	0.08				0.00	0.00	0.00	0.75	0.08
63	222	80	80	80.0	40.00	2A	14.5	3	0.66	0.32	0.04				0.00	0.00	0.00	0.32	0.04
64	205	75	80	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
65	220	80.5	83	81.8	40.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
66	214	77	79.5	78.2	39.12	2A	12	5	0.46	0.38	0.04	2C	18	5	1.05	0.85	0.09	1.23	0.14
Total	4643								8.88	0.98					3.14	0.35		12.019	1.3266

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 16.9.93

88:6/5

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 6

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
46	5B	11	1.5	0.38	0.09	0.01				0.00	0.00	0.00	0.09	0.01	0.09	0.01	Tray 3	
47	5B	21	5.5	1.40	1.30	0.14				0.00	0.00	0.00	1.30	0.14	1.30	0.14	Weight(kg)	4.64
48	5B	20	5.5	1.23	1.16	0.13				0.00	0.00	0.00	1.16	0.13	1.30	0.14		
49	5A	16.5	4.5	0.87	0.63	0.07				0.00	0.00	0.00	0.63	0.07	0.63	0.07	Vol Top	12.02
50	5B	20.5	8.5	1.36	2.00	0.22				0.00	0.00	0.00	2.00	0.22	2.00	0.22	Vol Bottom	26.29
51	5A	12	4	0.46	0.29	0.03				0.00	0.00	0.00	0.29	0.03	0.83	0.09	Vol Total	38.31
52	5B	27	8.5	2.44	3.54	0.39				0.00	0.00	0.00	3.54	0.39	3.54	0.39		
53	5B	26	8.5	2.18	3.24	0.36				0.00	0.00	0.00	3.24	0.36	3.60	0.40	Ea Top	1.33
54	5A	18.5	3.5	1.12	0.65	0.07				0.00	0.00	0.00	0.65	0.07	0.65	0.07	Ea Bottom	2.90
55	4B	13	2	0.55	0.17	0.02				0.00	0.00	0.00	0.17	0.02	0.17	0.02	Ea Total	4.23
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3	
57	5B	17.5	4.5	0.96	0.71	0.08				0.00	0.00	0.00	0.71	0.08	4.32	0.48	Top Br	13
58	5A	19.5	6.5	1.28	1.33	0.15				0.00	0.00	0.00	1.33	0.15	3.01	0.33	Bottom Br	17
59	5A	22.5	9	1.61	2.56	0.28				0.00	0.00	0.00	2.56	0.28	5.72	0.63	Br Fruit	19
60				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.23	0.03	Tray 4	
61	5B	27.5	9	2.43	3.88	0.43				0.00	0.00	0.00	3.88	0.43	3.88	0.43	Top Br	1
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.75	0.08	Bottom Br	10
63	5A	21	6.5	1.40	1.54	0.17				0.00	0.00	0.00	1.54	0.17	1.86	0.21	Br Fruit	9
64				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton	
65	5A	19	6	1.12	1.14	0.13				0.00	0.00	0.00	1.14	0.13	1.14	0.13	Top Br	48
66	5A	21.5	8	1.51	2.04	0.23				0.00	0.00	0.00	2.04	0.23	3.27	0.36	Bottom Br	46
Total				26.3	2.90					0	0		26.3	2.90	38.312	4.2287	Br Fruit	65

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 16.9.93

88:6/6

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 6

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	209	80	77.5	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	204	80	75.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	202	78.5	77	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	205	79	79.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	210	79	81.5	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	217	78.5	80.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	216	82.5	79.5	81.0	40.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	216	76.5	80.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	210	79.5	80	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	204	74.5	80	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	213	78	76.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	215	76.5	80.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	202	75.5	75	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	214	78	79.5	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	214	80	78.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	218	78.5	79	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	204	78	80	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	221	80.5	79	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	215	79.5	82	80.8	40.38	2B	11.5	2.5	0.41	0.16	0.02				0.00	0.00	0.00	0.16	0.02
86	211	80.5	80	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	213	78	80	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	216	77.5	79.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4649									0.16	0.02					0	0	0.1607	0.0177

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 16.9.93

88:6/7

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 6

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
68				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 4
69				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 4.65
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 0.16
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 16.87
73	5B	24.5	6.5	1.90	2.16	0.24				0.00	0.00	0.00	2.16	0.24	2.16	0.24	Vol Total 17.03
74	5B	18.5	4.5	1.11	0.81	0.09				0.00	0.00	0.00	0.81	0.09	0.81	0.09	
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top 0.02
76	5B	29.5	9.5	2.93	4.83	0.53				0.00	0.00	0.00	4.83	0.53	4.83	0.53	Ea Bottom 1.86
77	5B	25	8.5	2.08	3.00	0.33				0.00	0.00	0.00	3.00	0.33	3.00	0.33	Ea Total 1.88
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
79	5A	24	7	1.96	2.26	0.25				0.00	0.00	0.00	2.26	0.25	2.26	0.25	Carton
80	5B	16	4.5	0.82	0.59	0.07	5B	12	2.5	0.46	0.18	0.02	0.77	0.08	0.77	0.08	Weight(kg) 18.64
81	5B	20	7	1.28	1.51	0.17				0.00	0.00	0.00	1.51	0.17	1.51	0.17	
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 57.79
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 77.56
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 135.35
85	5B	15.5	7	0.75	0.93	0.10				0.00	0.00	0.00	0.93	0.10	1.09	0.12	
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top 6.38
87	4B	17	4	0.93	0.60	0.07				0.00	0.00	0.00	0.60	0.07	0.60	0.07	Ea Bottom 8.56
88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total 14.94
Total					16.7	1.84					0.18	0.02	16.9	1.86	17.031	1.8798	Ek Carton 109.73

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 16.9.93

88:6/8

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 7

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	209	77	80	78.5	39.25	2A	10.5	4	0.35	0.22	0.02	2C	22	8.5	1.57	2.29	0.25	2.52	0.28
2	212	79	78	78.5	39.25	2A	13	5.5	0.54	0.50	0.05	2C	14	5	0.63	0.51	0.06	1.00	0.11
3	214	81	82	81.5	40.75	2A	22	8.5	1.51	2.28	0.25	2C	10	3.5	0.31	0.17	0.02	2.45	0.27
4	208	77	81	79.0	39.50	2A	23	8	1.71	2.34	0.26				0.00	0.00	0.00	2.34	0.26
5	213	76.5	81.5	79.0	39.50	2B	28	8	2.56	3.60	0.40				0.00	0.00	0.00	3.60	0.40
6	219	80	78	79.0	39.50	2A	23.5	9.5	1.79	2.98	0.33				0.00	0.00	0.00	2.98	0.33
7	217	76	80	78.0	39.00	2A	27.5	10	2.50	4.37	0.48				0.00	0.00	0.00	4.37	0.48
8	216	77	80	78.5	39.25	2A	21.5	8	1.50	2.04	0.23				0.00	0.00	0.00	2.04	0.23
9	220	80	78	79.0	39.50	2A	23	8	1.71	2.34	0.26				0.00	0.00	0.00	2.34	0.26
10	220	78	83	80.5	40.25	2A	20.5	7.5	1.33	1.72	0.19	2C	14.5	5	0.66	0.54	0.06	2.26	0.25
11	216	79.5	78	78.8	39.38	2A	25.5	9.5	2.12	3.51	0.39	2C	19.5	8	1.23	1.69	0.19	5.20	0.57
12	219	79	77.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
13	222	77	83.5	80.2	40.12	2C	13	4.5	0.53	0.39	0.04				0.00	0.00	0.00	0.39	0.04
14	217	78	83	80.5	40.25	2A	20.5	6.5	1.33	1.46	0.16				0.00	0.00	0.00	1.46	0.16
15	217	77	82	79.5	39.75	2A	22	8.5	1.55	2.29	0.25				0.00	0.00	0.00	2.29	0.25
16	214	79	79.5	79.2	39.62	2A	29.5	11	2.85	5.61	0.62	2C	15.5	6	0.77	0.77	0.08	6.37	0.70
17	204	76	76.5	76.2	38.12	2A	19.5	7	1.27	1.45	0.16				0.00	0.00	0.00	1.45	0.16
18	220	80	78	79.0	39.50	2A	21	7.5	1.42	1.81	0.20				0.00	0.00	0.00	1.81	0.20
19	216	79.5	79	79.2	39.62	2A	13		0.54	0.04	0.00				0.00	0.00	0.00	0.04	0.00
20	207	75	79.5	77.2	38.62	2A	15.5	6	0.79	0.77	0.08				0.00	0.00	0.00	0.77	0.08
21	216	77	79	78.0	39.00	2A	21	8.5	1.44	2.10	0.23				0.00	0.00	0.00	2.10	0.23
22	203	74	78.5	76.2	38.12	2A	17	5.5	0.96	0.83	0.09				0.00	0.00	0.00	0.83	0.09
Total	4719									42.6	4.71					5.97	0.66	48.611	5.3655

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

88:7/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 7

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1	5B	20.5	5	1.36	1.13	0.13				0.00	0.00	0.00	1.13	0.13	3.65	0.40	
2	5B	23	7	1.72	2.03	0.22				0.00	0.00	0.00	2.03	0.22	3.04	0.34	Tray 1
3	5A	10	2	0.31	0.10	0.01				0.00	0.00	0.00	0.10	0.01	2.55	0.28	Weight(kg) 4.72
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.34	0.26	
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.60	0.40	Vol Top 48.61
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.98	0.33	Vol Bottom 17.72
7	5A	11	3	0.39	0.18	0.02				0.00	0.00	0.00	0.18	0.02	4.54	0.50	Vol Total 66.33
8	5B	20	4.5	1.30	0.97	0.11				0.00	0.00	0.00	0.97	0.11	3.01	0.33	
9				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.34	0.26	Ea Top 5.37
10				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.26	0.25	Ea Bottom 1.96
11	5B	31	7.5	3.18	4.34	0.48				0.00	0.00	0.00	4.34	0.48	9.54	1.05	Ea Total 7.32
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	5B	15	5.5	0.71	0.65	0.07				0.00	0.00	0.00	0.65	0.07	1.03	0.11	Top Br 27
14				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.46	0.16	Bottom Br 10
15	5B	20	7	1.28	1.51	0.17				0.00	0.00	0.00	1.51	0.17	3.80	0.42	Br Fruit 21
16	5B	28.5	10.5	2.65	4.95	0.55				0.00	0.00	0.00	4.95	0.55	11.32	1.25	
17	5B	22	7	1.62	1.86	0.21				0.00	0.00	0.00	1.86	0.21	3.30	0.36	
18				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.81	0.20	
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.04	0.00	
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.77	0.08	
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.10	0.23	
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.83	0.09	
Total					17.7	1.96					0	0	17.7	1.96	66.333	7.3215	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 7

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
23	201	74.5	74.5	74.5	37.25	2A	23	8.5	1.82	2.53	0.28				0.00	0.00	0.00	2.53	0.28
24	212	73	80.5	76.8	38.38	2A	23	7	1.76	2.04	0.23				0.00	0.00	0.00	2.04	0.23
25	209	76	77	76.5	38.25	2A	22.5	8.5	1.69	2.41	0.27				0.00	0.00	0.00	2.41	0.27
26	219	75	77.5	76.2	38.12	2A	24	7.5	1.94	2.41	0.27				0.00	0.00	0.00	2.41	0.27
27	217	78	81	79.5	39.75	2B	24	8.5	1.85	2.73	0.30	2D	15	6	0.71	0.72	0.08	3.45	0.38
28	206	76	79	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
29	212	81.5	74	77.8	38.88	2A	23	9.5	1.74	2.86	0.32				0.00	0.00	0.00	2.86	0.32
30	211	79.5	79	79.2	39.62	2B	17	6	0.92	0.92	0.10				0.00	0.00	0.00	0.92	0.10
31	206	79.5	73.5	76.5	38.25	2A	24	7.7	1.93	2.48	0.27	2C	13.5	5		0.42	0.05	2.90	0.32
32	219	81	81	81.0	40.50	2B	25	8	1.98	2.78	0.31				0.00	0.00	0.00	2.78	0.31
33	218	79	77	78.0	39.00	2C	16.5	6	0.88	0.87	0.10				0.00	0.00	0.00	0.87	0.10
34	204	77	80	78.5	39.25	2A	24	6.5	1.88	2.08	0.23	2C	18	4	1.05	0.68	0.08	2.76	0.31
35	217	78.5	80	79.2	39.62	2A	14	5	0.62	0.51	0.06				0.00	0.00	0.00	0.51	0.06
36	201	77.5	76.5	77.0	38.50	2B	19	6.5	1.19	1.26	0.14				0.00	0.00	0.00	1.26	0.14
37	218	78.5	78.5	78.5	39.25	2A	25.5	8	2.13	2.92	0.32				0.00	0.00	0.00	2.92	0.32
38	212	75.5	77.5	76.5	38.25	2A	18	5.5	1.07	0.94	0.10	2C	20	6.5	1.33	1.40	0.15	2.34	0.26
39	203	77	76.5	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	214	80	79	79.5	39.75	2A	19	6	1.15	1.15	0.13				0.00	0.00	0.00	1.15	0.13
41	218	78	74.5	76.2	38.12	2A	21	6.5	1.47	1.56	0.17				0.00	0.00	0.00	1.56	0.17
42	210	78.5	78.5	78.5	39.25	2B	20.5	6	1.36	1.35	0.15				0.00	0.00	0.00	1.35	0.15
43	203	78.5	77	77.8	38.88	2A	11	3	0.39	0.18	0.02	2C	10	2.5	0.32	0.12	0.01	0.30	0.03
44	217	77.5	79.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4647									34.0	3.75					3.35	0.37	37.329	4.1202

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 7

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
23	5A	18.5	6.5	1.17	1.20	0.13	5C	11.5	4	0.45	0.27	0.03	1.47	0.16	4.00	0.44	
24	5A	17.5	7	1.01	1.17	0.13				0.00	0.00	0.00	1.17	0.13	3.21	0.35	Tray 2
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.41	0.27	Weight(kg) 4.65
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.41	0.27	
27	5C	17	5.5	0.92	0.83	0.09				0.00	0.00	0.00	0.83	0.09	4.28	0.47	Vol Top 37.33
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 18.67
29	5B	23	7.5	1.74	2.19	0.24				0.00	0.00	0.00	2.19	0.24	5.06	0.56	Vol Total 56.00
30	5C	17	4	0.92	0.60	0.07				0.00	0.00	0.00	0.60	0.07	1.52	0.17	
31	5C	16.5	6	0.90	0.87	0.10				0.00	0.00	0.00	0.87	0.10	3.77	0.42	Ea Top 4.12
32	5A	18	7.5	1.01	1.33	0.15	5C	16.5	5	0.85	0.70	0.08	2.03	0.22	4.82	0.53	Ea Bottom 2.06
33	5C	19.5	6.5	1.24	1.33	0.15				0.00	0.00	0.00	1.33	0.15	2.19	0.24	Ea Total 6.18
34	5A	18	6	1.05	1.03	0.11				0.00	0.00	0.00	1.03	0.11	3.79	0.42	
35	5B	20.5	8	1.35	1.86	0.20				0.00	0.00	0.00	1.86	0.20	2.36	0.26	Top Br 24
36				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.26	0.14	Bottom Br 17
37	5A	16	5	0.82	0.66	0.07	5C	23	6	1.72	1.75	0.19	2.41	0.27	5.33	0.59	Br Fruit 20
38	5B	20.5	5	1.40	1.14	0.13				0.00	0.00	0.00	1.14	0.13	3.48	0.38	
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
40				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.15	0.13	
41				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.56	0.17	
42	5D	15	3	0.72	0.35	0.04				0.00	0.00	0.00	0.35	0.04	1.70	0.19	
43				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.30	0.03	
44	5A	18.5	7.5	1.11	1.41	0.16				0.00	0.00	0.00	1.41	0.16	1.41	0.16	
Total					16.0	1.76					2.72	0.30	18.7	2.06	56.002	6.1812	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 7

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	209	76.5	76	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	214	79.5	75	77.2	38.62	2B	21	6.5	1.45	1.55	0.17				0.00	0.00	0.00	1.55	0.17
47	214	78	78.5	78.2	39.12	2A	23	7	1.73	2.04	0.22				0.00	0.00	0.00	2.04	0.22
48	220	81	79	80.0	40.00	2A	17.5	6.5	0.97	1.06	0.12				0.00	0.00	0.00	1.06	0.12
49	208	77.5	78.5	78.0	39.00	2A	19.5	5	1.24	1.01	0.11				0.00	0.00	0.00	1.01	0.11
50	207	78	79.5	78.8	39.38	2B	17	4	0.93	0.60	0.07				0.00	0.00	0.00	0.60	0.07
51	212	78	78.5	78.2	39.12	2A	13.5	4.5	0.59	0.42	0.05				0.00	0.00	0.00	0.42	0.05
52	207	75	76.5	75.8	37.88	2A	21.5	8	1.56	2.05	0.23				0.00	0.00	0.00	2.05	0.23
53	204	77.5	76	76.8	38.38	2B	21.5	7	1.54	1.77	0.20				0.00	0.00	0.00	1.77	0.20
54	212	79	78	78.5	39.25	2A	20.5	9	1.36	2.15	0.24				0.00	0.00	0.00	2.15	0.24
55	214	76	83	79.5	39.75	2A	18	5.5	1.03	0.93	0.10				0.00	0.00	0.00	0.93	0.10
56	217	77	78	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	218	82	81	81.5	40.75	2A	14.5	6.5	0.65	0.75	0.08				0.00	0.00	0.00	0.75	0.08
58	207	79	74	76.5	38.25	2A	20.5	8.5	1.40	2.01	0.22				0.00	0.00	0.00	2.01	0.22
59	216	80	76.5	78.2	39.12	2B	26	8.5	2.22	3.25	0.36				0.00	0.00	0.00	3.25	0.36
60	212	78.5	78	78.2	39.12	2B	20.5	7.5	1.37	1.72	0.19				0.00	0.00	0.00	1.72	0.19
61	217	77.5	83	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	212	76	81	78.5	39.25	2B	19.5	4.5	1.23	0.92	0.10				0.00	0.00	0.00	0.92	0.10
63	222	76	81	78.5	39.25	2A	16	4.5	0.82	0.59	0.07				0.00	0.00	0.00	0.59	0.07
64	202	76.5	79	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
65	208	81.5	77	79.2	39.62	2A	18	5	1.04	0.85	0.09	2C	14	4.5	0.62	0.45	0.05	1.29	0.14
66	220	76	81	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4672									23.7	2.61					0.45	0.05	24.119	2.6621

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 7

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
45	5C	19.5	5	1.27	1.02	0.11				0.00	0.00	0.00	1.02	0.11	1.02	0.11		
46	5C	16	6	0.84	0.82	0.09				0.00	0.00	0.00	0.82	0.09	2.37	0.26	Tray 3	
47	5B	18	6.5	1.05	1.13	0.12				0.00	0.00	0.00	1.13	0.12	3.16	0.35	Weight(kg)	4.67
48				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.06	0.12		
49	5C	19.5	6.5	1.24	1.33	0.15				0.00	0.00	0.00	1.33	0.15	2.34	0.26	Vol Top	24.12
50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.60	0.07	Vol Bottom	16.09
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.42	0.05	Vol Total	40.21
52	5B	19.5	6	1.28	1.22	0.13				0.00	0.00	0.00	1.22	0.13	3.28	0.36		
53	5A	15.5	5	0.79	0.62	0.07				0.00	0.00	0.00	0.62	0.07	2.39	0.26	Ea Top	2.66
54				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.15	0.24	Ea Bottom	1.78
55	5B	22	9.5	1.55	2.62	0.29				0.00	0.00	0.00	2.62	0.29	3.56	0.39	Ea Total	4.44
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3	
57	5B	17	5.5	0.90	0.83	0.09	5C	11.5	4	0.41	0.27	0.03	1.09	0.12	1.84	0.20	Top Br	18
58	5B	21.5	9	1.54	2.36	0.26				0.00	0.00	0.00	2.36	0.26	4.37	0.48	Bottom Br	16
59				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.25	0.36	Br Fruit	20
60	5C	21.5	5.5	1.51	1.38	0.15				0.00	0.00	0.00	1.38	0.15	3.11	0.34	Tray 4	
61	5A	12	5	0.45	0.38	0.04				0.00	0.00	0.00	0.38	0.04	0.38	0.04	Top Br	1
62	5C	11	4	0.39	0.25	0.03				0.00	0.00	0.00	0.25	0.03	1.16	0.13	Bottom Br	8
63	5A	11.5	4	0.42	0.27	0.03				0.00	0.00	0.00	0.27	0.03	0.86	0.09	Br Fruit	9
64				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton	
65	5A	10	3.5	0.32	0.17	0.02				0.00	0.00	0.00	0.17	0.02	1.47	0.16	Top Br	70
66	5A	19.5	7	1.23	1.44	0.16				0.00	0.00	0.00	1.44	0.16	1.44	0.16	Bottom Br	51
Total					15.8	1.75					0.27	0.03	16.1	1.78	40.210	4.4382	Br Fruit	70

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 7

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	212	79.5	79.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	216	77.5	80	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	207	80.5	79	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	215	78.5	79	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	209	76	77.5	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	220	82	79	80.5	40.25	2A	13.5	3.5	0.57	0.32	0.04				0.00	0.00	0.00	0.32	0.04
73	218	79.5	82.5	81.0	40.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	202	76	78	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	212	76.5	77.5	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	221	80.5	77.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	218	81.5	78.5	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	207	78	78.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	215	79	76	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	219	79	79.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	222	78.5	78.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	219	80	81.5	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	220	77	79	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	212	77	80	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	216	78	79.5	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	206	77.5	79	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	208	76.5	80	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	217	77	81	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4711									0.32	0.04					0	0	0.3172	0.0350

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 7

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
67	5C	21.5	5	1.48	1.26	0.14				0.00	0.00	0.00	1.26	0.14	1.26	0.14		
68				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 4	
69				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	4.71
70	5C	11	2	0.39	0.12	0.01				0.00	0.00	0.00	0.12	0.01	0.12	0.01		
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	0.32
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.32	0.04	Vol Bottom	7.09
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	7.41
74				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	0.04
76				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.78
77	5A	22.5	5.5	1.61	1.53	0.17				0.00	0.00	0.00	1.53	0.17	1.53	0.17	Ea Total	0.82
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
79	5A	15.5	5.5	0.78	0.69	0.08	5C	18	6	1.06	1.03	0.11	1.72	0.19	1.72	0.19	Carton	
80	5C	17.5	4	0.98	0.64	0.07				0.00	0.00	0.00	0.64	0.07	0.64	0.07	Weight(kg)	18.75
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	110.38
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	59.58
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	169.95
85	5A	11.5	3	0.42	0.19	0.02				0.00	0.00	0.00	0.19	0.02	0.19	0.02		
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	12.18
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	6.58
88	5B	21.5	6.5	1.49	1.63	0.18				0.00	0.00	0.00	1.63	0.18	1.63	0.18	Ea Total	18.76
Total					6.06	0.67					1.03	0.11	7.09	0.78	7.4056	0.8174	Ek Carton	110.36

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 8

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	212	77.5	80.5	79.0	39.50	2C	18.5	5.5	1.10	0.99	0.11				0.00	0.00	0.00	0.99	0.11
2	216	80.5	79	79.8	39.88	2C	24	6	1.85	1.92	0.21				0.00	0.00	0.00	1.92	0.21
3	203	76	80	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
4	203	77.5	75.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
5	218	80	74.5	77.2	38.62	2A	13	3	0.55	0.25	0.03	2C	15.5	5	0.79	0.62	0.07	0.87	0.10
6	215	77	82	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
7	205	79	76.5	77.8	38.88	2A	12.5	5.5	0.51	0.46	0.05	2C	22	8	1.59	2.14	0.24	2.61	0.29
8	208	77	79	78.0	39.00	2B	10	2	0.32	0.10	0.01	2C	21.5	8	1.51	2.04	0.23	2.14	0.24
9	220	80	84	82.0	41.00	2A	16	5	0.79	0.66	0.07				0.00	0.00	0.00	0.66	0.07
10	216	80	77.5	78.8	39.38	2A	18	7	1.04	1.23	0.14	2C	16	7	0.82	0.99	0.11	2.22	0.24
11	207	77.5	80.5	79.0	39.50	2A	18	5	1.04	0.85	0.09				0.00	0.00	0.00	0.85	0.09
12	220	81.5	80.5	81.0	40.50	2C	23.5	8.5	1.74	2.61	0.29				0.00	0.00	0.00	2.61	0.29
13	211	78	80	79.0	39.50	2C	25.5	7.5	2.11	2.74	0.30				0.00	0.00	0.00	2.74	0.30
14	215	79.5	78	78.8	39.38	2A	15.5	5.5	0.77	0.69	0.08	2C	20	7.5	1.29	1.64	0.18	2.33	0.26
15	209	81.5	81.5	81.5	40.75	2C	22.5	8.5	1.58	2.38	0.26				0.00	0.00	0.00	2.38	0.26
16	205	77.5	77	77.2	38.62	2C	22	7.5	1.60	2.00	0.22				0.00	0.00	0.00	2.00	0.22
17	220	75.5	79	77.2	38.62	2A	15.5	4	0.79	0.49	0.05				0.00	0.00	0.00	0.49	0.05
18	222	84	81.5	82.8	41.38	2C	22	9	1.49	2.44	0.27				0.00	0.00	0.00	2.44	0.27
19	217	78.5	78	78.2	39.12	2C	20.5	6.5	1.37	1.47	0.16				0.00	0.00	0.00	1.47	0.16
20	215	81	78.5	79.8	39.88	2C	19.5	7	1.21	1.44	0.16				0.00	0.00	0.00	1.44	0.16
21	218	82.5	79.5	81.0	40.50	2A	14	5	0.61	0.50	0.06	2C	12.5	4	0.49	0.31	0.03	0.82	0.09
22	211	79.5	78.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4686									23.2	2.56					7.75	0.85	30.961	3.4173

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 8

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary		
1	5C	11.5	3.5	0.42	0.23	0.03					0.00	0.00	0.00	0.23	0.03	1.22	0.13		
2				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	1.92	0.21	Tray 1	
3				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	4.69
4				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00		
5				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.87	0.10	Vol Top	30.96
6				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	5.12
7				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	2.61	0.29	Vol Total	36.08
8				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	2.14	0.24		
9				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.66	0.07	Ea Top	3.42
10	5B	20.5	5.5	1.36	1.24	0.14					0.00	0.00	0.00	1.24	0.14	3.46	0.38	Ea Bottom	0.57
11				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.85	0.09	Ea Total	3.98
12	5B	20.5	6.5	1.32	1.46	0.16					0.00	0.00	0.00	1.46	0.16	4.07	0.45		
13	5C	14.5	3	0.67	0.32	0.04					0.00	0.00	0.00	0.32	0.04	3.06	0.34	Top Br	24
14				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	2.33	0.26	Bottom Br	7
15				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	2.38	0.26	Br Fruit	19
16				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	2.00	0.22		
17				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.49	0.05		
18				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	2.44	0.27		
19				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	1.47	0.16		
20	5B	17.5	3.5	0.97	0.57	0.06					0.00	0.00	0.00	0.57	0.06	2.00	0.22		
21	5B	17.5	4.5	0.96	0.71	0.08					0.00	0.00	0.00	0.71	0.08	1.53	0.17		
22	5B	16	4.5	0.82	0.59	0.07					0.00	0.00	0.00	0.59	0.07	0.59	0.07		
Total						5.12						0	0	5.12	0.57	36.083	3.9827		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 8

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
23	203	77.5	79.9	78.7	39.35	2A	15	3.5	0.72	0.40	0.04				0.00	0.00	0.00	0.40	0.04
24	221	80.5	77.5	79.0	39.50	2A	15.5	4	0.77	0.49	0.05	2C	15	4.5	0.72	0.52	0.06	1.01	0.11
25	213	79.5	79	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
26	218	79	82.5	80.8	40.38	2A	16	4.5	0.80	0.59	0.06				0.00	0.00	0.00	0.59	0.06
27	205	78	77	77.5	38.75	2A	21	7	1.45	1.68	0.19				0.00	0.00	0.00	1.68	0.19
28	220	79	83	81.0	40.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
29	206	74.5	79.5	77.0	38.50	2A	21.5	8	1.53	2.05	0.23				0.00	0.00	0.00	2.05	0.23
30	218	78.5	81	79.8	39.88	2A	17	6.5	0.92	1.01	0.11				0.00	0.00	0.00	1.01	0.11
31	212	78	80	79.0	39.50	2A	20	5	1.29	1.07	0.12				0.00	0.00	0.00	1.07	0.12
32	219	81.5	82.5	82.0	41.00	2B	2.5	9	0.02	0.40	0.04	2C	9.5	4	0.28	0.19	0.02	0.59	0.07
33	219	77	84	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
34	212	80.5	80	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
35	219	80	81	80.5	40.25	2A	22	5	1.53	1.33	0.15	2C	20	6	1.26	1.28	0.14	2.60	0.29
36	207	78	77.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
37	214	77	81	79.0	39.50	2A	14.5	5	0.67	0.54	0.06				0.00	0.00	0.00	0.54	0.06
38	205	76	76.5	76.2	38.12	2A	23	10	1.78	3.06	0.34				0.00	0.00	0.00	3.06	0.34
39	205	75	79.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	207	74.5	79	76.8	38.38	2A	32.5	9.5	3.61	6.05	0.67	2C	16	5.5	0.84	0.74	0.08	6.79	0.75
41	218	78	80	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
42	211	79	78	78.5	39.25	2A	18	4.5	1.05	0.76	0.08				0.00	0.00	0.00	0.76	0.08
43	213	79	79	79.0	39.50	2A	12	2	0.46	0.14	0.02				0.00	0.00	0.00	0.14	0.02
44	215	76.5	79.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4680									19.6	2.16					2.72	0.30	22.296	2.4609

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 8

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
23	5A	21.5	6	1.50	1.50	0.17				0.00	0.00	0.00	1.50	0.17	1.90	0.21		
24	5A	25.5	9.5	2.11	3.51	0.39				0.00	0.00	0.00	3.51	0.39	4.52	0.50	Tray 2	
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	4.68
26	5A	21	8	1.39	1.94	0.21				0.00	0.00	0.00	1.94	0.21	2.53	0.28	Vol Top	22.30
27	5A	19	4.5	1.18	0.87	0.10				0.00	0.00	0.00	0.87	0.10	2.54	0.28	Vol Bottom	32.71
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	55.01
29				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.05	0.23		
30	5A	29.5	5.5	2.83	2.98	0.33				0.00	0.00	0.00	2.98	0.33	3.98	0.44		
31	5B	18	6.5	1.04	1.13	0.12				0.00	0.00	0.00	1.13	0.12	2.19	0.24	Ea Top	2.46
32	5A	22	8	1.50	2.12	0.23				0.00	0.00	0.00	2.12	0.23	2.72	0.30	Ea Bottom	3.61
33	5A	20	7	1.26	1.51	0.17				0.00	0.00	0.00	1.51	0.17	1.51	0.17	Ea Total	6.07
34	5A	19	7	1.14	1.36	0.15				0.00	0.00	0.00	1.36	0.15	1.36	0.15		
35	5B	23.5	7.5	1.75	2.28	0.25				0.00	0.00	0.00	2.28	0.25	4.88	0.54	Top Br	18
36	5A	19	6.5	1.18	1.26	0.14				0.00	0.00	0.00	1.26	0.14	1.26	0.14	Bottom Br	18
37	5B	19	6	1.16	1.15	0.13				0.00	0.00	0.00	1.15	0.13	1.69	0.19	Br Fruit	19
38	5A	16	5	0.85	0.66	0.07				0.00	0.00	0.00	0.66	0.07	3.73	0.41		
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
40	5A	27	9.5	2.45	3.98	0.44				0.00	0.00	0.00	3.98	0.44	10.78	1.19		
41	5B	15	5.5	0.72	0.65	0.07				0.00	0.00	0.00	0.65	0.07	0.65	0.07		
42	5B	19	6.5	1.17	1.26	0.14				0.00	0.00	0.00	1.26	0.14	2.02	0.22		
43	5A	19	9	1.16	1.87	0.21				0.00	0.00	0.00	1.87	0.21	2.01	0.22		
44	5A	21.5	10	1.51	2.69	0.30				0.00	0.00	0.00	2.69	0.30	2.69	0.30		
Total					32.7	3.61				0	0	0	32.7	3.61	55.010	6.0718		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 8

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	219	80	81.5	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	222	82.5	76	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
47	214	80.5	78.5	79.5	39.75				0.00	0.00	0.00	2C	17.5	5.5	0.98	0.88	0.10	0.88	0.10
48	212	78.5	78	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
49	220	82.5	81	81.8	40.88	2A	22.5	7	1.58	1.92	0.21				0.00	0.00	0.00	1.92	0.21
50	213	77.5	78.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	212	77.5	78.5	78.0	39.00	2B	13.5	5	0.59	0.47	0.05				0.00	0.00	0.00	0.47	0.05
52	222	78	78.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
53	213	82.5	76.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
54	218	77.5	78	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
55	220	81	79	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
56	206	80.5	79	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	213	77.5	76.5	77.0	38.50	2A	19	5	1.19	0.96	0.11	2C	17	6	0.95	0.92	0.10	1.88	0.21
58	211	76	78	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
59	211	77.5	78	77.8	38.88	2C	23	6.6	1.74	1.92	0.21				0.00	0.00	0.00	1.92	0.21
60	206	77	77	77.0	38.50	2A	16	5	0.84	0.66	0.07				0.00	0.00	0.00	0.66	0.07
61	213	76	76	76.0	38.00	2A	12	3	0.48	0.21	0.02				0.00	0.00	0.00	0.21	0.02
62	205	77.5	76	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	212	78	79	78.5	39.25	2C	20	6	1.30	1.28	0.14				0.00	0.00	0.00	1.28	0.14
64	219	76	85	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
65	207	77	78	77.5	38.75	2A	21.5	6	1.52	1.51	0.17				0.00	0.00	0.00	1.51	0.17
66	201	78.5	79	78.8	39.38	2A	15	5	0.72	0.58	0.06				0.00	0.00	0.00	0.58	0.06
Total	4689									9.52	1.05					1.80	0.20	11.323	1.2497

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 8

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
46				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3
47	5B	19	6	1.15	1.15	0.13				0.00	0.00	0.00	1.15	0.13	2.03	0.22	Weight(kg) 4.69
48				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
49	5A	11.5	3.5	0.41	0.23	0.03	5C	14	5	0.60	0.50	0.06	0.73	0.08	2.66	0.29	Vol Top 11.32
50	5B	23.5	6	1.81	1.84	0.20				0.00	0.00	0.00	1.84	0.20	1.84	0.20	Vol Bottom 17.45
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.47	0.05	Vol Total 28.77
52	5C	16.5	4.5	0.88	0.63	0.07				0.00	0.00	0.00	0.63	0.07	0.63	0.07	
53	5A	13	3.5	0.54	0.29	0.03				0.00	0.00	0.00	0.29	0.03	0.29	0.03	Ea Top 1.25
54				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 1.93
55	5B	21	8.5	1.40	2.09	0.23				0.00	0.00	0.00	2.09	0.23	2.09	0.23	Ea Total 3.18
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3
57	5B	26.5	12.5	2.35	5.31	0.59				0.00	0.00	0.00	5.31	0.59	7.19	0.79	Top Br 11
58	5A	17.5	6	1.01	0.97	0.11				0.00	0.00	0.00	0.97	0.11	0.97	0.11	Bottom Br 15
59	5A	17	5.5	0.94	0.83	0.09				0.00	0.00	0.00	0.83	0.09	2.75	0.30	Br Fruit 14
60				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.66	0.07	Tray 4
61	5A	19	6	1.21	1.16	0.13				0.00	0.00	0.00	1.16	0.13	1.37	0.15	Top Br 0
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br 18
63	5B	13	3.5	0.54	0.29	0.03				0.00	0.00	0.00	0.29	0.03	1.58	0.17	Br Fruit 18
64				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton
65	5B	18.5	7	1.12	1.30	0.14				0.00	0.00	0.00	1.30	0.14	2.81	0.31	Top Br 53
66	5A	15.5	6.5	0.77	0.85	0.09				0.00	0.00	0.00	0.85	0.09	1.43	0.16	Bottom Br 58
Total					16.9	1.87					0.50	0.06	17.4	1.93	28.769	3.1754	Br Fruit 70

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 8

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	219	81.5	79.5	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	208	79.5	78	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	213	79.5	76.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	210	76.5	78.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	206	77.5	80.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	206	77.5	80.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	214	80	77	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	207	75	74	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	216	80	78.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	208	80	80.5	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	207	81	78	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	208	79	77	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	217	78	81.5	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	222	78.5	82.5	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	213	80	76	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	205	77.5	81.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	217	80	77	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	210	79.5	73.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	205	77.5	80	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	215	78	78.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	222	80.5	83	81.8	40.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	209	80	78	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4657								0	0	0				0	0	0	0	0

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 8

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
68	5A	13	5	0.54	0.44	0.05				0.00	0.00	0.00	0.44	0.05	0.44	0.05	Tray 4
69	5C	19.5	6	1.24	1.22	0.13				0.00	0.00	0.00	1.22	0.13	1.22	0.13	Weight(kg) 4.66
70	5C	16	4.5	0.83	0.59	0.07				0.00	0.00	0.00	0.59	0.07	0.59	0.07	
71	5A	16.5		0.87	0.09	0.01				0.00	0.00	0.00	0.09	0.01	0.09	0.01	Vol Top 0.00
72	5C	15	5	0.72	0.58	0.06				0.00	0.00	0.00	0.58	0.06	0.58	0.06	Vol Bottom 17.84
73	5B	17.5	5.5	0.99	0.88	0.10				0.00	0.00	0.00	0.88	0.10	0.88	0.10	Vol Total 17.84
74	5A	20	7	1.37	1.53	0.17				0.00	0.00	0.00	1.53	0.17	1.53	0.17	
75	5A	19	7.5	1.16	1.48	0.16				0.00	0.00	0.00	1.48	0.16	1.48	0.16	Ea Top 0.00
76				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 1.97
77	5A	23.5	8.5	1.78	2.62	0.29				0.00	0.00	0.00	2.62	0.29	2.62	0.29	Ea Total 1.97
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
79	5B	21	7	1.41	1.67	0.18				0.00	0.00	0.00	1.67	0.18	1.67	0.18	Carton
80	5A	11	3	0.38	0.18	0.02				0.00	0.00	0.00	0.18	0.02	0.18	0.02	Weight(kg) 18.71
81	5A	20	9	1.30	2.05	0.23				0.00	0.00	0.00	2.05	0.23	2.05	0.23	
82	5B	12	3.5	0.46	0.25	0.03				0.00	0.00	0.00	0.25	0.03	0.25	0.03	Vol Top 64.58
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 73.13
84	5A	11.5	4	0.43	0.27	0.03				0.00	0.00	0.00	0.27	0.03	0.27	0.03	Vol Total 137.71
85	5A	20	8	1.29	1.77	0.20				0.00	0.00	0.00	1.77	0.20	1.77	0.20	
86	5A	16	5.5	0.83	0.74	0.08				0.00	0.00	0.00	0.74	0.08	0.74	0.08	Ea Top 7.13
87	5B	13.5	4	0.56	0.36	0.04				0.00	0.00	0.00	0.36	0.04	0.36	0.04	Ea Bottom 8.07
88	5B	18	6.5	1.04	1.13	0.12				0.00	0.00	0.00	1.13	0.12	1.13	0.12	Ea Total 15.20
Total					17.8	1.97				0	0	0	17.8	1.97	17.844	1.9695	Ek Carton 110.14

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 9

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	212	79	77	78.0	39.00	2C	18	6	1.05	1.03	0.11				0.00	0.00	0.00	1.03	0.11
2	213	78.5	79.5	79.0	39.50	2A	17	8.5	0.93	1.43	0.16	2C	17	7	0.93	1.10	0.12	2.53	0.28
3	208	76	79	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
4	211	76	80	78.0	39.00	2C	16.5	5	0.88	0.71	0.08				0.00	0.00	0.00	0.71	0.08
5	217	81.5	77.5	79.5	39.75	2B	21	7	1.41	1.67	0.18				0.00	0.00	0.00	1.67	0.18
6	211	82.5	79	80.8	40.38	2A	10	3	0.31	0.15	0.02				0.00	0.00	0.00	0.15	0.02
7	208	77.5	82	79.8	39.88	2C	23	8	1.69	2.34	0.26				0.00	0.00	0.00	2.34	0.26
8	219	75.5	81.5	78.5	39.25	2C	16	4.5	0.82	0.59	0.07				0.00	0.00	0.00	0.59	0.07
9	210	79.5	78.5	79.0	39.50	2A	15.5	3.5	0.77	0.43	0.05	2C	15.5	4	0.77	0.49	0.05	0.92	0.10
10	211	78	81	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
11	205	78.5	77.5	78.0	39.00	2A	17.5	10.5	0.99	2.04	0.23	2C	20	6.5	1.30	1.40	0.15	3.44	0.38
12	219	82.5	77.5	80.0	40.00	2C	28	7.5	2.53	3.38	0.37				0.00	0.00	0.00	3.38	0.37
13	210	76.5	78.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
14	209	76	78	77.0	38.50	2C	16	5	0.84	0.66	0.07				0.00	0.00	0.00	0.66	0.07
15	207	74.5	81.5	78.0	39.00	2A	19	6	1.17	1.15	0.13				0.00	0.00	0.00	1.15	0.13
16	210	78.5	78	78.2	39.12	2A	23	10	1.73	3.05	0.34				0.00	0.00	0.00	3.05	0.34
17	217	78.5	81.5	80.0	40.00	2A	14	3.5	0.62	0.34	0.04				0.00	0.00	0.00	0.34	0.04
18	214	82	79.5	80.8	40.38	2A	16	5	0.80	0.66	0.07	2C	25	8.5	1.98	2.97	0.33	3.63	0.40
19	211	78	81.5	79.8	39.88				0.00	0.00	0.00	2C	15	6	0.71	0.72	0.08	0.72	0.08
20	204	78	76.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
21	214	81.5	80	80.8	40.38	2A	18	6	1.02	1.02	0.11	2C	16	5	0.80	0.66	0.07	1.68	0.19
22	200	78	77	77.5	38.75	2A	15	5	0.73	0.58	0.06	2C	20	7	1.31	1.52	0.17	2.10	0.23
Total	4640									21.2	2.34					8.85	0.98	30.089	3.3210

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 9

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.03	0.11	
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.53	0.28	Tray 1
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 4.64
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.71	0.08	
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.67	0.18	Vol Top 30.09
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.15	0.02	Vol Bottom 0.72
7				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.34	0.26	Vol Total 30.81
8				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.59	0.07	
9	5B	15	6	0.72	0.72	0.08				0.00	0.00	0.00	0.72	0.08	1.64	0.18	Ea Top 3.32
10				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 0.08
11				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.44	0.38	Ea Total 3.40
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.38	0.37	
13				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br 24
14				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.66	0.07	Bottom Br 1
15				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.15	0.13	Br Fruit 19
16				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.05	0.34	
17				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.34	0.04	
18				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.63	0.40	
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.72	0.08	
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.68	0.19	
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.10	0.23	
Total				0.72	0.08					0	0	0.72	0.08		30.809	3.4005	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 9

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
23	218	78.5	79.5	79.0	39.50	2A	28	10	2.56	4.52	0.50				0.00	0.00	0.00	4.52	0.50
24	219	79.5	81.5	80.5	40.25	2C	14	5	0.61	0.51	0.06				0.00	0.00	0.00	0.51	0.06
25	221	79	79	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
26	221	79.5	78.5	79.0	39.50	2A	17.5	6	0.98	0.97	0.11				0.00	0.00	0.00	0.97	0.11
27	213	78.5	76	77.2	38.62	2A	20	9	1.32	2.06	0.23				0.00	0.00	0.00	2.06	0.23
28	208	78.5	79	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
29	204	79	78	78.5	39.25	2C	18	5.5	1.05	0.94	0.10				0.00	0.00	0.00	0.94	0.10
30	220	79	80.5	79.8	39.88	2A	13.5	3.5	0.58	0.32	0.04	2C	20	3.5	1.27	0.78	0.09	1.10	0.12
31	208	76.5	79.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
32	205	77.5	76.5	77.0	38.50	2A	20	9	1.32	2.06	0.23	2C	19	5	1.19	0.96	0.11	3.02	0.33
33	204	78.5	76	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
34	213	77	82.5	79.8	39.88	2A	14.5	6.5	0.66	0.75	0.08	2C	21	8	1.41	1.94	0.21	2.69	0.30
35	211	78	79.5	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
36	217	77.5	81.5	79.5	39.75	2D	20	6.5	1.28	1.39	0.15				0.00	0.00	0.00	1.39	0.15
37	205	78	79.5	78.8	39.38	2B	18	5	1.04	0.85	0.09				0.00	0.00	0.00	0.85	0.09
38	201	78.5	79	78.8	39.38	2A	18	7.5	1.04	1.34	0.15	2C	22	6.5	1.57	1.71	0.19	3.05	0.34
39	202	79.5	77	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	204	78	78.5	78.2	39.12	2A	14	4.5	0.63	0.45	0.05	2C	23	7	1.73	2.04	0.22	2.49	0.27
41	211	83	78	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
42	217	78	81.5	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
43	219	78.5	78	78.2	39.12	2A	20	6	1.30	1.28	0.14	2C	24	6.5	1.89	2.08	0.23	3.36	0.37
44	219	75.5	77	76.2	38.12	2B	24	8	1.94	2.58	0.28				0.00	0.00	0.00	2.58	0.28
Total	4660									20.0	2.21					9.51	1.05	29.519	3.2582

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 9

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
23	5A	27	6.5	2.38	2.74	0.30				0.00	0.00	0.00	2.74	0.30	7.26	0.80		
24				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.51	0.06	Tray 2	
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	4.66
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.97	0.11		
27	5A	21.5	7.5	1.53	1.90	0.21				0.00	0.00	0.00	1.90	0.21	3.96	0.44	Vol Top	29.52
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	28.35
29	5A	22	7.5	1.57	1.99	0.22				0.00	0.00	0.00	1.99	0.22	2.93	0.32	Vol Total	57.87
30	5A	21	7.5	1.41	1.80	0.20				0.00	0.00	0.00	1.80	0.20	2.90	0.32		
31	5A	19	4.5	1.17	0.86	0.10				0.00	0.00	0.00	0.86	0.10	0.86	0.10	Ea Top	3.26
32	5A	18	6	1.07	1.03	0.11				0.00	0.00	0.00	1.03	0.11	4.05	0.45	Ea Bottom	3.13
33				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	6.39
34	5B	15	5	0.71	0.58	0.06				0.00	0.00	0.00	0.58	0.06	3.27	0.36		
35	5B	24	9	1.87	2.92	0.32				0.00	0.00	0.00	2.92	0.32	2.92	0.32	Top Br	20
36				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.39	0.15	Bottom Br	14
37				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.85	0.09	Br Fruit	19
38	5B	20.5	6	1.36	1.35	0.15				0.00	0.00	0.00	1.35	0.15	4.40	0.49		
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
40	5A	26	10	2.22	3.88	0.43				0.00	0.00	0.00	3.88	0.43	6.37	0.70		
41	5A	21	7.5	1.39	1.80	0.20				0.00	0.00	0.00	1.80	0.20	1.80	0.20		
42	5B	22	7.5	1.55	1.99	0.22				0.00	0.00	0.00	1.99	0.22	1.99	0.22		
43	5B	25	8	2.05	2.80	0.31				0.00	0.00	0.00	2.80	0.31	6.17	0.68		
44	5A	24.5	8	2.02	2.70	0.30				0.00	0.00	0.00	2.70	0.30	5.28	0.58		
Total					28.3	3.13					0	0	28.3	3.13	57.868	6.3872		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 9

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	211	78.5	78.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	207	78.5	76	77.2	38.62	2C	13	4	0.55	0.34	0.04				0.00	0.00	0.00	0.34	0.04
47	203	78.5	77.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
48	208	77	77.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
49	210	79	77.5	78.2	39.12	2A	19	6.5	1.17	1.26	0.14	2C	19	5.5	1.17	1.05	0.12	2.31	0.25
50	212	78	74	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	211	80	77.5	78.8	39.38	2A	19	5	1.16	0.95	0.11	2C	16	5	0.82	0.66	0.07	1.61	0.18
52	211	78.5	77.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
53	210	77.5	81.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
54	214	75.5	76.5	76.0	38.00	2A	20	3	1.34	0.70	0.08				0.00	0.00	0.00	0.70	0.08
55	209	78	76.5	77.2	38.62	2A	15.5	6	0.79	0.77	0.08				0.00	0.00	0.00	0.77	0.08
56	211	77.5	82.5	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	217	79	77	78.0	39.00	2C	15	3	0.73	0.35	0.04				0.00	0.00	0.00	0.35	0.04
58	209	81.5	80.5	81.0	40.50	2B	14	4	0.61	0.39	0.04	2C	21	6	1.38	1.42	0.16	1.81	0.20
59	203	76	79	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
60	204	76	78	77.0	38.50	2B	19	6	1.19	1.15	0.13				0.00	0.00	0.00	1.15	0.13
61	214	78	80	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	215	80.5	79	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	217	80	79.5	79.8	39.88	2C	23	6	1.69	1.74	0.19				0.00	0.00	0.00	1.74	0.19
64	212	77	80.5	78.8	39.38	2C	22.5	6	1.64	1.66	0.18				0.00	0.00	0.00	1.66	0.18
65	220	79.5	81	80.2	40.12	2B	16	4	0.81	0.52	0.06				0.00	0.00	0.00	0.52	0.06
66	215	79.5	80.5	80.0	40.00	2A	15.5	4.5	0.76	0.55	0.06				0.00	0.00	0.00	0.55	0.06
Total	4643									10.4	1.15					3.13	0.35	13.523	1.4926

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 9

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
46	5A	19	7	1.19	1.37	0.15				0.00	0.00	0.00	1.37	0.15	1.71	0.19	Tray 3	
47	5A	15	4	0.73	0.46	0.05				0.00	0.00	0.00	0.46	0.05	0.46	0.05	Weight(kg)	4.64
48	5B	17.5	6.5	1.00	1.07	0.12				0.00	0.00	0.00	1.07	0.12	1.07	0.12	Vol Top	13.52
49				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.31	0.25	Vol Bottom	24.24
50	5A	21.5	7	1.55	1.77	0.20				0.00	0.00	0.00	1.77	0.20	1.77	0.20	Vol Total	37.76
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.61	0.18		
52	5B	24.5	7.5	1.97	2.51	0.28				0.00	0.00	0.00	2.51	0.28	2.51	0.28	Ea Top	1.49
53	5B	24	8	1.85	2.56	0.28				0.00	0.00	0.00	2.56	0.28	2.56	0.28	Ea Bottom	2.67
54	5B	19.5	3	1.27	0.66	0.07				0.00	0.00	0.00	0.66	0.07	1.36	0.15	Ea Total	4.17
55	5A	15.5	5	0.79	0.62	0.07				0.00	0.00	0.00	0.62	0.07	1.39	0.15	Tray 3	
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br	15
57	5A	23	8	1.73	2.35	0.26				0.00	0.00	0.00	2.35	0.26	2.69	0.30	Bottom Br	17
58	5B	20.5	6	1.32	1.35	0.15				0.00	0.00	0.00	1.35	0.15	3.16	0.35	Br Fruit	19
59	5A	19	8.5	1.18	1.74	0.19				0.00	0.00	0.00	1.74	0.19	1.74	0.19	Tray 4	
60	5C	19	5.5	1.19	1.05	0.12				0.00	0.00	0.00	1.05	0.12	2.21	0.24	Top Br	1
61	5A	20	8.5	1.29	1.91	0.21				0.00	0.00	0.00	1.91	0.21	1.91	0.21	Bottom Br	11
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit	12
63	5B	19.5	5	1.21	1.01	0.11				0.00	0.00	0.00	1.01	0.11	2.75	0.30	Carton	
64	5A	19	7	1.16	1.37	0.15				0.00	0.00	0.00	1.37	0.15	3.03	0.33	Top Br	60
65	5A	17	6	0.91	0.91	0.10				0.00	0.00	0.00	0.91	0.10	1.44	0.16	Bottom Br	43
66	5A	21	6.5	1.40	1.54	0.17				0.00	0.00	0.00	1.54	0.17	2.09	0.23	Br Fruit	69
Total					24.2	2.67					0	0	24.2	2.67	37.758	4.1676		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 9

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	214	79	79	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	215	80	78	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	200	79.5	75.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	209	79	79	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	220	79.5	83	81.2	40.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	215	77	76	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	205	78	79.5	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	213	79.5	80	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	207	77	73.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	205	79	76.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	211	81	77.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	208	76.5	81.5	79.0	39.50	2A	19	3	1.16	0.61	0.07				0.00	0.00	0.00	0.61	0.07
79	212	78.5	80	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	215	77.5	76	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	219	80.5	81	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	210	78	78	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	214	78	76.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	220	75.5	77	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	208	75	80	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	203	76.5	79.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	212	78	77.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	216	78.5	78	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4651									0.61	0.07					0	0	0.6089	0.0672

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 9

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
68	5A	14	5.5	0.63	0.57	0.06				0.00	0.00	0.00	0.57	0.06	0.57	0.06	Tray 4
69	5C	9.5	3.5	0.29	0.16	0.02				0.00	0.00	0.00	0.16	0.02	0.16	0.02	Weight(kg)
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.65
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom
74	5B	17	5.5	0.92	0.83	0.09				0.00	0.00	0.00	0.83	0.09	0.83	0.09	11.34
75	5B	26	7	2.32	2.71	0.30				0.00	0.00	0.00	2.71	0.30	2.71	0.30	Vol Total
76	5B	17	5.5	0.94	0.83	0.09				0.00	0.00	0.00	0.83	0.09	0.83	0.09	11.95
77	5B	21	5	1.42	1.19	0.13				0.00	0.00	0.00	1.19	0.13	1.19	0.13	0.07
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.61	0.07	0.00
79	5A	20	6	1.28	1.28	0.14				0.00	0.00	0.00	1.28	0.14	1.28	0.14	0.00
80				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
82	5A	15	6	0.73	0.72	0.08				0.00	0.00	0.00	0.72	0.08	0.72	0.08	0.00
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
85	5B	22	7	1.59	1.85	0.20				0.00	0.00	0.00	1.85	0.20	1.85	0.20	0.00
86	5B	18	5	1.05	0.85	0.09				0.00	0.00	0.00	0.85	0.09	0.85	0.09	0.00
87	5B	13	4	0.55	0.34	0.04				0.00	0.00	0.00	0.34	0.04	0.34	0.04	0.00
88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total					11.3	1.25					0	0	11.3	1.25	11.946	1.3186	Ek Carton

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 10

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	220	76	80	78.0	39.00	2C	15.5	5.5	0.78	0.69	0.08				0.00	0.00	0.00	0.69	0.08
2	214	78	79	78.5	39.25	2A	14	4.5	0.63	0.45	0.05	2C	18	7	1.05	1.23	0.14	1.68	0.19
3	211	79.5	77.5	78.5	39.25	2A	12.5	4	0.50	0.31	0.03	2C	16	5	0.82	0.66	0.07	0.98	0.11
4	220	79	77.5	78.2	39.12	2C	12.5	5	0.50	0.41	0.05				0.00	0.00	0.00	0.41	0.05
5	210	76	79.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
6	206	78.5	76	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
7	220	76.5	82.5	79.5	39.75	2A	12	6	0.46	0.49	0.05	2C	15	6	0.71	0.72	0.08	1.21	0.13
8	212	79.5	78	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
9	214	78	75.5	76.8	38.38	2A	15	5.5	0.74	0.65	0.07				0.00	0.00	0.00	0.65	0.07
10	221	79	79	79.0	39.50	2A	17	5	0.93	0.75	0.08				0.00	0.00	0.00	0.75	0.08
11	212	78.5	79.5	79.0	39.50	2A	18.5	6	1.10	1.09	0.12	2C	17.5	6	0.98	0.97	0.11	2.06	0.23
12	222	79.5	79	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
13	212	76	79	77.5	38.75	2B	11	3	0.39	0.18	0.02				0.00	0.00	0.00	0.18	0.02
14	212	77.5	77	77.2	38.62	2C	16	5	0.84	0.66	0.07				0.00	0.00	0.00	0.66	0.07
15	214	79	78	78.5	39.25	2A	18.5	7	1.11	1.30	0.14	2C	10	3	0.32	0.15	0.02	1.44	0.16
16	217	77.5	77	77.2	38.62	2A	13.5	4	0.59	0.37	0.04				0.00	0.00	0.00	0.37	0.04
17	219	78.5	78	78.2	39.12	2A	17	6.5	0.93	1.01	0.11				0.00	0.00	0.00	1.01	0.11
18	205	77	74.5	75.8	37.88	2A	11.5	4	0.44	0.27	0.03	2C	16	8	0.85	1.19	0.13	1.45	0.16
19	221	77.5	80.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
20	212	76.5	77	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
21	222	79	81.5	80.2	40.12	2C	15.5	5.5	0.76	0.69	0.08				0.00	0.00	0.00	0.69	0.08
22	216	80	79	79.5	39.75	2A	16.5	6.5	0.87	0.95	0.10	2C	12.5	5.5	0.49	0.46	0.05	1.41	0.16
Total	4732									10.3	1.13					5.38	0.59	15.630	1.7252

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 10

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.69	0.08	
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.68	0.19	Tray 1
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.98	0.11	Weight(kg) 4.73
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.41	0.05	
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 15.63
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 3.64
7				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.21	0.13	Vol Total 19.27
8				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
9	5A	10	3.5	0.33	0.17	0.02				0.00	0.00	0.00	0.17	0.02	0.82	0.09	Ea Top 1.73
10				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.75	0.08	Ea Bottom 0.40
11				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.06	0.23	Ea Total 2.13
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.18	0.02	Top Br 23
14	5C	10	4.5	0.32	0.24	0.03				0.00	0.00	0.00	0.24	0.03	0.90	0.10	Bottom Br 6
15				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.44	0.16	Br Fruit 17
16				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.37	0.04	
17	5B	16.5	5	0.88	0.71	0.08				0.00	0.00	0.00	0.71	0.08	1.71	0.19	
18	5B	16.5	5	0.91	0.71	0.08				0.00	0.00	0.00	0.71	0.08	2.16	0.24	
19	5B	13	3.5	0.54	0.29	0.03				0.00	0.00	0.00	0.29	0.03	0.29	0.03	
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.69	0.08	
22	5B	20	7	1.28	1.51	0.17				0.00	0.00	0.00	1.51	0.17	2.92	0.32	
Total					3.64	0.40					0	0	3.64	0.40	19.265	2.1264	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

88:10/2

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 10

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
23	218	81.5	79.5	80.5	40.25	2A	16.5	6	0.85	0.86	0.10	2B	20	7	1.26	1.51	0.17	2.37	0.26
24	212	76.5	78	77.2	38.62	2C	10	2.5	0.32	0.12	0.01				0.00	0.00	0.00	0.12	0.01
25	207	78	77.5	77.8	38.88	2A	12	4	0.47	0.29	0.03	2C	10.5	4	0.36	0.22	0.02	0.51	0.06
26	221	78.5	79	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
27	209	77	79.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
28	218	78	81.5	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
29	213	77.5	75.5	76.5	38.25	2A	10	4	0.33	0.21	0.02	2C	9.5	3	0.30	0.13	0.01	0.34	0.04
30	205	79.5	78	78.8	39.38	2C	21	6.5	1.43	1.55	0.17				0.00	0.00	0.00	1.55	0.17
31	206	75.5	77	76.2	38.12	2A	19	3	1.20	0.62	0.07	2C	12	4	0.48	0.29	0.03	0.91	0.10
32	214	77.5	76.5	77.0	38.50	2B	14	4	0.64	0.40	0.04	2D	13	6	0.55	0.56	0.06	0.95	0.11
33	212	79.5	79.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
34	219	76	81.5	78.8	39.38	2A	14	6	0.63	0.63	0.07				0.00	0.00	0.00	0.63	0.07
35	221	78	80	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
36	213	73	77.5	75.2	37.62	2C	20	9	1.35	2.06	0.23				0.00	0.00	0.00	2.06	0.23
37	210	74.5	77.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
38	215	80	79.5	79.8	39.88	2A	22	8.5	1.55	2.29	0.25	2C	14	5	0.62	0.51	0.06	2.79	0.31
39	216	79.5	81	80.2	40.12	2A	9.5	2.5	0.28	0.11	0.01				0.00	0.00	0.00	0.11	0.01
40	217	81	80	80.5	40.25	2A	19	7.5	1.14	1.48	0.16	2C	19	4.5	1.14	0.86	0.09	2.34	0.26
41	214	79	80.5	79.8	39.88	2C	20	6.5	1.27	1.39	0.15				0.00	0.00	0.00	1.39	0.15
42	218	76	81	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
43	215	80	77.5	78.8	39.38	2A	18.5	5.5	1.10	0.99	0.11				0.00	0.00	0.00	0.99	0.11
44	210	80	77.5	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4703									13.0	1.43					4.08	0.45	17.072	1.8844

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 10

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary		
23	5B	18.5	6.5	1.08	1.19	0.13					0.00	0.00	0.00	1.19	0.13	3.56	0.39		
24				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.12	0.01	Tray 2	
25	5B	15.5	3.5	0.78	0.43	0.05					0.00	0.00	0.00	0.43	0.05	0.95	0.10	Weight(kg) 4.70	
26	5A	19	7	1.16	1.37	0.15					0.00	0.00	0.00	1.37	0.15	1.37	0.15		
27	5B	13	6	0.54	0.56	0.06					0.00	0.00	0.00	0.56	0.06	0.56	0.06	Vol Top 17.07	
28	5A	11.5	3.5	0.42	0.23	0.03	5C	12.5	3.5	0.49	0.27	0.03	0.50	0.06	0.50	0.06	0.50	0.06	Vol Bottom 24.46
29	5B	18.5	7	1.14	1.30	0.14					0.00	0.00	0.00	1.30	0.14	1.64	0.18	Vol Total 41.53	
30	5B	16	6	0.82	0.81	0.09					0.00	0.00	0.00	0.81	0.09	2.36	0.26		
31	5A	10.5	2	0.36	0.11	0.01					0.00	0.00	0.00	0.11	0.01	1.01	0.11	Ea Top 1.88	
32	5A	12.5	5.5	0.51	0.46	0.05					0.00	0.00	0.00	0.46	0.05	1.42	0.16	Ea Bottom 2.70	
33				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total 4.58	
34	5A	25	9	2.04	3.18	0.35					0.00	0.00	0.00	3.18	0.35	3.81	0.42		
35	5A	20	7	1.29	1.51	0.17					0.00	0.00	0.00	1.51	0.17	1.51	0.17	Top Br 21	
36	5B	21.5	7.5	1.57	1.91	0.21					0.00	0.00	0.00	1.91	0.21	3.98	0.44	Bottom Br 20	
37				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit 20	
38	5B	20	8	1.27	1.77	0.19	5D	11	4	0.38	0.24	0.03	2.01	0.22	4.81	0.53			
39				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.11	0.01		
40	5A	21	7	1.39	1.67	0.18					0.00	0.00	0.00	1.67	0.18	4.00	0.44		
41	5A	22.5	8	1.62	2.23	0.25					0.00	0.00	0.00	2.23	0.25	3.63	0.40		
42	5B	24	9	1.88	2.92	0.32					0.00	0.00	0.00	2.92	0.32	2.92	0.32		
43	5A	11.5	5	0.42	0.35	0.04					0.00	0.00	0.00	0.35	0.04	1.34	0.15		
44	5A	21	8	1.43	1.95	0.21					0.00	0.00	0.00	1.95	0.21	1.95	0.21		
Total					23.9	2.64						0.52	0.06	24.5	2.70	41.532	4.5841		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 10

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	213	79	79	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	217	79	78	78.5	39.25	2C	12.5	6	0.50	0.52	0.06				0.00	0.00	0.00	0.52	0.06
47	222	77.5	77.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
48	206	76.5	73.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
49	221	79	81	80.0	40.00	2A	11	4	0.38	0.24	0.03				0.00	0.00	0.00	0.24	0.03
50	206	76	79	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	220	78.5	81.5	80.0	40.00	2B	14	4	0.62	0.39	0.04				0.00	0.00	0.00	0.39	0.04
52	206	80	80	80.0	40.00	2C	22	5.5	1.54	1.45	0.16				0.00	0.00	0.00	1.45	0.16
53	213	77	80	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
54	212	79.5	77.5	78.5	39.25	2A	15	5.5	0.72	0.65	0.07				0.00	0.00	0.00	0.65	0.07
55	210	77	77.5	77.2	38.62	2A	12	4	0.47	0.29	0.03				0.00	0.00	0.00	0.29	0.03
56	208	80	78.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	220	77.5	79.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
58	216	80	78.5	79.2	39.62	2C	12.5	4	0.50	0.31	0.03				0.00	0.00	0.00	0.31	0.03
59	204	77.5	77	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
60	217	82	79	80.5	40.25	2A	17	6.5	0.91	1.00	0.11	2C	14	5	0.61	0.51	0.06	1.51	0.17
61	208	78	80	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	210	77	81	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	218	79	79.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
64	222	81.5	78.5	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
65	215	77.5	81.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
66	211	77	82.5	79.8	39.88	2A	13	4	0.53	0.34	0.04				0.00	0.00	0.00	0.34	0.04
Total	4695									5.20	0.57					0.51	0.06	5.7085	0.6301

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mis, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 10

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
46	5A	18.5	6	1.11	1.09	0.12				0.00	0.00	0.00	1.09	0.12	1.61	0.18	Tray 3	
47	5B	15	6.5	0.73	0.80	0.09				0.00	0.00	0.00	0.80	0.09	0.80	0.09	Weight(kg)	4.70
48				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
49	5A	21	7	1.40	1.67	0.18				0.00	0.00	0.00	1.67	0.18	1.91	0.21	Vol Top	5.71
50	5A	19	6.5	1.18	1.26	0.14				0.00	0.00	0.00	1.26	0.14	1.26	0.14	Vol Bottom	16.51
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.39	0.04	Vol Total	22.22
52	5B	18	4.5	1.03	0.76	0.08				0.00	0.00	0.00	0.76	0.08	2.21	0.24		
53	5B	21	6	1.43	1.43	0.16				0.00	0.00	0.00	1.43	0.16	1.43	0.16	Ea Top	0.63
54	5B	17	5	0.93	0.75	0.08				0.00	0.00	0.00	0.75	0.08	1.40	0.15	Ea Bottom	1.82
55	5A	20	7.5	1.32	1.64	0.18				0.00	0.00	0.00	1.64	0.18	1.93	0.21	Ea Total	2.45
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3	
57	5B	16.5	6	0.88	0.86	0.10				0.00	0.00	0.00	0.86	0.10	0.86	0.10	Top Br	10
58	5B	16.5	7	0.87	1.04	0.12				0.00	0.00	0.00	1.04	0.12	1.36	0.15	Bottom Br	16
59	5A	18	6	1.06	1.03	0.11				0.00	0.00	0.00	1.03	0.11	1.03	0.11	Br Fruit	17
60	5A	17.5	7.5	0.96	1.27	0.14	5C	13	4.5	0.53	0.39	0.04	1.65	0.18	3.16	0.35	Tray 4	
61	5A	12.5	6	0.50	0.52	0.06				0.00	0.00	0.00	0.52	0.06	0.52	0.06	Top Br	0
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	8
63				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit	8
64	5A	19.5	7	1.21	1.44	0.16				0.00	0.00	0.00	1.44	0.16	1.44	0.16	Carton	
65	5A	14	5.5	0.62	0.57	0.06				0.00	0.00	0.00	0.57	0.06	0.57	0.06	Top Br	54
66				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.34	0.04	Bottom Br	50
Total					16.1	1.78					0.39	0.04	16.5	1.82	22.221	2.4526	Br Fruit	62

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mis, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 10

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	207	75.5	81	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	203	77	77.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	201	78.5	80.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	210	77	79	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	211	78.5	83	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	216	80	81	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	211	77.5	78	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	218	76.5	80.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	217	77	77	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	212	81.5	75.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	214	80	81.5	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	204	78.5	75.5	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	218	81.5	81	81.2	40.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	212	78	79	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	204	77	77.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	205	74.5	76.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	210	77	82.5	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	211	81.5	79	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	210	79	81.5	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	216	80	76	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	207	76.5	77	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	220	78.5	80	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4637								0	0	0				0	0	0	0	0

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 10

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
68				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 4	
69	5B	20	6	1.28	1.28	0.14				0.00	0.00	0.00	1.28	0.14	1.28	0.14	Weight(kg)	4.64
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	0.00
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	6.37
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	6.37
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
74	5B	14	4	0.63	0.39	0.04				0.00	0.00	0.00	0.39	0.04	0.39	0.04	Ea Top	0.00
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.70
76				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.70
77	5B	14.5	4.5	0.66	0.48	0.05				0.00	0.00	0.00	0.48	0.05	0.48	0.05		
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton	
79	5B	17	6	0.90	0.91	0.10				0.00	0.00	0.00	0.91	0.10	0.91	0.10	Weight(kg)	18.77
80	5A	21	8	1.43	1.95	0.22				0.00	0.00	0.00	1.95	0.22	1.95	0.22		
81	5B	14	5	0.64	0.51	0.06				0.00	0.00	0.00	0.51	0.06	0.51	0.06	Vol Top	38.41
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	50.98
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	89.39
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
85				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	4.24
87	5B	14	5	0.64	0.51	0.06				0.00	0.00	0.00	0.51	0.06	0.51	0.06	Ea Bottom	5.63
88	5A	13	4	0.54	0.34	0.04				0.00	0.00	0.00	0.34	0.04	0.34	0.04	Ea Total	9.87
Total					6.37	0.70					0	0	6.37	0.70	6.3702	0.7031	Ek Carton	110.46

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 21.9.93

88:10/8

**TABLES 6.2 FULL RESULTS OF DROP TEST DATA COUNT 88
CARTONS 11 - 20 AT 8% MOISTURE CONTENT**

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 11

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	218	79.5	79	79.2	39.62	2C	30	12.5	2.95	6.72	0.74				0.00	0.00	0.00	6.72	0.74
2	220	78.5	81.5	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
3	215	80	78	79.0	39.50	2D	13.5	4.5	0.58	0.42	0.05				0.00	0.00	0.00	0.42	0.05
4	215	80.5	80	80.2	40.12	2B	11	2.5	0.38	0.15	0.02	2C	12.5	4	0.49	0.31	0.03	0.46	0.05
5	215	79.5	75.5	77.5	38.75	2A	16	5.5	0.83	0.74	0.08	2C	11.5	4	0.43	0.27	0.03	1.00	0.11
6	209	78.5	78	78.2	39.12	2A	11.5	4.5	0.42	0.31	0.03				0.00	0.00	0.00	0.31	0.03
7	209	79.5	80	79.8	39.88	2A	19.5	6.5	1.21	1.32	0.15				0.00	0.00	0.00	1.32	0.15
8	219	78.5	81.5	80.0	40.00	2B	19.5	4.5	1.21	0.91	0.10	2C	24.5	4.5	1.92	1.58	0.17	2.49	0.28
9	213	77.5	81.5	79.5	39.75	2B	13.5	4	0.58	0.37	0.04				0.00	0.00	0.00	0.37	0.04
10	209	75.5	78.5	77.0	38.50	2A	19.5	7	1.26	1.44	0.16				0.00	0.00	0.00	1.44	0.16
11	216	77	82	79.5	39.75	2A	19.5	7	1.21	1.44	0.16	2C	17.5	5	0.98	0.80	0.09	2.23	0.25
12	215	76.5	80.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
13	215	78	78.5	78.2	39.12	2A	14	6	0.63	0.64	0.07				0.00	0.00	0.00	0.64	0.07
14	218	74.5	77	75.8	37.88	2B	16.5	5.5	0.91	0.79	0.09	2C	18	6	1.08	1.03	0.11	1.82	0.20
15	212	78.5	78	78.2	39.12	2A	16	6.5	0.83	0.90	0.10				0.00	0.00	0.00	0.90	0.10
16	212	79	78.5	78.8	39.38	2B	31	12	3.18	6.87	0.76				0.00	0.00	0.00	6.87	0.76
17	210	74.5	77.5	76.0	38.00	2B	19	7.5	1.21	1.49	0.16				0.00	0.00	0.00	1.49	0.16
18	214	78.5	79	78.8	39.38	2A	14	4	0.63	0.39	0.04	2C	24.5	6	1.95	2.02	0.22	2.42	0.27
19	220	77.5	76	76.8	38.38	2B	10.5	3	0.36	0.16	0.02	2C	19	6	1.19	1.15	0.13	1.32	0.15
20	214	80	80	80.0	40.00	2A	16	4.5	0.81	0.59	0.07	2C	21	5.5	1.40	1.30	0.14	1.89	0.21
21	212	77.5	76.5	77.0	38.50	2B	22.5	6	1.68	1.67	0.18				0.00	0.00	0.00	1.67	0.18
22	217	80	80	80.0	40.00	2A	20.5	9	1.34	2.14	0.24	2C	24	7	1.84	2.23	0.25	4.37	0.48
Total	4717									29.4	3.25					10.7	1.18	40.147	4.4312

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 24.9.93

88:11/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 11

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
1	5B	28.5	12	2.65	5.77	0.64				0.00	0.00	0.00	5.77	0.64	12.50	1.38		
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 1	
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.42	0.05	Weight(kg)	4.72
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.46	0.05		
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.00	0.11	Vol Top	40.15
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.31	0.03	Vol Bottom	6.42
7				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.32	0.15	Vol Total	46.57
8	5C	14.5	3	0.66	0.32	0.04				0.00	0.00	0.00	0.32	0.04	2.81	0.31		
9				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.37	0.04	Ea Top	4.43
10				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.44	0.16	Ea Bottom	0.71
11	6B	11.5	3.5	0.42	0.23	0.03				0.00	0.00	0.00	0.23	0.03	2.46	0.27	Ea Total	5.14
12	5A	9	2.5	0.26	0.10	0.01				0.00	0.00	0.00	0.10	0.01	0.10	0.01		
13				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.64	0.07	Top Br	29
14				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.82	0.20	Bottom Br	4
15				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.90	0.10	Br Fruit	21
16				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	6.87	0.76		
17				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.49	0.16		
18				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.42	0.27		
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.32	0.15		
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.89	0.21		
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.67	0.18		
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	4.37	0.48		
Total					6.42	0.71					0	0	6.42	0.71	46.567	5.1398		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 24.9.93

88:11/2

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 11

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
23	217	80	79	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
24	211	76	75	75.5	37.75	2A	17	5	0.97	0.76	0.08	2C	15.5	5	0.80	0.62	0.07	1.38	0.15
25	218	80.5	80	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
26	212	78	79	78.5	39.25	2A	23.5	3.5	1.80	1.18	0.13	2C	16.5	5.5	0.88	0.78	0.09	1.97	0.22
27	212	76	80	78.0	39.00	2C	19.5	8	1.24	1.69	0.19				0.00	0.00	0.00	1.69	0.19
28	212	79	75.5	77.2	38.62	2C	26	6.5	2.25	2.52	0.28				0.00	0.00	0.00	2.52	0.28
29	212	79	82.5	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
30	219	77.5	77	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
31	204	77.5	77	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
32	213	80.5	76	78.2	39.12	2B	14.5	4.5	0.68	0.48	0.05	2C	12	4	0.46	0.29	0.03	0.77	0.09
33	211	77	80	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
34	222	80.5	80	80.2	40.12	2A	17.5	4.5	0.97	0.71	0.08	2C	22	8	1.54	2.13	0.24	2.85	0.31
35	218	80	79.5	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
36	212	82	76.5	79.2	39.62	2B	15.5	3	0.77	0.37	0.04	2C	16.5	3	0.87	0.43	0.05	0.80	0.09
37	208	81	78.5	79.8	39.88	2A	14.5	6	0.66	0.68	0.07				0.00	0.00	0.00	0.68	0.07
38	215	78.5	79.5	79.0	39.50	2A	18.5	6	1.10	1.09	0.12	2C	19	6	1.16	1.15	0.13	2.24	0.25
39	208	78.5	78.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	216	80.5	79.5	80.0	40.00	2B	20.5	5	1.34	1.13	0.12				0.00	0.00	0.00	1.13	0.12
41	203	78.5	78	78.2	39.12	2C	12.5	4	0.50	0.31	0.03				0.00	0.00	0.00	0.31	0.03
42	221	78.5	81	79.8	39.88	2C	22	5	1.55	1.33	0.15				0.00	0.00	0.00	1.33	0.15
43	205	78	79	78.5	39.25	2A	12	3	0.46	0.21	0.02	2C	16	7	0.82	0.99	0.11	1.20	0.13
44	204	80	77.5	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4673									12.5	1.38					6.39	0.71	18.852	2.0808

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise Joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 24.9.93

88:11/3

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 11

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
23					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
24					0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.38	0.15	Tray 2
25	5A	18.5	5.5	1.08	0.99	0.11				0.00	0.00	0.00	0.99	0.11	0.99	0.11	Weight(kg) 4.67
26					0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.97	0.22	
27					0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.69	0.19	Vol Top 18.85
28	5A	11	4	0.39	0.25	0.03				0.00	0.00	0.00	0.25	0.03	2.76	0.30	Vol Bottom 12.07
29					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 30.93
30	5B	14	5	0.64	0.51	0.06				0.00	0.00	0.00	0.51	0.06	0.51	0.06	
31	5B	12.5	3.5	0.51	0.27	0.03				0.00	0.00	0.00	0.27	0.03	0.27	0.03	Ea Top 2.08
32					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.77	0.09	Ea Bottom 1.33
33	5B	19	4.5	1.17	0.86	0.10				0.00	0.00	0.00	0.86	0.10	0.86	0.10	Ea Total 3.41
34	5B	21.5	4	1.47	1.04	0.11	5C	14	4.5	0.62	0.45	0.05	1.49	0.16	4.33	0.48	
35	5B	14.5	3	0.66	0.32	0.04				0.00	0.00	0.00	0.32	0.04	0.32	0.04	Top Br 20
36	5A	11.5	5	0.42	0.35	0.04				0.00	0.00	0.00	0.35	0.04	1.16	0.13	Bottom Br 13
37					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.68	0.07	Br Fruit 19
38					0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.24	0.25	
39					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
40	5A	20.5	7.5	1.34	1.72	0.19				0.00	0.00	0.00	1.72	0.19	2.85	0.31	
41	5A	15	5	0.73	0.58	0.06				0.00	0.00	0.00	0.58	0.06	0.89	0.10	
42	5A	28.5	7	2.63	3.32	0.37				0.00	0.00	0.00	3.32	0.37	4.65	0.51	
43					0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.20	0.13	
44	5B	21	6	1.43	1.43	0.16				0.00	0.00	0.00	1.43	0.16	1.43	0.16	
Total					11.6	1.28					0.45	0.05	12.1	1.33	30.927	3.4136	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise Joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 24.9.93

88:11/4

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 11

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	200	78.5	76	77.2	38.62	2A	12.5	2.5	0.51	0.19	0.02				0.00	0.00	0.00	0.19	0.02
46	221	79.5	80.5	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
47	206	74.5	77.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
48	213	78.5	77	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
49	211	80	80.5	80.2	40.12	2C	18.5	6.5	1.08	1.19	0.13				0.00	0.00	0.00	1.19	0.13
50	222	78.5	83	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	215	77	79	78.0	39.00	2A	11.5	3	0.43	0.19	0.02				0.00	0.00	0.00	0.19	0.02
52	218	79	82.5	80.8	40.38	2A	14	7	0.61	0.78	0.09				0.00	0.00	0.00	0.78	0.09
53	205	78	78	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
54	204	76	75.5	75.8	37.88	2A	16	5.5	0.85	0.74	0.08				0.00	0.00	0.00	0.74	0.08
55	212	76	77.5	76.8	38.38	2A	23	7.5	1.76	2.20	0.24	2C	14	4	0.64	0.40	0.04	2.59	0.29
56	214	79.5	76.5	78.0	39.00	1A	10.5	2.5	0.35	0.13	0.01				0.00	0.00	0.00	0.13	0.01
57	205	78.5	79.5	79.0	39.50	2A	14.5	5	0.67	0.54	0.06				0.00	0.00	0.00	0.54	0.06
58	214	77.5	77.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
59	208	76.5	76.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
60	205	78.5	77	77.8	38.88	2A	15.5	6.5	0.78	0.85	0.09				0.00	0.00	0.00	0.85	0.09
61	217	81.5	81	81.2	40.62	2B	11.5	2.5	0.41	0.16	0.02	3B	11	2.5	0.37	0.15	0.02	0.31	0.03
62	215	82.5	76	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	214	80	80	80.0	40.00	2B	17.5	5.5	0.97	0.88	0.10				0.00	0.00	0.00	0.88	0.10
64	210	77	77	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
65	213	78.5	80	79.2	39.62	2A	23	9	1.71	2.68	0.30				0.00	0.00	0.00	2.68	0.30
66	213	82.5	79	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4655									10.5	1.16					0.54	0.06	11.072	1.2221

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mis, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 24.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 11

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.19	0.02	
46				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3
47				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 4.66
48	5B	17	6	0.94	0.92	0.10				0.00	0.00	0.00	0.92	0.10	0.92	0.10	
49	6B	13	3.5	0.53	0.29	0.03				0.00	0.00	0.00	0.29	0.03	1.48	0.16	Vol Top 11.07
50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 16.78
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.19	0.02	Vol Total 27.85
52	5B	28	11	2.50	5.01	0.55				0.00	0.00	0.00	5.01	0.55	5.79	0.64	
53	5B	17	6.5	0.94	1.01	0.11				0.00	0.00	0.00	1.01	0.11	1.01	0.11	Ea Top 1.22
54	5A	12	4.5	0.48	0.33	0.04				0.00	0.00	0.00	0.33	0.04	1.07	0.12	Ea Bottom 1.85
55	5B	22	8	1.61	2.15	0.24				0.00	0.00	0.00	2.15	0.24	4.74	0.52	Ea Total 3.07
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.13	0.01	Tray 3
57	5A	14	4	0.63	0.39	0.04				0.00	0.00	0.00	0.39	0.04	0.94	0.10	Top Br 14
58	5B	19.5	8.5	1.25	1.82	0.20				0.00	0.00	0.00	1.82	0.20	1.82	0.20	Bottom Br 14
59	5B	18.5	6.5	1.14	1.19	0.13				0.00	0.00	0.00	1.19	0.13	1.19	0.13	Br Fruit 18
60	5B	14.5	5.5	0.68	0.61	0.07				0.00	0.00	0.00	0.61	0.07	1.46	0.16	Tray 4
61				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.31	0.03	Top Br 2
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br 11
63	5B	20.5	8	1.34	1.85	0.20				0.00	0.00	0.00	1.85	0.20	2.73	0.30	Br Fruit 10
64	5A	14.5	3.5	0.69	0.37	0.04				0.00	0.00	0.00	0.37	0.04	0.37	0.04	Carton
65	5A	13	2	0.54	0.17	0.02				0.00	0.00	0.00	0.17	0.02	2.85	0.31	Top Br 65
66	5B	15	5.5	0.70	0.65	0.07				0.00	0.00	0.00	0.65	0.07	0.65	0.07	Bottom Br 42
Total					16.8	1.85					0	0	16.8	1.85	27.849	3.0738	Br Fruit 68

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mis, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 24.9.93

88:11/6

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 11

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	218	80.5	79.5	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	210	79.5	78.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	208	78	78	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	211	75	78	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	215	80	79	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	215	81	76	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	205	77.5	76.5	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	214	79.5	82.5	81.0	40.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	216	77.5	82	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	214	76	79.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	219	79	79	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	209	78	75	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	216	77.5	78.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	217	79	80	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	206	78.5	77.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	216	81	77	79.0	39.50	2A	21	2	1.42	0.60	0.07				0.00	0.00	0.00	0.60	0.07
83	208	76	78	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	221	81	78	79.5	39.75	2A	11.5	4	0.42	0.27	0.03				0.00	0.00	0.00	0.27	0.03
85	212	79.5	81	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	221	79.5	79.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	222	79	82.5	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	209	78.5	79	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4702								0.87	0.10					0	0		0.8657	0.0955

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 24.9.93

88:11/7

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 11

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
68				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 4
69	5B	13.5	4.5	0.59	0.42	0.05				0.00	0.00	0.00	0.42	0.05	0.42	0.05	Weight(kg) 4.70
70	5A	17	6.5	0.96	1.01	0.11				0.00	0.00	0.00	1.01	0.11	1.01	0.11	
71	5A	19.5	6	1.21	1.21	0.13				0.00	0.00	0.00	1.21	0.13	1.21	0.13	Vol Top 0.87
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 7.48
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 8.35
74				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top 0.10
76	5C	13.5	4	0.59	0.37	0.04				0.00	0.00	0.00	0.37	0.04	0.37	0.04	Ea Bottom 0.83
77	5A	17	4.5	0.93	0.67	0.07				0.00	0.00	0.00	0.67	0.07	0.67	0.07	Ea Total 0.92
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
79	5B	18	7	1.05	1.23	0.14	5C	18	4.5	1.05	0.76	0.08	2.00	0.22	2.00	0.22	Carton
80	5A	11.5	3	0.42	0.19	0.02	5C	18	5	1.03	0.85	0.09	1.04	0.11	1.04	0.11	Weight(kg) 18.75
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.60	0.07	Vol Top 70.94
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 42.75
84	5A	17.5	3	0.98	0.50	0.05				0.00	0.00	0.00	0.50	0.05	0.76	0.08	Vol Total 113.69
85				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top 7.83
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 4.72
88	5B	15.5	2	0.77	0.27	0.03				0.00	0.00	0.00	0.27	0.03	0.27	0.03	Ea Total 12.55
Total				5.87	0.65					1.61	0.18		7.48	0.83	8.3453	0.9211	Ek Carton 110.34

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 24.9.93

88:11/8

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 12

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	221	80	81.5	80.8	40.38	2C	19.5	7.5	1.19	1.55	0.17				0.00	0.00	0.00	1.55	0.17
2	214	80	79.5	79.8	39.88	2C	16.5	5	0.86	0.70	0.08				0.00	0.00	0.00	0.70	0.08
3	218	80.5	75	77.8	38.88	2C	19	6.5	1.18	1.26	0.14				0.00	0.00	0.00	1.26	0.14
4	209	76.5	79	77.8	38.88	2B	14.5	5.5	0.68	0.61	0.07				0.00	0.00	0.00	0.61	0.07
5	213	75	79	77.0	38.50	2B	16	6.5	0.84	0.90	0.10				0.00	0.00	0.00	0.90	0.10
6	202	78.5	76.5	77.5	38.75	2B	20	7.5	1.31	1.64	0.18				0.00	0.00	0.00	1.64	0.18
7	206	76	79	77.5	38.75	2B	20	7.5	1.31	1.64	0.18				0.00	0.00	0.00	1.64	0.18
8	205	80	79.5	79.8	39.88	2B	18.5	6	1.09	1.09	0.12				0.00	0.00	0.00	1.09	0.12
9	203	75.5	77	76.2	38.12	2B	19.5	7	1.27	1.45	0.16				0.00	0.00	0.00	1.45	0.16
10	215	76	78	77.0	38.50	2A	20.5	6	1.39	1.36	0.15	2C	11	4	0.39	0.25	0.03	1.60	0.18
11	201	76	76.5	76.2	38.12	2C	22	7.5	1.62	2.00	0.22				0.00	0.00	0.00	2.00	0.22
12	200	80	81.5	80.8	40.38	2C	20.5	6.5	1.32	1.46	0.16				0.00	0.00	0.00	1.46	0.16
13	219	77	79	78.0	39.00	2A	14	2.5	0.63	0.25	0.03	2C	23.5	7	1.81	2.14	0.24	2.39	0.26
14	211	79	78	78.5	39.25	2B	17.5	2	0.99	0.37	0.04	2C	20.5	6.5	1.36	1.47	0.16	1.84	0.20
15	209	80	79	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
16	216	83	79	81.0	40.50	2A	21	8	1.38	1.94	0.21	2C	15	3.5	0.70	0.40	0.04	2.34	0.26
17	220	79.5	79	79.2	39.62	2A	23	7	1.71	2.03	0.22				0.00	0.00	0.00	2.03	0.22
18	219	81.5	80	80.8	40.38	2A	14.5	4.5	0.66	0.48	0.05	2C	25.5	6.5	2.07	2.38	0.26	2.86	0.32
19	218	78	77	77.5	38.75	2A	11.5	2	0.43	0.13	0.01				0.00	0.00	0.00	0.13	0.01
20	214	80	79	79.5	39.75	2C	21.5	7	1.48	1.76	0.19				0.00	0.00	0.00	1.76	0.19
21	204	78	78.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
22	204	75	78.5	76.8	38.38	2A	12.5	5.5	0.51	0.46	0.05				0.00	0.00	0.00	0.46	0.05
Total	4641									23.1	2.55					6.63	0.73	29.706	3.2788

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 24.9.93

88:12/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 12

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1					0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.55	0.17	
2					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.70	0.08	Tray 1
3					0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.26	0.14	Weight(kg) 4.64
4					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.61	0.07	
5					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.90	0.10	Vol Top 29.71
6					0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.64	0.18	Vol Bottom 5.07
7					0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.64	0.18	Vol Total 34.78
8					0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.09	0.12	
9	5B	25.5	7	2.20	2.58	0.29				0.00	0.00	0.00	2.58	0.29	4.03	0.44	Ea Top 3.28
10	5B	13.5	2	0.60	0.19	0.02				0.00	0.00	0.00	0.19	0.02	1.79	0.20	Ea Bottom 0.56
11					0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.00	0.22	Ea Total 3.84
12					0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.46	0.16	
13	5B	16	4	0.83	0.53	0.06				0.00	0.00	0.00	0.53	0.06	2.91	0.32	Top Br 25
14					0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.84	0.20	Bottom Br 7
15	6B	13.5	5	0.58	0.47	0.05				0.00	0.00	0.00	0.47	0.05	0.47	0.05	Br Fruit 21
16	5B	18	5	1.01	0.84	0.09				0.00	0.00	0.00	0.84	0.09	3.18	0.35	
17					0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.03	0.22	
18	5B	11.5	2	0.41	0.13	0.01				0.00	0.00	0.00	0.13	0.01	2.99	0.33	
19	5A	11	5	0.39	0.33	0.04				0.00	0.00	0.00	0.33	0.04	0.46	0.05	
20					0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.76	0.19	
21					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
22					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.46	0.05	
Total					5.07	0.56				0	0	0	5.07	0.56	34.778	3.8386	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 24.9.93

88:12/2

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 12

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top	
23	216	80.5	75.5	78.0	39.00	2A	16.5	5.5	0.88	0.78	0.09	2C	19	6	1.17	1.15	0.13	1.93	0.21	
24	212	79.5	77.5	78.5	39.25	2C	20	5	1.30	1.07	0.12	2C	12	3	0.46	0.21	0.02	1.28	0.14	
25	216	81	77.5	79.2	39.62				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
26	209	79.5	80	79.8	39.88	2B	15	2	0.71	0.25	0.03					0.00	0.00	0.00	0.25	0.03
27	212	77.5	79	78.2	39.12	2A	22.5	7	1.65	1.94	0.21	2C	12.5	4.5	0.50	0.36	0.04	2.30	0.25	
28	204	78.5	77.5	78.0	39.00				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
29	216	82.5	76.5	79.5	39.75	2B	21.5	7	1.48	1.76	0.19					0.00	0.00	0.00	1.76	0.19
30	200	78.5	75	76.8	38.38				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
31	208	79.5	80	79.8	39.88	2B	18.5	4	1.09	0.73	0.08	2C	20	6	1.27	1.28	0.14	2.01	0.22	
32	215	76.5	78.5	77.5	38.75				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
33	213	76	78	77.0	38.50				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
34	208	77	78	77.5	38.75	2B	24.5	5.5	1.99	1.88	0.21					0.00	0.00	0.00	1.88	0.21
35	206	77	77.5	77.2	38.62	2C	23	6.5	1.75	1.90	0.21					0.00	0.00	0.00	1.90	0.21
36	219	77.5	79.5	78.5	39.25	2C	25.5	8.5	2.13	3.11	0.34					0.00	0.00	0.00	3.11	0.34
37	204	77.5	82	79.8	39.88				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
38	218	79	80	79.5	39.75	2A	21	8	1.41	1.94	0.21	2C	10.5	2.5	0.35	0.13	0.01	2.08	0.23	
39	217	78	81.5	79.8	39.88				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
40	210	77	76.5	76.8	38.38	2B	22	6.5	1.61	1.72	0.19					0.00	0.00	0.00	1.72	0.19
41	206	78	78	78.0	39.00	2C	23.5	7	1.81	2.14	0.24					0.00	0.00	0.00	2.14	0.24
42	220	79	79.5	79.2	39.62	2C	21.5	6	1.49	1.50	0.17					0.00	0.00	0.00	1.50	0.17
43	200	78.5	79	78.8	39.38	2C	14	2.5	0.63	0.25	0.03					0.00	0.00	0.00	0.25	0.03
44	221	82	81	81.5	40.75				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
Total	4650									21.0	2.31					3.14	0.35	24.101	2.6601	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 24.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 12

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
23	5B	21	6	1.44	1.43	0.16					0.00	0.00	0.00	1.43	0.16	3.36	0.37	
24	5A	18.5	6	1.11	1.09	0.12					0.00	0.00	0.00	1.09	0.12	2.37	0.26	Tray 2
25	5B	23.5	8	1.78	2.45	0.27					0.00	0.00	0.00	2.45	0.27	2.45	0.27	Weight(kg) 4.65
26				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.25	0.03	
27	5C	15	4.5	0.73	0.52	0.06					0.00	0.00	0.00	0.52	0.06	2.82	0.31	Vol Top 24.10
28				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 17.07
29	5B	18.5	5.5	1.09	0.99	0.11	6B	14.5	2.5	0.67	0.27	0.03	1.26	0.14	3.02	0.33	Vol Total 41.17	
30	5A	16	3.5	0.84	0.46	0.05					0.00	0.00	0.00	0.46	0.05	0.46	0.05	
31				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	2.01	0.22	Ea Top 2.66
32	5A	14	5	0.64	0.51	0.06					0.00	0.00	0.00	0.51	0.06	0.51	0.06	Ea Bottom 1.88
33				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total 4.54
34	5A	20.5	6.5	1.38	1.47	0.16					0.00	0.00	0.00	1.47	0.16	3.36	0.37	
35	5B	22	7.5	1.60	2.00	0.22	6B	13.5	3	0.59	0.27	0.03	2.27	0.25	4.17	0.46	Top Br 19	
36	5A	13.5	4	0.58	0.37	0.04					0.00	0.00	0.00	0.37	0.04	3.48	0.38	Bottom Br 15
37				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit 18
38				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	2.08	0.23	
39				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	
40	5B	25.5	8.5	2.18	3.13	0.35					0.00	0.00	0.00	3.13	0.35	4.85	0.54	
41				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	2.14	0.24	
42	5A	20.5	7	1.35	1.59	0.18					0.00	0.00	0.00	1.59	0.18	3.09	0.34	
43				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.25	0.03	
44	5A	16	4	0.79	0.52	0.06					0.00	0.00	0.00	0.52	0.06	0.52	0.06	
Total					16.5	1.82					0.55	0.06	17.1	1.88	41.169	4.5440		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 24.9.93

88:12/4

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 12

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	219	79	80	79.5	39.75	2B	13	2	0.54	0.17	0.02				0.00	0.00	0.00	0.17	0.02
46	218	79.5	78	78.8	39.38	2A	17	6	0.93	0.92	0.10				0.00	0.00	0.00	0.92	0.10
47	210	77.5	76.5	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
48	208	77	77.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
49	216	74	76.5	75.2	37.62	2A	16	6.5	0.86	0.90	0.10				0.00	0.00	0.00	0.90	0.10
50	202	77.5	79	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	205	77	82.5	79.8	39.88	2B	20.5	6.5	1.34	1.47	0.16				0.00	0.00	0.00	1.47	0.16
52	205	77.5	74.5	76.0	38.00	2C	20.5	5	1.41	1.14	0.13				0.00	0.00	0.00	1.14	0.13
53	218	78.5	80.5	79.5	39.75	2C	14	4.5	0.62	0.45	0.05				0.00	0.00	0.00	0.45	0.05
54	211	77.5	79.5	78.5	39.25	2B	16.5	3	0.88	0.43	0.05				0.00	0.00	0.00	0.43	0.05
55	206	78	78	78.0	39.00	2A	13	4	0.55	0.34	0.04				0.00	0.00	0.00	0.34	0.04
56	214	76	78	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	208	78.5	80.5	79.5	39.75	2A	11	1.5	0.38	0.09	0.01				0.00	0.00	0.00	0.09	0.01
58	210	76.5	78.5	77.5	38.75	2C	18	4	1.06	0.69	0.08	2B	24	11.5	1.90	3.96	0.44	4.64	0.51
59	214	80	75	77.5	38.75	2A	20	7	1.31	1.52	0.17	2C	12.5	3.5	0.51	0.27	0.03	1.79	0.20
60	212	79	80	79.5	39.75	2A	20.5	7	1.34	1.59	0.18				0.00	0.00	0.00	1.59	0.18
61	213	78.5	80	79.2	39.62	2A	15.5	5	0.77	0.62	0.07				0.00	0.00	0.00	0.62	0.07
62	215	78	82.5	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	217	77.5	81.5	79.5	39.75	2C	18.5	5.5	1.09	0.99	0.11				0.00	0.00	0.00	0.99	0.11
64	202	78	77	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
65	214	78.5	82	80.2	40.12	2C	16.5	4	0.86	0.56	0.06				0.00	0.00	0.00	0.56	0.06
66	203	79	77.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4640									11.9	1.31					4.23	0.47	16.104	1.7775

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 24.9.93

88:12/5

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 12

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
45	5C	15	4	0.71	0.46	0.05				0.00	0.00	0.00	0.46	0.05	0.63	0.07	
46	5B	21	6	1.43	1.43	0.16				0.00	0.00	0.00	1.43	0.16	2.34	0.26	Tray 3
47	6B	21.5	6	1.53	1.51	0.17				0.00	0.00	0.00	1.51	0.17	1.51	0.17	Weight(kg) 4.64
48	5B	16	4.5	0.84	0.59	0.07				0.00	0.00	0.00	0.59	0.07	0.59	0.07	
49				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.90	0.10	Vol Top 16.10
50	5A	18.5	5	1.11	0.90	0.10				0.00	0.00	0.00	0.90	0.10	0.90	0.10	Vol Bottom 16.41
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.47	0.16	Vol Total 32.52
52	5A	15.5	4.5	0.80	0.56	0.06				0.00	0.00	0.00	0.56	0.06	1.70	0.19	
53	5B	21	8.5	1.41	2.09	0.23				0.00	0.00	0.00	2.09	0.23	2.54	0.28	Ea Top 1.78
54	5A	11	4	0.39	0.25	0.03				0.00	0.00	0.00	0.25	0.03	0.68	0.07	Ea Bottom 1.81
55	5A	20.5	8.5	1.37	2.00	0.22				0.00	0.00	0.00	2.00	0.22	2.34	0.26	Ea Total 3.59
56	4B	15	2	0.74	0.25	0.03	5C	20.5	5	1.39	1.14	0.13	1.39	0.15	1.39	0.15	Tray 3
57	6B	12	2	0.46	0.14	0.02	5B	11.5	2.5	0.42	0.16	0.02	0.30	0.03	0.40	0.04	Top Br 17
58				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	4.64	0.51	Bottom Br 20
59	5A	19	4.5	1.18	0.87	0.10				0.00	0.00	0.00	0.87	0.10	2.66	0.29	Br Fruit 20
60	5B	14	3	0.62	0.30	0.03				0.00	0.00	0.00	0.30	0.03	1.89	0.21	Tray 4
61	5B	13	3.5	0.54	0.29	0.03	4B	13	2.5	0.54	0.21	0.02	0.51	0.06	1.12	0.12	Top Br 2
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br 15
63	5A	19.5	6.5	1.21	1.32	0.15				0.00	0.00	0.00	1.32	0.15	2.31	0.26	Br Fruit 14
64	5A	18	6.5	1.06	1.13	0.12				0.00	0.00	0.00	1.13	0.12	1.13	0.12	Carton
65	5B	17	5.5	0.91	0.83	0.09				0.00	0.00	0.00	0.83	0.09	1.39	0.15	Top Br 63
66				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br 57
Total						14.9	1.64				1.51	0.17	16.4	1.81	32.515	3.5889	Br Fruit 73

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 24.9.93

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Apple Data, Bruise Analysis and Energy Absorbed In Bruising Count 88 Carton 12

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	216	79.5	81	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	208	82	77	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	207	78.5	78.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	204	80	79	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	204	78.5	77	77.8	38.88	2B	16.5	2.5	0.89	0.37	0.04				0.00	0.00	0.00	0.37	0.04
72	210	79	79	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	221	77	80	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	204	76.5	80	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	219	79	80	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	215	80	81.5	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	208	76.5	80.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	208	78	81.5	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	213	79.5	81.5	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	213	78.5	78	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	212	79.5	79.5	79.5	39.75	2B	18.5	4	1.09	0.73	0.08				0.00	0.00	0.00	0.73	0.08
82	209	77.5	77	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	211	77.5	79.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	209	75	79	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	205	78	78.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	205	79.5	77.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	219	76.5	81	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	203	77	80	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4623									1.10	0.12					0	0	1.0994	0.1213

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise Joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 24.9.93

88:12/7

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 12

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
68	5B	20.5	6.5	1.34	1.47	0.16	6B	12	4.5	0.46	0.33	0.04	1.80	0.20	1.80	0.20	Tray 4
69	5B	18	7	1.05	1.23	0.14				0.00	0.00	0.00	1.23	0.14	1.23	0.14	Weight(kg): 4.62
70	5B	21.5	6	1.48	1.50	0.17				0.00	0.00	0.00	1.50	0.17	1.50	0.17	
71	5A	15.5	5	0.78	0.62	0.07				0.00	0.00	0.00	0.62	0.07	0.99	0.11	Vol Top 1.10
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 16.61
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 17.70
74	5B	17.5	5	0.99	0.80	0.09				0.00	0.00	0.00	0.80	0.09	0.80	0.09	
75	5A	18	6	1.03	1.03	0.11				0.00	0.00	0.00	1.03	0.11	1.03	0.11	Ea Top 0.12
76	5B	18.5	6.5	1.07	1.18	0.13				0.00	0.00	0.00	1.18	0.13	1.18	0.13	Ea Bottom 1.83
77				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total 1.95
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
79	5A	15.5	5	0.75	0.62	0.07				0.00	0.00	0.00	0.62	0.07	0.62	0.07	Carton
80	5A	23	6.5	1.73	1.89	0.21				0.00	0.00	0.00	1.89	0.21	1.89	0.21	Weight(kg) 18.55
81	5B	16	5	0.81	0.66	0.07				0.00	0.00	0.00	0.66	0.07	1.39	0.15	
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 71.01
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 55.16
84	5B	22	7	1.60	1.86	0.20				0.00	0.00	0.00	1.86	0.20	1.86	0.20	Vol Total 126.17
85				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
86	5A	19.5	8.5	1.23	1.82	0.20				0.00	0.00	0.00	1.82	0.20	1.82	0.20	Ea Top 7.84
87	5A	15	6	0.72	0.72	0.08				0.00	0.00	0.00	0.72	0.08	0.72	0.08	Ea Bottom 6.09
88	5B	17.5	5.5	0.99	0.88	0.10				0.00	0.00	0.00	0.88	0.10	0.88	0.10	Ea Total 13.93
Total					16.3	1.80					0.33	0.04	16.6	1.83	17.705	1.9541	Ek Carton 109.21

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise Joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 24.9.93

88:12/8

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 13

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	216	78.5	80.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
2	218	82	79	80.5	40.25	2B	27	7.5	2.33	3.10	0.34				0.00	0.00	0.00	3.10	0.34
3	212	79	79	79.0	39.50	2A	11	2	0.38	0.12	0.01				0.00	0.00	0.00	0.12	0.01
4	205	77.5	79	78.2	39.12	2B	19	7	1.17	1.37	0.15				0.00	0.00	0.00	1.37	0.15
5	205	76	79.5	77.8	38.88	2A	23.5	8.5	1.82	2.63	0.29				0.00	0.00	0.00	2.63	0.29
6	208	77	77.5	77.2	38.62	2A	20.5	7	1.38	1.60	0.18				0.00	0.00	0.00	1.60	0.18
7	213	78	79.5	78.8	39.38	2B	23	8	1.72	2.34	0.26				0.00	0.00	0.00	2.34	0.26
8	215	81.5	79	80.2	40.12	2B	22	9.5	1.54	2.62	0.29				0.00	0.00	0.00	2.62	0.29
9	205	79	77	78.0	39.00	2A	17	6.5	0.94	1.01	0.11				0.00	0.00	0.00	1.01	0.11
10	202	78	78.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
11	208	77	76.5	76.8	38.38	2A	24	9	1.92	2.93	0.32	2C	19	6	1.19	1.15	0.13	4.09	0.45
12	215	81	79.5	80.2	40.12	2C	20	6	1.27	1.28	0.14				0.00	0.00	0.00	1.28	0.14
13	220	79	79.5	79.2	39.62	2B	18	4.5	1.04	0.76	0.08	2D	16.5	4.5	0.87	0.63	0.07	1.39	0.15
14	220	82	79	80.5	40.25	2B	18	6	1.02	1.02	0.11	2C	21.5	9	1.46	2.34	0.26	3.37	0.37
15	203	77.5	80.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
16	206	80	82.5	81.2	40.62	2A	22.5	10	1.59	2.91	0.32	2C	11.5	3	0.41	0.19	0.02	3.10	0.34
17	205	79	77.5	78.2	39.12	2B	22.5	10	1.65	2.93	0.32				0.00	0.00	0.00	2.93	0.32
18	213	78.5	80.5	79.5	39.75	2B	27	8	2.36	3.31	0.37				0.00	0.00	0.00	3.31	0.37
19	212	77.5	77	77.2	38.62	2B	29	4	2.82	2.31	0.25				0.00	0.00	0.00	2.31	0.25
20	204	76.5	77.5	77.0	38.50	2A	15.5	5.5	0.79	0.69	0.08				0.00	0.00	0.00	0.69	0.08
21	219	82	82.5	82.2	41.12	2B	10.5	3	0.34	0.16	0.02				0.00	0.00	0.00	0.16	0.02
22	206	82	75	78.5	39.25	2A	16.5	5	0.88	0.70	0.08	2C	20.5	5.5	1.36	1.24	0.14	1.95	0.21
Total	4630									33.8	3.73					5.56	0.61	39.355	4.3438

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 25.9.93

88:13/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 13

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
1	5B	21.5	3	1.48	0.83	0.09				0.00	0.00	0.00	0.83	0.09	0.83	0.09		
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.10	0.34	Tray 1	
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.12	0.01	Weight(kg)	4.63
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.37	0.15		
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.63	0.29	Vol Top	39.35
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.60	0.18	Vol Bottom	9.29
7				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.34	0.26	Vol Total	48.65
8				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.62	0.29		
9	5B	33.5	6	3.78	4.49	0.50				0.00	0.00	0.00	4.49	0.50	5.50	0.61	Ea Top	4.34
10				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	1.03
11				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	4.09	0.45	Ea Total	5.37
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.28	0.14		
13	5B	20.5	7	1.35	1.59	0.18	5D	11	4.5	0.38	0.28	0.03	1.87	0.21	3.27	0.36	Top Br	24
14				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.37	0.37	Bottom Br	8
15	5B	17.5	3	0.98	0.50	0.05				0.00	0.00	0.00	0.50	0.05	0.50	0.05	Br Fruit	21
16	5B	18.5	4.5	1.07	0.81	0.09				0.00	0.00	0.00	0.81	0.09	3.91	0.43		
17				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.93	0.32		
18				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.31	0.37		
19	5C	13.5	3	0.59	0.27	0.03				0.00	0.00	0.00	0.27	0.03	2.58	0.29		
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.69	0.08		
21	4B	15	4.5	0.69	0.51	0.06				0.00	0.00	0.00	0.51	0.06	0.67	0.07		
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.95	0.21		
Total					9.01	0.99					0.28	0.03	9.29	1.03	48.648	5.3695		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 25.9.93

88:13/2

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 13

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
23	217	77.5	83	80.2	40.12	2A	17	5	0.91	0.75	0.08	2C	17	6	0.91	0.91	0.10	1.66	0.18
24	210	79	77	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
25	208	78	76.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
26	207	78	76	77.0	38.50	2A	16	5.5	0.84	0.74	0.08				0.00	0.00	0.00	0.74	0.08
27	204	79	76.5	77.8	38.88	2A	25	9.5	2.06	3.38	0.37				0.00	0.00	0.00	3.38	0.37
28	213	79	80	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
29	211	79	82	80.5	40.25	2A	16.5	6.5	0.85	0.95	0.10	2C	16.5	5.5	0.85	0.78	0.09	1.73	0.19
30	210	76.5	81	78.8	39.38	2B	19	6	1.16	1.15	0.13				0.00	0.00	0.00	1.15	0.13
31	204	77	76.5	76.8	38.38	2B	14.5	2	0.69	0.23	0.03				0.00	0.00	0.00	0.23	0.03
32	212	77	82	79.5	39.75	2A	19	8	1.15	1.60	0.18				0.00	0.00	0.00	1.60	0.18
33	200	81	76	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
34	222	77	79	78.0	39.00	2A	20	8.5	1.30	1.91	0.21				0.00	0.00	0.00	1.91	0.21
35	221	80	79.5	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
36	215	77	78	77.5	38.75	2A	11	3.5	0.39	0.21	0.02	2C	21.5	5	1.52	1.27	0.14	1.48	0.16
37	210	77.5	80.5	79.0	39.50	2B	17	5	0.93	0.75	0.08				0.00	0.00	0.00	0.75	0.08
38	215	81	81	81.0	40.50	2B	20	6.5	1.25	1.39	0.15				0.00	0.00	0.00	1.39	0.15
39	217	81.5	77.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	212	74.5	76.5	75.5	37.75	2A	14.5	5	0.70	0.55	0.06				0.00	0.00	0.00	0.55	0.06
41	203	78.5	75.5	77.0	38.50	2A	16	3.5	0.84	0.46	0.05				0.00	0.00	0.00	0.46	0.05
42	216	79	79.5	79.2	39.62	2B	27	8.5	2.37	3.52	0.39				0.00	0.00	0.00	3.52	0.39
43	222	79	79.5	79.2	39.62	2A	24	9.5	1.86	3.11	0.34				0.00	0.00	0.00	3.11	0.34
44	203	75	75.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4652									20.7	2.28					2.96	0.33	23.654	2.6108

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 25.9.93

88:13/3

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 13

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
23	5B	12	3	0.45	0.21	0.02	5C	15	5	0.71	0.58	0.06	0.79	0.09	2.45	0.27		
24				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 2	
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	4.65
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.74	0.08		
27				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.38	0.37	Vol Top	23.65
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	12.27
29	5C	18.5	6.5	1.08	1.19	0.13				0.00	0.00	0.00	1.19	0.13	2.91	0.32	Vol Total	35.92
30				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.15	0.13		
31				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.23	0.03	Ea Top	2.61
32				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.60	0.18	Ea Bottom	1.35
33	5B	16	6	0.82	0.81	0.09				0.00	0.00	0.00	0.81	0.09	0.81	0.09	Ea Total	3.97
34	5A	17.5	6.5	0.99	1.07	0.12				0.00	0.00	0.00	1.07	0.12	2.98	0.33		
35	5A	23	8.5	1.69	2.50	0.28				0.00	0.00	0.00	2.50	0.28	2.50	0.28	Top Br	18
36	5B	21	7.5	1.45	1.81	0.20				0.00	0.00	0.00	1.81	0.20	3.29	0.36	Bottom Br	11
37	5C	14	5	0.63	0.51	0.06				0.00	0.00	0.00	0.51	0.06	1.26	0.14	Br Fruit	18
38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.39	0.15		
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
40	5A	9.5	2	0.30	0.09	0.01				0.00	0.00	0.00	0.09	0.01	0.63	0.07		
41				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.46	0.05		
42				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.52	0.39		
43	5B	23.5	8.5	1.78	2.62	0.29				0.00	0.00	0.00	2.62	0.29	5.72	0.63		
44	5B	17.5	5.5	1.03	0.89	0.10				0.00	0.00	0.00	0.89	0.10	0.89	0.10		
Total					11.7	1.29					0.58	0.06	12.3	1.35	35.923	3.9650		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 25.9.93

88:13/4

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 13

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	205	79	76.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	222	77	81.5	79.2	39.62	3A	25.5	8	2.11	2.92	0.32				0.00	0.00	0.00	2.92	0.32
47	212	78	79	78.5	39.25	2B	11	3.5	0.39	0.21	0.02				0.00	0.00	0.00	0.21	0.02
48	217	78.5	81	79.8	39.88	2A	12.5	3.5	0.49	0.27	0.03				0.00	0.00	0.00	0.27	0.03
49	213	78.5	79.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
50	215	83	79	81.0	40.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	217	78.5	79.5	79.0	39.50	2A	18.5	7.5	1.10	1.41	0.16	2C	13	3.5	0.54	0.29	0.03	1.70	0.19
52	211	77	79	78.0	39.00	2B	16	4	0.83	0.53	0.06				0.00	0.00	0.00	0.53	0.06
53	222	81	77.5	79.2	39.62	2A	7	2	0.15	0.05	0.01				0.00	0.00	0.00	0.05	0.01
54	202	77.5	85	81.2	40.62	2A	12	5	0.45	0.38	0.04				0.00	0.00	0.00	0.38	0.04
55	214	79	78.5	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
56	217	80	78.5	79.2	39.62	2A	18.5	6.5	1.09	1.19	0.13				0.00	0.00	0.00	1.19	0.13
57	211	77.5	75.5	76.5	38.25	2A	19	7.5	1.20	1.49	0.16				0.00	0.00	0.00	1.49	0.16
58	213	77	79	78.0	39.00	2A	17	6	0.94	0.92	0.10				0.00	0.00	0.00	0.92	0.10
59	205	78.5	80	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
60	205	79.5	78	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
61	215	78.5	79.5	79.0	39.50	2B	16	2	0.82	0.29	0.03				0.00	0.00	0.00	0.29	0.03
62	217	80	79.5	79.8	39.88	2B	21	7.5	1.41	1.80	0.20				0.00	0.00	0.00	1.80	0.20
63	207	76.5	76.5	76.5	38.25	2A	15	4.5	0.74	0.52	0.06				0.00	0.00	0.00	0.52	0.06
64	209	77	77	77.0	38.50	2C	20	6.5	1.32	1.40	0.15				0.00	0.00	0.00	1.40	0.15
65	207	76.5	77	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
66	216	78.5	77	77.8	38.88	2B	12	3	0.47	0.21	0.02				0.00	0.00	0.00	0.21	0.02
Total	4672									13.6	1.50					0.29	0.03	13.870	1.5309

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 25.9.93

88:13/5

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 13

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
45	5B	28	5	2.61	2.44	0.27				0.00	0.00	0.00	2.44	0.27	2.44	0.27		
46				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.92	0.32	Tray 3	
47				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.21	0.02	Weight(kg)	4.67
48				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.27	0.03		
49				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	13.87
50	5B	17.5	6.5	0.96	1.06	0.12				0.00	0.00	0.00	1.06	0.12	1.06	0.12	Vol Bottom	15.48
51	5B	15.5	4	0.77	0.49	0.05	5C	16.5	5	0.87	0.70	0.08	1.19	0.13	2.90	0.32	Vol Total	29.35
52	5A	13	3.5	0.55	0.29	0.03	5C	15	5	0.73	0.58	0.06	0.88	0.10	1.40	0.15		
53	5B	25	9	2.02	3.17	0.35				0.00	0.00	0.00	3.17	0.35	3.22	0.36	Ea Top	1.53
54	5A	22	7.5	1.52	1.98	0.22				0.00	0.00	0.00	1.98	0.22	2.36	0.26	Ea Bottom	1.71
55				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	3.24
56	5A	12.5	5	0.50	0.41	0.05				0.00	0.00	0.00	0.41	0.05	1.60	0.18	Tray 3	
57	5A	15.5	4.5	0.79	0.56	0.06	5C	17	6	0.96	0.92	0.10	1.48	0.16	2.96	0.33	Top Br	16
58	5A	15.5	5	0.78	0.62	0.07				0.00	0.00	0.00	0.62	0.07	1.54	0.17	Bottom Br	14
59				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit	17
60				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 4	
61				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.29	0.03	Top Br	4
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.80	0.20	Bottom Br	7
63	5B	15	3.5	0.74	0.40	0.04				0.00	0.00	0.00	0.40	0.04	0.92	0.10	Br Fruit	11
64	5B	22	7	1.60	1.86	0.20				0.00	0.00	0.00	1.86	0.20	3.26	0.36	Carton	
65				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br	62
66				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.21	0.02	Bottom Br	40
Total						13.3	1.47				2.21	0.24	15.5	1.71	29.353	3.2398	Br Fruit	67

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 25.9.93

88:13/6

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 13

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	206	79	80	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	209	82	78.5	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	212	79.5	77.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	209	81.5	77.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	211	77.5	77.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	214	79	79	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	210	79	81.5	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	220	79	81.5	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	215	81.5	78	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	217	81.5	77	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	210	76	78.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	217	76.5	79	77.8	38.88	2A	11.5	3	0.43	0.19	0.02				0.00	0.00	0.00	0.19	0.02
79	211	79	79	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	213	77.5	80.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	209	78	78	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	219	78	82	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	212	78	79.5	78.8	39.38	2B	20.5	2.5	1.36	0.65	0.07				0.00	0.00	0.00	0.65	0.07
84	202	77.5	79.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	221	77.5	81.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	208	77	80	78.5	39.25	2B	13.5	4	0.58	0.37	0.04				0.00	0.00	0.00	0.37	0.04
87	218	79.5	80.5	80.0	40.00	2B	10.5	2.5	0.35	0.13	0.01				0.00	0.00	0.00	0.13	0.01
88	212	78	78	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4675									1.34	0.15					0	0	1.3418	0.1481

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 25.9.93

88:13/7

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 13

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
68	5B	24.5	6	1.92	2.01	0.22				0.00	0.00	0.00	2.01	0.22	2.01	0.22	Tray 4	
69	5B	19	4.5	1.17	0.86	0.10				0.00	0.00	0.00	0.86	0.10	0.86	0.10	Weight(kg)	4.68
70	5B	15	2.5	0.71	0.29	0.03				0.00	0.00	0.00	0.29	0.03	0.29	0.03		
71	5A	15	5.5	0.73	0.65	0.07				0.00	0.00	0.00	0.65	0.07	0.65	0.07	Vol Top	1.34
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	6.14
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	7.48
74	5B	17	5	0.91	0.75	0.08				0.00	0.00	0.00	0.75	0.08	0.75	0.08		
75	5B	14	4.5	0.62	0.45	0.05				0.00	0.00	0.00	0.45	0.05	0.45	0.05	Ea Top	0.15
76	5C	18	6.5	1.04	1.12	0.12				0.00	0.00	0.00	1.12	0.12	1.12	0.12	Ea Bottom	0.68
77				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.83
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.19	0.02		
79				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton	
80				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	18.63
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	78.22
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.65	0.07	Vol Bottom	43.19
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	121.41
85				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.37	0.04	Ea Top	8.63
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.13	0.01	Ea Bottom	4.77
88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	13.40
Total					6.14	0.68					0	0	6.14	0.68	7.4831	0.8259	Ek Carton	109.65

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 25.9.93

88:13/8

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 14

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	222	76	81.5	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
2	213	74.5	76.5	75.5	37.75	2A	14	6	0.65	0.64	0.06				0.00	0.00	0.00	0.64	0.06
3	213	77.5	82.5	80.0	40.00	2A	13.5	3.5	0.57	0.32	0.03				0.00	0.00	0.00	0.32	0.03
4	218	77.5	81	79.2	39.62	2A	18	5.5	1.04	0.93	0.09				0.00	0.00	0.00	0.93	0.09
5	210	80.5	79	79.8	39.88	2A	16.5	7	0.86	1.04	0.10	2C	15	5.5	0.71	0.65	0.06	1.69	0.16
6	212	83	76.5	79.8	39.88	2A	22	9.5	1.55	2.62	0.25				0.00	0.00	0.00	2.62	0.25
7	204	74.5	76.5	75.5	37.75	2A	25	8	2.13	2.82	0.27				0.00	0.00	0.00	2.82	0.27
8	218	78	81.5	79.8	39.88	2A	20	6.5	1.27	1.39	0.13				0.00	0.00	0.00	1.39	0.13
9	209	77.5	79.5	78.5	39.25	2B	21.5	7	1.50	1.76	0.17				0.00	0.00	0.00	1.76	0.17
10	211	77	79	78.0	39.00	2A	20	7	1.30	1.52	0.15				0.00	0.00	0.00	1.52	0.15
11	200	76	79	77.5	38.75	2A	20	7.5	1.31	1.64	0.16	2C	15.5	5.5	0.78	0.69	0.07	2.33	0.23
12	207	77	78	77.5	38.75	2C	20.5	6.5	1.38	1.47	0.14				0.00	0.00	0.00	1.47	0.14
13	219	78	76	77.0	38.50	2A	16	4	0.84	0.53	0.05				0.00	0.00	0.00	0.53	0.05
14	203	76.5	79	77.8	38.88	2A	19.5	8	1.24	1.69	0.16	2C	21	6.5	1.44	1.55	0.15	3.24	0.31
15	200	74.5	76.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
16	207	78	78.5	78.2	39.12	2B	20	8.5	1.30	1.91	0.18				0.00	0.00	0.00	1.91	0.18
17	212	78	81.5	79.8	39.88	2B	20.5	5	1.34	1.13	0.11				0.00	0.00	0.00	1.13	0.11
18	210	81.5	80	80.8	40.38	2A	20	7	1.26	1.51	0.15	2C	18	6.5	1.02	1.12	0.11	2.63	0.25
19	214	80.5	79	79.8	39.88	2A	10.5	2.5	0.35	0.13	0.01	2C	19	5.5	1.15	1.05	0.10	1.18	0.11
20	211	77.5	79.5	78.5	39.25	2A	10.5	2	0.35	0.11	0.01				0.00	0.00	0.00	0.11	0.01
21	213	78.5	82.5	80.5	40.25	2A	21	9.5	1.39	2.40	0.23				0.00	0.00	0.00	2.40	0.23
22	209	75.5	81	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4635									25.6	2.47					5.06	0.49	30.623	2.9558

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

88:14/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 14

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.64	0.06	Tray 1	
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.32	0.03	Weight(kg) 4.64	
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.93	0.09		
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.69	0.16	Vol Top 30.62	
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.62	0.25	Vol Bottom 2.28	
7	5B	18.5	3	1.15	0.58	0.06				0.00	0.00	0.00	0.58	0.06	3.40	0.33	Vol Total 32.91	
8				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.39	0.13		
9				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.76	0.17	Ea Top 2.96	
10				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.52	0.15	Ea Bottom 0.22	
11	5B	16	4.5	0.83	0.59	0.06				0.00	0.00	0.00	0.59	0.06	2.93	0.28	Ea Total 3.18	
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.47	0.14		
13				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.53	0.05	Top Br 24	
14	5B	19.5	5.5	1.24	1.11	0.11				0.00	0.00	0.00	1.11	0.11	4.35	0.42	Bottom Br 3	
15				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit 19	
16				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.91	0.18		
17				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.13	0.11		
18				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.63	0.25		
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.18	0.11		
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.11	0.01		
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.40	0.23		
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Total						2.28						0	0	2.28	0.22	32.905	3.1762	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 14

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top	
23	216	77.5	80.5	79.0	39.50	2C	25	6.5	2.03	2.28	0.22					0.00	0.00	0.00	2.28	0.22
24	205	77.5	79	78.2	39.12				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
25	208	80	78.5	79.2	39.62	2A	18.5	6.5	1.09	1.19	0.11					0.00	0.00	0.00	1.19	0.11
26	210	77.5	80	78.8	39.38	2B	19	6	1.16	1.15	0.11					0.00	0.00	0.00	1.15	0.11
27	212	79	79	79.0	39.50	2A	22	9	1.56	2.45	0.24	2C	13	3.5	0.54	0.29	0.03		2.75	0.27
28	213	77.5	79	78.2	39.12				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
29	218	74	81.5	77.8	38.88	2B	17	5.5	0.94	0.83	0.08					0.00	0.00	0.00	0.83	0.08
30	221	77	80	78.5	39.25				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
31	220	79.5	81	80.2	40.12	2A	23	9	1.68	2.67	0.26	2C	14.5	4.5	0.66	0.48	0.05		3.15	0.30
32	204	76.5	78.5	77.5	38.75	2C	15	5.5	0.73	0.65	0.06					0.00	0.00	0.00	0.65	0.06
33	213	80	78.5	79.2	39.62	2B	14.5	3.5	0.67	0.37	0.04					0.00	0.00	0.00	0.37	0.04
34	213	77.5	80.5	79.0	39.50	2A	16	5.5	0.82	0.73	0.07					0.00	0.00	0.00	0.73	0.07
35	221	77.5	77	77.2	38.62	2A	18.5	6	1.12	1.09	0.11	2C	14.5	5	0.69	0.54	0.05		1.63	0.16
36	208	78	79	78.5	39.25	2B	15.5	4	0.77	0.49	0.05					0.00	0.00	0.00	0.49	0.05
37	210	79.5	80	79.8	39.88	2A	13.5	5.5	0.58	0.53	0.05					0.00	0.00	0.00	0.53	0.05
38	219	76.5	81.5	79.0	39.50	2B	14	5	0.63	0.51	0.05					0.00	0.00	0.00	0.51	0.05
39	220	78.5	81	79.8	39.88				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
40	205	77	79.5	78.2	39.12	2A	15.5	5	0.78	0.62	0.06					0.00	0.00	0.00	0.62	0.06
41	208	78.5	79	78.8	39.38				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
42	202	74.5	77	75.8	37.88				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
43	215	80	79.5	79.8	39.88	2A	25	7	2.01	2.44	0.24					0.00	0.00	0.00	2.44	0.24
44	218	77	80.5	78.8	39.38				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
Total	4679									18.0	1.74					1.32	0.13		19.330	1.8658

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 14

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
23	5C	17.5	5.5	0.98	0.88	0.09				0.00	0.00	0.00	0.88	0.09	3.16	0.31		
24				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 2	
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.19	0.11	Weight(kg)	4.68
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.15	0.11		
27	5A	12.5	3.5	0.50	0.27	0.03				0.00	0.00	0.00	0.27	0.03	3.02	0.29	Vol Top	19.33
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	10.54
29				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.83	0.08	Vol Total	29.87
30	5C	15	7	0.72	0.88	0.08				0.00	0.00	0.00	0.88	0.08	0.88	0.08		
31				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.15	0.30	Ea Top	1.87
32				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.65	0.06	Ea Bottom	1.02
33				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.37	0.04	Ea Total	2.88
34				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.73	0.07		
35	5C	16	6.5	0.84	0.90	0.09				0.00	0.00	0.00	0.90	0.09	2.53	0.24	Top Br	18
36	5B	16.5	4	0.88	0.56	0.05				0.00	0.00	0.00	0.56	0.05	1.05	0.10	Bottom Br	12
37	5B	17	5.5	0.92	0.83	0.08				0.00	0.00	0.00	0.83	0.08	1.36	0.13	Br Fruit	19
38	5B	17	5.5	0.93	0.83	0.08				0.00	0.00	0.00	0.83	0.08	1.34	0.13		
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
40	5B	23.5	5	1.81	1.56	0.15				0.00	0.00	0.00	1.56	0.15	2.18	0.21		
41	5B	19.5	7	1.23	1.44	0.14				0.00	0.00	0.00	1.44	0.14	1.44	0.14		
42	5A	14	4.5	0.65	0.45	0.04				0.00	0.00	0.00	0.45	0.04	0.45	0.04		
43	5C	15	5	0.71	0.58	0.06				0.00	0.00	0.00	0.58	0.06	3.02	0.29		
44	5B	20.5	6	1.36	1.35	0.13				0.00	0.00	0.00	1.35	0.13	1.35	0.13		
Total					10.5	1.02					0	0	10.5	1.02	29.869	2.8831		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 14

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	212	76	80	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	206	77.5	77.5	77.5	38.75	2B	13.5	4.5	0.59	0.42	0.04				0.00	0.00	0.00	0.42	0.04
47	200	73	76	74.5	37.25	2A	23	7	1.82	2.06	0.20				0.00	0.00	0.00	2.06	0.20
48	211	75.5	81.5	78.5	39.25	2B	10.5	3	0.35	0.16	0.02				0.00	0.00	0.00	0.16	0.02
49	220	83.5	80	81.8	40.88	2B	17	4.5	0.89	0.67	0.06				0.00	0.00	0.00	0.67	0.06
50	218	77	80	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	218	81.5	79	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
52	211	79.5	78.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
53	201	75.5	77	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
54	221	79	83.5	81.2	40.62	2A	8	2	0.20	0.06	0.01	2C	18	5	1.01	0.84	0.08	0.90	0.09
55	221	80.5	78.5	79.5	39.75	2C	15	5	0.71	0.58	0.06				0.00	0.00	0.00	0.58	0.06
56	213	80	80.5	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	214	77.5	77.5	77.5	38.75	2A	22	7	1.59	1.85	0.18	2C	18	6	1.06	1.03	0.10	2.88	0.28
58	219	79	81	80.0	40.00	2B	21.5	7	1.47	1.75	0.17				0.00	0.00	0.00	1.75	0.17
59	217	78	80	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
60	204	72.5	76.5	74.5	37.25	2B	18.5	5.5	1.17	1.00	0.10				0.00	0.00	0.00	1.00	0.10
61	216	79.5	78	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	221	79.5	82	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	207	77	80	78.5	39.25	2A	13.5	4.5	0.58	0.42	0.04	2C	21	6.5	1.43	1.55	0.15	1.97	0.19
64	200	74.5	78.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
65	202	78	76.5	77.2	38.62	2A	15	5	0.74	0.58	0.06				0.00	0.00	0.00	0.58	0.06
66	219	78	81	79.5	39.75	2C	15	3.5	0.71	0.40	0.04				0.00	0.00	0.00	0.40	0.04
Total	4671									9.95	0.96					3.42	0.33	13.373	1.2908

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 14

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
46	5B	17.5	5.5	1.00	0.88	0.09				0.00	0.00	0.00	0.88	0.09	1.30	0.13	Tray 3	
47				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.06	0.20	Weight(kg)	4.67
48				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.16	0.02		
49				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.67	0.06	Vol Top	13.37
50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	16.72
51	5C	15	5	0.71	0.58	0.06				0.00	0.00	0.00	0.58	0.06	0.58	0.06	Vol Total	30.09
52				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
53	5B	15.5	4	0.80	0.49	0.05				0.00	0.00	0.00	0.49	0.05	0.49	0.05	Ea Top	1.29
54	5B	17	7	0.90	1.10	0.11				0.00	0.00	0.00	1.10	0.11	2.00	0.19	Ea Bottom	1.61
55	5A	15.5	4	0.76	0.49	0.05				0.00	0.00	0.00	0.49	0.05	1.07	0.10	Ea Total	2.90
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3	
57	5B	25	9	2.07	3.19	0.31	5C	13.5	5	0.59	0.47	0.05	3.66	0.35	6.54	0.63	Top Br	15
58	5B	20	7	1.27	1.51	0.15				0.00	0.00	0.00	1.51	0.15	3.26	0.32	Bottom Br	15
59	5B	12	3	0.46	0.21	0.02				0.00	0.00	0.00	0.21	0.02	0.21	0.02	Br Fruit	17
60	5C	16.5	3.5	0.93	0.50	0.05				0.00	0.00	0.00	0.50	0.05	1.50	0.15	Tray 4	
61	5B	25.5	8	2.12	2.92	0.28				0.00	0.00	0.00	2.92	0.28	2.92	0.28	Top Br	4
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	8
63	5A	19.5	5	1.23	1.01	0.10				0.00	0.00	0.00	1.01	0.10	2.98	0.29	Br Fruit	12
64	5A	22	9.5	1.62	2.64	0.25				0.00	0.00	0.00	2.64	0.25	2.64	0.25	Carton	
65	5B	10	3	0.32	0.15	0.01				0.00	0.00	0.00	0.15	0.01	0.73	0.07	Top Br	61
66	5A	15	5	0.71	0.58	0.06				0.00	0.00	0.00	0.58	0.06	0.98	0.09	Bottom Br	38
Total					16.2	1.57					0.47	0.05	16.7	1.61	30.094	2.9048	Br Fruit	67

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 14

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	213	78.5	81	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	206	77.5	78.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	212	78	80	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	213	76.5	79.5	78.0	39.00	2B	11.5	3	0.43	0.19	0.02				0.00	0.00	0.00	0.19	0.02
71	220	81	80	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	211	78	77	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	218	77.5	79	78.2	39.12	2B	11	2	0.39	0.12	0.01				0.00	0.00	0.00	0.12	0.01
74	212	76	81	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	220	78	79.5	78.8	39.38	2B	10.5	3	0.35	0.16	0.02				0.00	0.00	0.00	0.16	0.02
76	205	80	80.5	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	214	78	80	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	219	77	80	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	209	78.5	79.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	203	80.5	77	78.8	39.38	2A	13.5	2	0.58	0.19	0.02				0.00	0.00	0.00	0.19	0.02
81	219	77	77.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	219	78.5	81.5	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	209	76.5	82	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	219	80.5	81	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	211	78	79.5	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	206	79	79	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	211	74.5	78	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	215	79	78	78.5	39.25	2A	14.5	7	0.68	0.83	0.08				0.00	0.00	0.00	0.83	0.08
Total	4684									1.49	0.14					0	0	1.4936	0.1442

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 14

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
67	5B	10.5	2	0.35	0.11	0.01				0.00	0.00	0.00	0.11	0.01	0.11	0.01	
68	5B	17	4	0.94	0.60	0.06				0.00	0.00	0.00	0.60	0.06	0.60	0.06	Tray 4
69				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.19	0.02	4.68
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.49
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.12	0.01	Vol Bottom
74				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.70
75	5B	8.5	2	0.23	0.07	0.01				0.00	0.00	0.00	0.07	0.01	0.23	0.02	Vol Total
76	5A	13.5	3	0.57	0.27	0.03				0.00	0.00	0.00	0.27	0.03	0.27	0.03	9.20
77	5A	26.5	4	2.29	1.79	0.17				0.00	0.00	0.00	1.79	0.17	1.79	0.17	Ea Top
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
79	5B	21	8	1.42	1.95	0.19				0.00	0.00	0.00	1.95	0.19	1.95	0.19	Ea Bottom
80				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.19	0.02	0.74
81	5B	21.5	7.5	1.53	1.90	0.18				0.00	0.00	0.00	1.90	0.18	1.90	0.18	Ea Total
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.89
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton
84	5B	12	3.5	0.45	0.25	0.02				0.00	0.00	0.00	0.25	0.02	0.25	0.02	Weight(kg)
85				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.67
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top
87	5A	16	5	0.85	0.66	0.06	5B	9.5	2.5	0.30	0.11	0.01	0.77	0.07	0.77	0.07	64.82
88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.83	0.08	Vol Bottom
Total					7.60	0.73					0.11	0.01	7.70	0.74	9.1983	0.8879	Vol Total
																	102.07
																	6.26
																	3.60
																	9.85
																	Ek Carton
																	109.89

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 15

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top	
1	215	81	82	81.5	40.75	2C	16.5	4.5	0.84	0.63	0.06					0.00	0.00	0.00	0.63	0.06
2	204	76	77.5	76.8	38.38	2B	10	1.5	0.33	0.07	0.01					0.00	0.00	0.00	0.07	0.01
3	208	77	80.5	78.8	39.38	2A	14	5.5	0.63	0.57	0.05					0.00	0.00	0.00	0.57	0.05
4	210	79.5	76	77.8	38.88	2B	21.5	7.5	1.52	1.90	0.18					0.00	0.00	0.00	1.90	0.18
5	212	77	81.5	79.2	39.62	2B	18	6	1.04	1.03	0.10	2C	9	2	0.26	0.08	0.01	1.10	0.11	
6	203	74	81	77.5	38.75	2A	19.5	7.5	1.25	1.56	0.15					0.00	0.00	0.00	1.56	0.15
7	208	78.5	76	77.2	38.62	2A	26	7.5	2.25	2.87	0.28	2C	14	5	0.64	0.51	0.05	3.38	0.33	
8	216	77.5	78.5	78.0	39.00				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
9	217	82	79.5	80.8	40.38	2A	16	5	0.80	0.66	0.06	2C	19	6	1.13	1.15	0.11	1.80	0.17	
10	209	80	79.5	79.8	39.88	2A	12.5	5	0.49	0.41	0.04					0.00	0.00	0.00	0.41	0.04
11	218	82.5	80	81.2	40.62	2A	24.5	9.5	1.89	3.22	0.31	2C	15	2.5	0.70	0.29	0.03	3.51	0.34	
12	200	78.5	77.5	78.0	39.00	2C	19.5	5.5	1.24	1.11	0.11					0.00	0.00	0.00	1.11	0.11
13	202	75.5	78	76.8	38.38				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
14	200	76	78.5	77.2	38.62	2A	16.5	5.5	0.89	0.78	0.08					0.00	0.00	0.00	0.78	0.08
15	220	79.5	78.5	79.0	39.50	2A	18.5	5.5	1.10	0.99	0.10					0.00	0.00	0.00	0.99	0.10
16	218	79	77.5	78.2	39.12	2B	19	6.5	1.17	1.26	0.12					0.00	0.00	0.00	1.26	0.12
17	220	82	80	81.0	40.50	2A	21.5	10	1.45	2.68	0.26					0.00	0.00	0.00	2.68	0.26
18	207	77.5	78.5	78.0	39.00	2A	18	5	1.05	0.85	0.08					0.00	0.00	0.00	0.85	0.08
19	218	78.5	80.5	79.5	39.75				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
20	215	78	82	80.0	40.00	2A	17	6.5	0.91	1.00	0.10	1A	8.5	2.5	0.23	0.09	0.01	1.09	0.11	
21	217	79.5	78	78.8	39.38	2A	18.5	8.5	1.10	1.65	0.16	2C	12	4	0.46	0.29	0.03	1.94	0.19	
22	205	75.5	79.5	77.5	38.75	2A	18	7	1.06	1.23	0.12	2C	11.5	4.5	0.43	0.31	0.03	1.54	0.15	
Total	4642									24.5	2.36					2.71	0.26	27.191	2.6246	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 15

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
1	5C	10.5	2	0.34	0.11	0.01					0.00	0.00	0.00	0.11	0.01	0.73	0.07	
2				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.07	0.01	Tray 1
3				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.57	0.05	Weight(kg) 4.64
4				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	1.90	0.18	
5	5A	9.5	3	0.29	0.13	0.01					0.00	0.00	0.00	0.13	0.01	1.24	0.12	Vol Top 27.19
6				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	1.56	0.15	Vol Bottom 1.59
7				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	3.38	0.33	Vol Total 28.78
8				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	
9	5C	10	2.5	0.31	0.12	0.01					0.00	0.00	0.00	0.12	0.01	1.92	0.19	Ea Top 2.62
10				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.41	0.04	Ea Bottom 0.15
11				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	3.51	0.34	Ea Total 2.78
12	5B	18.5	3	1.11	0.57	0.06					0.00	0.00	0.00	0.57	0.06	1.68	0.16	
13				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br 26
14				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.78	0.08	Bottom Br 6
15				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.99	0.10	Br Fruit 19
16				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	1.26	0.12	
17				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	2.68	0.26	
18				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.85	0.08	
19				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	
20				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	1.09	0.11	
21	5B	14.5	4.5	0.67	0.48	0.05	6B	12	2.50	0.46	0.18	0.02	0.66	0.06	2.60	0.25		
22				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	1.54	0.15	
Total				1.41	0.14						0.18	0.02	1.59	0.15	28.779	2.7779		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 15

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
23	216	80	82	81.0	40.50	2A	17.5	5	0.96	0.79	0.08	2C	15.5	3.5	0.75	0.43	0.04	1.22	0.12
24	217	77	80.5	78.8	39.38	2C	15	5.5	0.72	0.65	0.06				0.00	0.00	0.00	0.65	0.06
25	218	78.5	80.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
26	212	78	80.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
27	214	78.5	80	79.2	39.62	2A	21	7.5	1.42	1.81	0.17	2C	17.5	6	0.98	0.97	0.09	2.78	0.27
28	204	72.5	78.5	75.5	37.75	2C	13	3	0.56	0.25	0.02				0.00	0.00	0.00	0.25	0.02
29	210	78.5	77	77.8	38.88	2A	19	7.5	1.18	1.49	0.14	2C	24.5	7	1.98	2.35	0.23	3.83	0.37
30	211	79.5	80.5	80.0	40.00	2C	18.5	5.5	1.08	0.99	0.10				0.00	0.00	0.00	0.99	0.10
31	213	81	79	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
32	206	76.5	76.5	76.5	38.25	2A	21.5	7	1.54	1.77	0.17				0.00	0.00	0.00	1.77	0.17
33	212	81.5	76.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
34	202	79	77	78.0	39.00	2B	23	7.5	1.73	2.19	0.21	1B	16	3.5	0.83	0.46	0.04	2.65	0.26
35	221	76.5	83	79.8	39.88	2A	14	5	0.62	0.51	0.05	2C	16	6.5	0.81	0.90	0.09	1.40	0.14
36	222	81	81.5	81.2	40.62	2A	17.5	6.5	0.95	1.06	0.10				0.00	0.00	0.00	1.06	0.10
37	221	81	80	80.5	40.25	2A	19	7.5	1.14	1.48	0.14	2C	18.5	5.5	1.08	0.99	0.10	2.47	0.24
38	220	78	81.5	79.8	39.88	2A	18	6.5	1.03	1.12	0.11	2C	16.5	4.5	0.86	0.63	0.06	1.75	0.17
39	208	76.5	77	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	222	78	81	79.5	39.75	2A	18	5.5	1.03	0.93	0.09	2C	15.5	5.5	0.76	0.69	0.07	1.62	0.16
41	212	78.5	78.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
42	214	77	82	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
43	215	80.5	78.5	79.5	39.75	2B	18	6.5	1.03	1.12	0.11				0.00	0.00	0.00	1.12	0.11
44	211	78	78	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4701									16.2	1.56					7.41	0.72	23.570	2.2751

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 15

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
23	5B	12	2.5	0.45	0.18	0.02				0.00	0.00	0.00	0.18	0.02	1.40	0.13	
24	5B	13.5	4	0.58	0.37	0.04				0.00	0.00	0.00	0.37	0.04	1.01	0.10	Tray 2
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 4.70
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
27	5B	11.5	2	0.42	0.13	0.01				0.00	0.00	0.00	0.13	0.01	2.91	0.28	Vol Top 23.57
28	5C	17.5	4	1.03	0.65	0.06				0.00	0.00	0.00	0.65	0.06	0.90	0.09	Vol Bottom 12.27
29	5A	17	6.5	0.94	1.01	0.10				0.00	0.00	0.00	1.01	0.10	4.84	0.47	Vol Total 35.84
30	5B	21.5	7.5	1.47	1.89	0.18				0.00	0.00	0.00	1.89	0.18	2.88	0.28	
31				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top 2.28
32				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.77	0.17	Ea Bottom 1.18
33	5B	18	6	1.04	1.03	0.10	5C	11.5	3	0.42	0.19	0.02	1.22	0.12	1.22	0.12	Ea Total 3.46
34				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.65	0.26	
35	5A	15	7.5	0.71	0.97	0.09				0.00	0.00	0.00	0.97	0.09	2.37	0.23	Top Br 22
36				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.06	0.10	Bottom Br 15
37	5B	15.5	5	0.75	0.62	0.06	5C	24.5	7.5	1.91	2.49	0.24	3.11	0.30	5.58	0.54	Br Fruit 17
38	5D	15	5.5	0.71	0.65	0.06				0.00	0.00	0.00	0.65	0.06	2.40	0.23	
39	5B	10	2	0.33	0.10	0.01				0.00	0.00	0.00	0.10	0.01	0.10	0.01	
40	5B	20.5	7	1.34	1.59	0.15				0.00	0.00	0.00	1.59	0.15	3.21	0.31	
41	5B	13.5	4.5	0.58	0.42	0.04				0.00	0.00	0.00	0.42	0.04	0.42	0.04	
42				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
43				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.12	0.11	
44				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total					9.58	0.93					2.69	0.26	12.3	1.18	35.841	3.4596	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 15

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	207	77	79.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	206	79	82.5	80.8	40.38	2A	12	2.5	0.45	0.18	0.02				0.00	0.00	0.00	0.18	0.02
47	211	77.5	79	78.2	39.12	2A	11.5	2	0.42	0.13	0.01	2C	17.5	6	0.99	0.97	0.09	1.10	0.11
48	202	79	79	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
49	214	79	80	79.5	39.75	2A	19	6.5	1.15	1.25	0.12				0.00	0.00	0.00	1.25	0.12
50	213	78	82.5	80.2	40.12	2A	11	3.5	0.38	0.21	0.02				0.00	0.00	0.00	0.21	0.02
51	212	75.5	78.5	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
52	210	78	81	79.5	39.75	2B	11.5	4	0.42	0.27	0.03				0.00	0.00	0.00	0.27	0.03
53	217	80	78	79.0	39.50	2A	19.5	9.5	1.22	2.11	0.20				0.00	0.00	0.00	2.11	0.20
54	213	79.5	80.5	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
55	214	76.5	76.5	76.5	38.25	2A	17.5	3	1.01	0.50	0.05				0.00	0.00	0.00	0.50	0.05
56	215	79	81.5	80.2	40.12	2A	12	2	0.45	0.14	0.01				0.00	0.00	0.00	0.14	0.01
57	200	76.5	76.5	76.5	38.25	2A	15.5	5.5	0.79	0.69	0.07				0.00	0.00	0.00	0.69	0.07
58	205	79	78	78.5	39.25	2A	22.5	7	1.65	1.94	0.19	2C	13.5	5	0.58	0.47	0.05	2.41	0.23
59	213	77	79	78.0	39.00	2B	23	7	1.73	2.04	0.20				0.00	0.00	0.00	2.04	0.20
60	207	77	80	78.5	39.25	2A	23	8	1.72	2.34	0.23				0.00	0.00	0.00	2.34	0.23
61	208	76	78	77.0	38.50	2A	14	3.5	0.64	0.35	0.03				0.00	0.00	0.00	0.35	0.03
62	201	76	78.5	77.2	38.62	2A	18	6	1.06	1.03	0.10				0.00	0.00	0.00	1.03	0.10
63	209	81.5	79.5	80.5	40.25	2B	16	5	0.80	0.66	0.06				0.00	0.00	0.00	0.66	0.06
64	216	79.5	78	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
65	221	78.5	75.5	77.0	38.50	2A	18.5	6.5	1.13	1.19	0.12				0.00	0.00	0.00	1.19	0.12
66	221	81	81.5	81.2	40.62	2C	18	6	1.01	1.02	0.10				0.00	0.00	0.00	1.02	0.10
Total	4635									16.1	1.55					1.44	0.14	17.499	1.6891

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 15

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
46	5B	16.5	4	0.85	0.56	0.05				0.00	0.00	0.00	0.56	0.05	0.74	0.07	Tray 3	
47	5C	14.5	5	0.68	0.54	0.05				0.00	0.00	0.00	0.54	0.05	1.65	0.16	Weight(kg)	4.64
48				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
49	5A	18	4	1.03	0.68	0.07	5C	15.5	5.5	0.76	0.69	0.07	1.37	0.13	2.63	0.25	Vol Top	17.50
50	5A	12.5	4	0.49	0.31	0.03				0.00	0.00	0.00	0.31	0.03	0.52	0.05	Vol Bottom	14.39
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	31.89
52	5B	18.5	5.5	1.09	0.99	0.10				0.00	0.00	0.00	0.99	0.10	1.26	0.12		
53	5B	17	6	0.93	0.92	0.09				0.00	0.00	0.00	0.92	0.09	3.02	0.29	Ea Top	1.69
54	5B	21.5	8	1.47	2.04	0.20				0.00	0.00	0.00	2.04	0.20	2.04	0.20	Ea Bottom	1.39
55				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.50	0.05	Ea Total	3.08
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.14	0.01	Tray 3	
57				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.69	0.07	Top Br	19
58	5B	18	7.5	1.05	1.34	0.13				0.00	0.00	0.00	1.34	0.13	3.75	0.36	Bottom Br	17
59				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.04	0.20	Br Fruit	18
60	5A	19	7	1.17	1.37	0.13	5C	18.5	6	1.11	1.09	0.11	2.46	0.24	4.80	0.46	Tray 4	
61	5A	13.5	5.5	0.60	0.53	0.05				0.00	0.00	0.00	0.53	0.05	0.88	0.08	Top Br	9
62	5B	11.5	4	0.43	0.27	0.03				0.00	0.00	0.00	0.27	0.03	1.30	0.13	Bottom Br	13
63	5B	18	5	1.02	0.84	0.08				0.00	0.00	0.00	0.84	0.08	1.50	0.15	Br Fruit	12
64	5B	15	3	0.72	0.35	0.03				0.00	0.00	0.00	0.35	0.03	0.35	0.03	Carton	
65	5A	12.5	4.5	0.51	0.36	0.03				0.00	0.00	0.00	0.36	0.03	1.55	0.15	Top Br	76
66	5A	18.5	8	1.07	1.52	0.15				0.00	0.00	0.00	1.52	0.15	2.55	0.25	Bottom Br	51
Total					12.6	1.22					1.78	0.17	14.4	1.39	31.893	3.0785	Br Fruit	66

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 15

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	204	78	80	79.0	39.50	2A	12	3	0.46	0.21	0.02				0.00	0.00	0.00	0.21	0.02
68	209	78	80.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	203	74	75	74.5	37.25	2B	12.5	3	0.53	0.23	0.02				0.00	0.00	0.00	0.23	0.02
70	223	81	81	81.0	40.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	202	77	76	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	200	77.5	80	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	203	77	78	77.5	38.75	2B	11	2.5	0.39	0.15	0.01	2A	12.5	3	0.51	0.23	0.02	0.38	0.04
74	208	77	80	78.5	39.25	2A	10	3	0.32	0.15	0.01	2B	9	2.5	0.26	0.10	0.01	0.24	0.02
75	213	78	79	78.5	39.25	2B	11.5	1.5	0.42	0.10	0.01				0.00	0.00	0.00	0.10	0.01
76	211	80	78.5	79.2	39.62	2A	23	9.5	1.71	2.86	0.28				0.00	0.00	0.00	2.86	0.28
77	204	74.5	75.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	220	80	79	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	220	77	79.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	212	77	80.5	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	200	79	80	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	220	78.5	80.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	215	77.5	80.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	205	75.5	80.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	211	76.5	81.5	79.0	39.50	2B	10.5	2.5	0.35	0.13	0.01				0.00	0.00	0.00	0.13	0.01
86	213	78	79	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	218	78	80	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	212	78	78	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4626									3.83	0.37					0.33	0.03	4.1565	0.4012

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 15

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
67	5A	11.5	3	0.42	0.19	0.02				0.00	0.00	0.00	0.19	0.02	0.41	0.04	
68				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 4
69	5A	19.5	5.5	1.30	1.12	0.11				0.00	0.00	0.00	1.12	0.11	1.36	0.13	Weight(kg) 4.63
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 4.16
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 7.79
73	5B	19	6.5	1.18	1.26	0.12				0.00	0.00	0.00	1.26	0.12	1.64	0.16	Vol Total 11.95
74	5B	15	5.5	0.72	0.65	0.06				0.00	0.00	0.00	0.65	0.06	0.89	0.09	
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.10	0.01	Ea Top 0.40
76	5A	17	5	0.92	0.75	0.07				0.00	0.00	0.00	0.75	0.07	3.61	0.35	Ea Bottom 0.75
77	5B	19	6	1.22	1.16	0.11				0.00	0.00	0.00	1.16	0.11	1.16	0.11	Ea Total 1.15
78	5B	13.5	3	0.58	0.27	0.03				0.00	0.00	0.00	0.27	0.03	0.27	0.03	
79	5C	16	6	0.83	0.81	0.08				0.00	0.00	0.00	0.81	0.08	0.81	0.08	Carton
80				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 18.60
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
82	5A	10.5	3.5	0.35	0.19	0.02	5B	10.5	2.5	0.35	0.13	0.01	0.32	0.03	0.32	0.03	Vol Top 72.42
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 36.04
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 108.46
85	5B	7.5	2	0.18	0.05	0.01				0.00	0.00	0.00	0.05	0.01	0.19	0.02	
86	5B	18.5	5	1.11	0.90	0.09	6B	13	3.5	0.54	0.29	0.03	1.19	0.12	1.19	0.12	Ea Top 6.99
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 3.48
88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total 10.47
Total					7.36	0.71					0.43	0.04	7.79	0.75	11.946	1.1531	Ek Carton 109.50

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 16

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	218	80.5	77.5	79.0	39.50	2C	20	6	1.29	1.28	0.12				0.00	0.00	0.00	1.28	0.12
2	211	79	78	78.5	39.25	2A	14	5.5	0.63	0.57	0.05	2C	14	4.5	0.63	0.45	0.04	1.02	0.10
3	204	80	76.5	78.2	39.12	2A	10	2	0.32	0.10	0.01	2C	13	5	0.54	0.44	0.04	0.54	0.05
4	212	77	80	78.5	39.25	2A	12.5	2	0.50	0.16	0.02				0.00	0.00	0.00	0.16	0.02
5	221	80	79.5	79.8	39.88	2A	18	5	1.03	0.85	0.08	2C	18	4.5	1.03	0.76	0.07	1.61	0.16
6	215	76	78.5	77.2	38.62	2A	18	6	1.06	1.03	0.10				0.00	0.00	0.00	1.03	0.10
7	219	78	79	78.5	39.25	2A	20	6	1.30	1.28	0.12	2C	13	4.5	0.54	0.39	0.04	1.67	0.16
8	218	77	80	78.5	39.25	2A	21	6.5	1.43	1.55	0.15				0.00	0.00	0.00	1.55	0.15
9	218	83	77	80.0	40.00	2A	21	9	1.40	2.24	0.22	2C	15	4	0.71	0.46	0.04	2.70	0.26
10	208	78	78.5	78.2	39.12	2A	17.5	6	0.99	0.97	0.09	2C	14	5	0.63	0.51	0.05	1.48	0.14
11	207	76	77	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
12	208	81	75	78.0	39.00	2C	14	4	0.63	0.40	0.04				0.00	0.00	0.00	0.40	0.04
13	211	81	75.5	78.2	39.12	2A	18	5	1.05	0.85	0.08	2C	21	5	1.44	1.20	0.12	2.05	0.20
14	207	78.5	77.5	78.0	39.00	2A	9	2	0.26	0.08	0.01				0.00	0.00	0.00	0.08	0.01
15	214	78	82.5	80.2	40.12	2A	26	8.5	2.16	3.23	0.31	2C	15.5	4	0.76	0.49	0.05	3.72	0.36
16	214	81	80	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
17	222	78.5	82.5	80.5	40.25	2A	14.5	6	0.66	0.67	0.07				0.00	0.00	0.00	0.67	0.07
18	219	80.5	80	80.2	40.12	2A	14.5	5	0.66	0.54	0.05				0.00	0.00	0.00	0.54	0.05
19	205	78	76	77.0	38.50	2A	24	7	1.92	2.24	0.22	2C	13	3	0.55	0.25	0.02	2.50	0.24
20	210	77	80	78.5	39.25	2A	13.5	5.5	0.58	0.53	0.05				0.00	0.00	0.00	0.53	0.05
21	220	82	77.5	79.8	39.88	2A	22	9	1.55	2.45	0.24	2C	16	6.5	0.81	0.90	0.09	3.35	0.32
22	207	77	79	78.0	39.00	2A	16.5	5	0.88	0.71	0.07	2C	20.5	6	1.37	1.35	0.13	2.06	0.20
Total	4688									21.7	2.10					7.19	0.69	28.918	2.7914

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 16

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.28	0.12	
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.02	0.10	Tray 1
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.54	0.05	Weight(kg) 4.69
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.16	0.02	
5	5B	10	3	0.31	0.15	0.01				0.00	0.00	0.00	0.15	0.01	1.75	0.17	Vol Top 28.92
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.03	0.10	Vol Bottom 4.38
7				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.67	0.16	Vol Total 33.30
8	5B	25	2	2.04	1.00	0.10				0.00	0.00	0.00	1.00	0.10	2.55	0.25	
9				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.70	0.26	Ea Top 2.79
10				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.48	0.14	Ea Bottom 0.42
11				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total 3.21
12	5B	20	2.5	1.30	0.61	0.06				0.00	0.00	0.00	0.61	0.06	1.00	0.10	
13	5B	10.5	2.5	0.35	0.13	0.01				0.00	0.00	0.00	0.13	0.01	2.18	0.21	Top Br 31
14	5B	10	1.5	0.32	0.07	0.01				0.00	0.00	0.00	0.07	0.01	0.15	0.01	Bottom Br 7
15	5B	23	5.5	1.68	1.61	0.15				0.00	0.00	0.00	1.61	0.15	5.33	0.51	Br Fruit 20
16				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
17				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.67	0.07	
18				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.54	0.05	
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.50	0.24	
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.53	0.05	
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.35	0.32	
22	5B	18.5	4.5	1.11	0.81	0.08				0.00	0.00	0.00	0.81	0.08	2.87	0.28	
Total					4.38	0.42					0	0	4.38	0.42	33.299	3.2142	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 16

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
23	213	79	76.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
24	209	80.5	81.5	81.0	40.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
25	218	79	79.5	79.2	39.62	2C	16.5	5	0.87	0.70	0.07				0.00	0.00	0.00	0.70	0.07
26	209	78.5	78.5	78.5	39.25	2C	16	5	0.82	0.66	0.06				0.00	0.00	0.00	0.66	0.06
27	220	79	79.5	79.2	39.62	2B	18	6	1.04	1.03	0.10				0.00	0.00	0.00	1.03	0.10
28	209	77	76	76.5	38.25	2A	21	6	1.47	1.43	0.14	2C	17	6	0.96	0.92	0.09	2.35	0.23
29	208	77	78	77.5	38.75	2A	7	2	0.16	0.05	0.00	2C	18.5	5.5	1.12	0.99	0.10	1.04	0.10
30	222	78.5	82	80.2	40.12	2A	16	4	0.81	0.52	0.05	2C	10	2	0.31	0.10	0.01	0.62	0.06
31	207	76.5	77.5	77.0	38.50	2C	14	4	0.64	0.40	0.04				0.00	0.00	0.00	0.40	0.04
32	204	78	78.5	78.2	39.12	2B	22	6	1.58	1.58	0.15				0.00	0.00	0.00	1.58	0.15
33	206	80.5	77.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
34	214	78.5	79.5	79.0	39.50	2A	18	2.5	1.04	0.46	0.04	2C	17	7	0.93	1.10	0.11	1.56	0.15
35	206	78	74.5	76.2	38.12	2C	28	8	2.66	3.64	0.35				0.00	0.00	0.00	3.64	0.35
36	210	81	76	78.5	39.25	2C	21	6.5	1.43	1.55	0.15				0.00	0.00	0.00	1.55	0.15
37	210	79	80	79.5	39.75	2B	14.5	3.5	0.67	0.37	0.04				0.00	0.00	0.00	0.37	0.04
38	212	79	80	79.5	39.75	2A	12	3.5	0.46	0.25	0.02	2C	11	4	0.38	0.24	0.02	0.49	0.05
39	209	78	77	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	220	76	81.5	78.8	39.38	2C	20.5	5.5	1.36	1.24	0.12				0.00	0.00	0.00	1.24	0.12
41	207	79	76.5	77.8	38.88	2C	22.5	7.5	1.66	2.09	0.20				0.00	0.00	0.00	2.09	0.20
42	205	79.5	77	78.2	39.12	2A	12	3	0.46	0.21	0.02	2C	20	6	1.30	1.28	0.12	1.50	0.14
43	213	76	82.5	79.2	39.62	2C	14	4	0.62	0.39	0.04				0.00	0.00	0.00	0.39	0.04
44	207	78	79	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4638									16.6	1.60					4.64	0.45	21.218	2.0481

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 16

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
23	5A	24	5	1.90	1.65	0.16				0.00	0.00	0.00	1.65	0.16	1.65	0.16	
24				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 2
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.70	0.07	Weight(kg) 4.64
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.66	0.06	
27				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.03	0.10	Vol Top 21.22
28	5A	13	5	0.56	0.44	0.04				0.00	0.00	0.00	0.44	0.04	2.80	0.27	Vol Bottom 14.22
29	5B	15	5	0.73	0.58	0.06	5C	16	4	0.83	0.53	0.05	1.11	0.11	2.15	0.21	Vol Total 35.43
30	5C	15	6	0.71	0.72	0.07				0.00	0.00	0.00	0.72	0.07	1.34	0.13	
31				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.40	0.04	Ea Top 2.05
32	5A	18	7	1.05	1.23	0.12	5C	13	4	0.54	0.34	0.03	1.57	0.15	3.15	0.30	Ea Bottom 1.37
33	5A	15.5	5	0.77	0.62	0.06				0.00	0.00	0.00	0.62	0.06	0.62	0.06	Ea Total 3.42
34	5A	16	5.5	0.82	0.73	0.07				0.00	0.00	0.00	0.73	0.07	2.30	0.22	
35	5A	16.5	3.5	0.90	0.50	0.05	5C	12	5	0.48	0.38	0.04	0.88	0.08	4.52	0.44	Top Br 23
36	5A	11.5	2.5	0.42	0.16	0.02				0.00	0.00	0.00	0.16	0.02	1.71	0.16	Bottom Br 16
37				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.37	0.04	Br Fruit 19
38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.49	0.05	
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
40	5B	25	8.5	2.04	2.98	0.29				0.00	0.00	0.00	2.98	0.29	4.22	0.41	
41	5B	16	6	0.83	0.82	0.08				0.00	0.00	0.00	0.82	0.08	2.91	0.28	
42	5B	18.5	4.5	1.11	0.81	0.08	5C	19	3	1.17	0.61	0.06	1.42	0.14	2.92	0.28	
43				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.39	0.04	
44	5B	19.5	5.5	1.23	1.11	0.11				0.00	0.00	0.00	1.11	0.11	1.11	0.11	
Total					12.4	1.19					1.86	0.18	14.2	1.37	35.434	3.4202	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 16

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	215	76	81	78.5	39.25	2B	15	3	0.72	0.35	0.03				0.00	0.00	0.00	0.35	0.03
46	215	80.5	77.5	79.0	39.50	2A	19	5	1.16	0.95	0.09				0.00	0.00	0.00	0.95	0.09
47	219	79.5	80.5	80.0	40.00	2A	23	8	1.69	2.34	0.23				0.00	0.00	0.00	2.34	0.23
48	211	79	79	79.0	39.50					0.00	0.00				0.00	0.00	0.00	0.00	0.00
49	216	80	79	79.5	39.75	2A	18	4	1.03	0.68	0.07				0.00	0.00	0.00	0.68	0.07
50	203	77.5	72.5	75.0	37.50	2B	16	4.5	0.86	0.60	0.06				0.00	0.00	0.00	0.60	0.06
51	220	78.5	79.5	79.0	39.50	2A	22	7	1.56	1.85	0.18				0.00	0.00	0.00	1.85	0.18
52	222	78	80	79.0	39.50	2A	23	7	1.71	2.03	0.20				0.00	0.00	0.00	2.03	0.20
53	207	76.5	79.5	78.0	39.00					0.00	0.00				0.00	0.00	0.00	0.00	0.00
54	219	80	81	80.5	40.25	2A	18	6.5	1.02	1.12	0.11				0.00	0.00	0.00	1.12	0.11
55	220	79.5	81.5	80.5	40.25	2A	17	6	0.91	0.91	0.09				0.00	0.00	0.00	0.91	0.09
56	219	79.5	83	81.2	40.62					0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	211	78	78	78.0	39.00	2A	18	5	1.05	0.85	0.08	2B	19	4	1.17	0.78	0.07	1.63	0.16
58	216	81.5	80	80.8	40.38					0.00	0.00				0.00	0.00	0.00	0.00	0.00
59	204	76.5	82	79.2	39.62	2B	13.5	4.5	0.58	0.42	0.04				0.00	0.00	0.00	0.42	0.04
60	214	82	80	81.0	40.50	2A	17	7.5	0.90	1.20	0.12				0.00	0.00	0.00	1.20	0.12
61	208	78	81.5	79.8	39.88					0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	206	78.5	78.5	78.5	39.25					0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	203	76.5	75	75.8	37.88					0.00	0.00				0.00	0.00	0.00	0.00	0.00
64	212	78	78.5	78.2	39.12	2A	20.5	8	1.37	1.86	0.18				0.00	0.00	0.00	1.86	0.18
65	214	81.5	77	79.2	39.62	2A	21.5	9	1.49	2.35	0.23				0.00	0.00	0.00	2.35	0.23
66	214	81.5	77.5	79.5	39.75					0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4688									17.5	1.69				0.78	0.07		18.277	1.7642

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 16

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.35	0.03	
46	5A	23	7.5	1.71	2.18	0.21				0.00	0.00	0.00	2.18	0.21	3.14	0.30	Tray 3
47	5B	16	6	0.81	0.81	0.08				0.00	0.00	0.00	0.81	0.08	3.15	0.30	Weight(kg) 4.69
48	5A	22	6	1.56	1.58	0.15				0.00	0.00	0.00	1.58	0.15	1.58	0.15	
49	5A	10	2	0.32	0.10	0.01	5C	19	5	1.15	0.95	0.09	1.05	0.10	1.73	0.17	Vol Top 18.28
50	5A	24	5	1.97	1.67	0.16				0.00	0.00	0.00	1.67	0.16	2.26	0.22	Vol Bottom 18.83
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.85	0.18	Vol Total 37.11
52	5A	21.5	7	1.49	1.76	0.17				0.00	0.00	0.00	1.76	0.17	3.79	0.37	
53	5A	16	6	0.83	0.81	0.08				0.00	0.00	0.00	0.81	0.08	0.81	0.08	Ea Top 1.76
54	5A	12	3.5	0.45	0.25	0.02				0.00	0.00	0.00	0.25	0.02	1.37	0.13	Ea Bottom 1.82
55	5A	12	3.5	0.45	0.25	0.02				0.00	0.00	0.00	0.25	0.02	1.16	0.11	Ea Total 3.58
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3
57	5B	24.5	6.5	1.97	2.18	0.21				0.00	0.00	0.00	2.18	0.21	3.81	0.37	Top Br 15
58	5A	19	6	1.13	1.15	0.11				0.00	0.00	0.00	1.15	0.11	1.15	0.11	Bottom Br 18
59	5C	13	4.5	0.54	0.39	0.04				0.00	0.00	0.00	0.39	0.04	0.80	0.08	Br Fruit 20
60	5A	19.5	7	1.19	1.43	0.14				0.00	0.00	0.00	1.43	0.14	2.63	0.25	Tray 4
61	5A	16.5	6.5	0.86	0.95	0.09				0.00	0.00	0.00	0.95	0.09	0.95	0.09	Top Br 1
62	5C	13.5	5.5	0.58	0.53	0.05				0.00	0.00	0.00	0.53	0.05	0.53	0.05	Bottom Br 13
63	5A	17.5	6	1.02	0.98	0.09				0.00	0.00	0.00	0.98	0.09	0.98	0.09	Br Fruit 13
64				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.86	0.18	Carton
65	5A	16.5	6	0.87	0.86	0.08				0.00	0.00	0.00	0.86	0.08	3.21	0.31	Top Br 70
66				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br 54
Total					17.9	1.73					0.95	0.09	18.8	1.82	37.108	3.5818	Br Fruit 72

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 16

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	216	80.5	76	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	210	76	78.5	77.2	38.62	2C	14	4	0.64	0.40	0.04				0.00	0.00	0.00	0.40	0.04
69	208	77.5	80.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	219	78.5	80.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	214	75	78	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	219	77.5	79.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	212	77	78	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	218	81.5	82.5	82.0	41.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	218	77.5	82.5	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	208	77.5	80.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	214	77.5	82.5	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	202	75	80.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	210	79.5	76	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	208	75.5	77.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	211	78	81	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	209	81.5	78.5	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	208	77.5	78.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	210	78	78.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	219	76.5	79.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	203	77	78	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	205	76.5	75.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	219	78.5	80.5	79.5	39.75	2A	11	2.5	0.38	0.15	0.01				0.00	0.00	0.00	0.15	0.01
Total	4660									0.54	0.05					0	0	0.5421	0.0523

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 16

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
68				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.40	0.04	Tray 4	
69	5A	20	5.5	1.29	1.17	0.11				0.00	0.00	0.00	1.17	0.11	1.17	0.11	Weight(kg)	4.66
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	0.54
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	8.18
72	5A	16.5	3.5	0.88	0.50	0.05				0.00	0.00	0.00	0.50	0.05	0.50	0.05	Vol Total	8.72
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
74	5A	10.5	2	0.34	0.11	0.01				0.00	0.00	0.00	0.11	0.01	0.11	0.01		
75	5A	13	3	0.53	0.25	0.02	5C	13	5	0.53	0.44	0.04	0.69	0.07	0.69	0.07	Ea Top	0.05
76	5B	14	4	0.63	0.39	0.04				0.00	0.00	0.00	0.39	0.04	0.39	0.04	Ea Bottom	0.79
77	5A	20.5	3.5	1.34	0.83	0.08				0.00	0.00	0.00	0.83	0.08	0.83	0.08	Ea Total	0.84
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
79				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton	
80	5A	17.5	5.5	1.01	0.89	0.09				0.00	0.00	0.00	0.89	0.09	0.89	0.09	Weight(kg)	18.67
81	5A	16	3	0.81	0.40	0.04				0.00	0.00	0.00	0.40	0.04	0.40	0.04		
82	5A	19	5.5	1.14	1.05	0.10				0.00	0.00	0.00	1.05	0.10	1.05	0.10	Vol Top	68.96
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	45.61
84	5A	12	4.5	0.46	0.33	0.03				0.00	0.00	0.00	0.33	0.03	0.33	0.03	Vol Total	114.56
85	5A	20.5	5.5	1.37	1.24	0.12				0.00	0.00	0.00	1.24	0.12	1.24	0.12		
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	6.66
87	5C	13.5	5	0.60	0.47	0.05				0.00	0.00	0.00	0.47	0.05	0.47	0.05	Ea Bottom	4.40
88	5A	10.5	2	0.35	0.11	0.01				0.00	0.00	0.00	0.11	0.01	0.25	0.02	Ea Total	11.06
Total					7.74	0.75					0.44	0.04	8.18	0.79	8.7202	0.8417	Ek Carton	109.92

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 6.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 17

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	218	81.5	78	79.8	39.88	2C	18.5	5	1.09	0.90	0.09				0.00	0.00	0.00	0.90	0.09
2	211	78	77	77.5	38.75	2A	13	5.5	0.55	0.50	0.05				0.00	0.00	0.00	0.50	0.05
3	213	77	76	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
4	218	79.5	75	77.2	38.62	2A	23	9.5	1.75	2.87	0.28				0.00	0.00	0.00	2.87	0.28
5	210	79	76.5	77.8	38.88	2B	20.5	7.5	1.38	1.73	0.17				0.00	0.00	0.00	1.73	0.17
6	205	78	80	79.0	39.50	2A	16.5	7	0.87	1.04	0.10				0.00	0.00	0.00	1.04	0.10
7	215	79	77	78.0	39.00	2A	24.5	8	1.97	2.68	0.26				0.00	0.00	0.00	2.68	0.26
8	207	76.5	77.5	77.0	38.50	2A	16	4.5	0.84	0.59	0.06				0.00	0.00	0.00	0.59	0.06
9	219	81.5	80	80.8	40.38	2A	22	10	1.53	2.79	0.27				0.00	0.00	0.00	2.79	0.27
10	222	82	79.5	80.8	40.38	2A	22.5	8.5	1.60	2.39	0.23				0.00	0.00	0.00	2.39	0.23
11	213	77	77	77.0	38.50	2A	17	4.5	0.95	0.68	0.07				0.00	0.00	0.00	0.68	0.07
12	211	78	74.5	76.2	38.12	2C	21	6.5	1.47	1.56	0.15				0.00	0.00	0.00	1.56	0.15
13	218	80	76.5	78.2	39.12	2A	20	7	1.30	1.52	0.15	2C	18	6	1.05	1.03	0.10	2.55	0.25
14	207	77.5	78.5	78.0	39.00	2B	20	7.5	1.30	1.64	0.16				0.00	0.00	0.00	1.64	0.16
15	209	76.5	78	77.2	38.62	2A	18.5	6.5	1.12	1.19	0.12				0.00	0.00	0.00	1.19	0.12
16	221	80	76.5	78.2	39.12	2A	21.5	8	1.51	2.04	0.20	2C	22	7	1.58	1.85	0.18	3.89	0.38
17	211	77.5	79.5	78.5	39.25	2A	20	6.5	1.30	1.40	0.13				0.00	0.00	0.00	1.40	0.13
18	219	82	79.5	80.8	40.38	2A	17	6	0.90	0.91	0.09	2C	12	4	0.45	0.29	0.03	1.20	0.12
19	211	80	77.5	78.8	39.38	2A	19	6.5	1.16	1.26	0.12	2C	18	6	1.04	1.03	0.10	2.28	0.22
20	206	77	73	75.0	37.50	2A	14.5	4.5	0.71	0.48	0.05				0.00	0.00	0.00	0.48	0.05
21	201	79.5	74.5	77.0	38.50	2A	19.5	7	1.26	1.44	0.14				0.00	0.00	0.00	1.44	0.14
22	222	82	73	77.5	38.75	2A	25.5	9.5	2.16	3.53	0.34				0.00	0.00	0.00	3.53	0.34
Total	4687									33.1	3.20					4.20	0.40	37.330	3.6033

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 17

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.90	0.09	
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.50	0.05	Tray 1
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 4.69
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.87	0.28	
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.73	0.17	Vol Top 37.33
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.04	0.10	Vol Bottom 2.38
7				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.68	0.26	Vol Total 39.71
8				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.59	0.06	
9				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.79	0.27	Ea Top 3.60
10	5C	23	4	1.67	1.23	0.12				0.00	0.00	0.00	1.23	0.12	3.61	0.35	Ea Bottom 0.23
11				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.68	0.07	Ea Total 3.83
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.56	0.15	
13				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.55	0.25	Top Br 26
14				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.64	0.16	Bottom Br 2
15				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.19	0.12	Br Fruit 21
16	5C	19	6	1.17	1.15	0.11				0.00	0.00	0.00	1.15	0.11	5.04	0.49	
17				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.40	0.13	
18				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.20	0.12	
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.28	0.22	
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.48	0.05	
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.44	0.14	
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.53	0.34	
Total					2.38	0.23					0	0	2.38	0.23	39.706	3.8326	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 17

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
23	222	81	77.5	79.2	39.62	2A	27	7	2.37	2.92	0.28	2C	22.5	7	1.63	1.94	0.19	4.86	0.47
24	202	78.5	75.5	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
25	219	83	81	82.0	41.00	2A	23	8.5	1.65	2.49	0.24				0.00	0.00	0.00	2.49	0.24
26	206	79.5	76	77.8	38.88	2A	22	6	1.59	1.58	0.15				0.00	0.00	0.00	1.58	0.15
27	222	80	77	78.5	39.25	2C	19.5	6	1.23	1.22	0.12				0.00	0.00	0.00	1.22	0.12
28	222	79.5	78	78.8	39.38	2C	14	4	0.63	0.39	0.04				0.00	0.00	0.00	0.39	0.04
29	205	77	78	77.5	38.75	2A	10	4	0.32	0.21	0.02				0.00	0.00	0.00	0.21	0.02
30	218	81.5	75	78.2	39.12	2A	18.5	6.5	1.11	1.19	0.11				0.00	0.00	0.00	1.19	0.11
31	200	77.5	76	76.8	38.38	2A	20	6.5	1.33	1.40	0.14				0.00	0.00	0.00	1.40	0.14
32	204	75	77	76.0	38.00	2C	9.5	2.5	0.30	0.11	0.01				0.00	0.00	0.00	0.11	0.01
33	202	76.5	76.5	76.5	38.25	2B	16	4.5	0.85	0.59	0.06				0.00	0.00	0.00	0.59	0.06
34	213	76.5	78	77.2	38.62	2A	13.5	6	0.59	0.60	0.06				0.00	0.00	0.00	0.60	0.06
35	213	77.5	76.5	77.0	38.50	2A	21.5	9	1.53	2.36	0.23				0.00	0.00	0.00	2.36	0.23
36	209	79.5	75.5	77.5	38.75	2C	19	6	1.18	1.15	0.11				0.00	0.00	0.00	1.15	0.11
37	219	78	79.5	78.8	39.38	2A	24	8	1.87	2.56	0.25				0.00	0.00	0.00	2.56	0.25
38	221	80.5	81.5	81.0	40.50	2A	23	8	1.67	2.33	0.22				0.00	0.00	0.00	2.33	0.22
39	210	76.5	78.5	77.5	38.75	2C	11	4.5	0.39	0.28	0.03				0.00	0.00	0.00	0.28	0.03
40	212	81.5	74.5	78.0	39.00	2A	21	8	1.44	1.95	0.19				0.00	0.00	0.00	1.95	0.19
41	220	78.5	77.5	78.0	39.00	2C	16.5	6	0.88	0.87	0.08				0.00	0.00	0.00	0.87	0.08
42	212	82	77	79.5	39.75	2B	21	7	1.41	1.67	0.16				0.00	0.00	0.00	1.67	0.16
43	216	73.5	79.5	76.5	38.25	2A	25	9.5	2.10	3.39	0.33				0.00	0.00	0.00	3.39	0.33
44	216	78	80	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4683									29.3	2.83					1.94	0.19	31.207	3.0123

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 17

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
23	5A	19.5	6.5	1.22	1.32	0.13				0.00	0.00	0.00	1.32	0.13	6.18	0.60	
24				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 2
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.49	0.24	Weight(kg)
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.58	0.15	
27				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.22	0.12	Vol Top
28	5C	19.5	5.5	1.23	1.11	0.11				0.00	0.00	0.00	1.11	0.11	1.51	0.15	Vol Bottom
29	5B	13	5	0.55	0.44	0.04				0.00	0.00	0.00	0.44	0.04	0.65	0.06	Vol Total
30				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.19	0.11	
31	5C	15	5	0.74	0.58	0.06				0.00	0.00	0.00	0.58	0.06	1.98	0.19	Ea Top
32	5B	11	3.5	0.40	0.21	0.02				0.00	0.00	0.00	0.21	0.02	0.32	0.03	Ea Bottom
33	5A	16	5	0.85	0.66	0.06				0.00	0.00	0.00	0.66	0.06	1.26	0.12	Ea Total
34	5B	17	5	0.95	0.75	0.07				0.00	0.00	0.00	0.75	0.07	1.35	0.13	
35	5B	18	6	1.07	1.03	0.10				0.00	0.00	0.00	1.03	0.10	3.39	0.33	Top Br
36	5A	14	5	0.64	0.51	0.05				0.00	0.00	0.00	0.51	0.05	1.66	0.16	Bottom Br
37	5C	16	4.5	0.82	0.59	0.06				0.00	0.00	0.00	0.59	0.06	3.15	0.30	Br Fruit
38	5A	24	9	1.82	2.90	0.28	5C	11	4	0.38	0.24	0.02	3.15	0.30	5.48	0.53	
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.28	0.03	
40	5A	17.5	7	0.99	1.17	0.11				0.00	0.00	0.00	1.17	0.11	3.12	0.30	
41	5A	14.5	5	0.68	0.54	0.05				0.00	0.00	0.00	0.54	0.05	1.41	0.14	
42	5A	15	6.5	0.71	0.80	0.08				0.00	0.00	0.00	0.80	0.08	2.47	0.24	
43	5C	16.5	4	0.90	0.56	0.05				0.00	0.00	0.00	0.56	0.05	3.96	0.38	
44				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total					13.2	1.27					0.24	0.02	13.4	1.30	44.639	4.3088	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 17

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	200	81	79	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	201	75	76	75.5	37.75	2C	18	4	1.09	0.69	0.07				0.00	0.00	0.00	0.69	0.07
47	218	77.5	79.5	78.5	39.25	2A	22	8	1.57	2.14	0.21				0.00	0.00	0.00	2.14	0.21
48	215	79	77	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
49	206	77	78.5	77.8	38.88	2A	18	5	1.06	0.85	0.08	2C	19	6	1.18	1.15	0.11	2.00	0.19
50	212	79.5	81.5	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	210	80	78.5	79.2	39.62	2A	19	6.5	1.16	1.25	0.12				0.00	0.00	0.00	1.25	0.12
52	214	78.5	80.5	79.5	39.75	2C	17	5	0.92	0.75	0.07				0.00	0.00	0.00	0.75	0.07
53	219	79.5	79	79.2	39.62	2A	19.5	4	1.22	0.82	0.08	2C	16	5	0.82	0.66	0.06	1.48	0.14
54	222	79.5	78	78.8	39.38	2B	23.5	8	1.79	2.45	0.24				0.00	0.00	0.00	2.45	0.24
55	206	81	74.5	77.8	38.88	2A	17	6	0.94	0.92	0.09	2C	21	6	1.44	1.43	0.14	2.35	0.23
56	203	77	76	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	210	80	76.5	78.2	39.12	2A	17	6.5	0.93	1.01	0.10				0.00	0.00	0.00	1.01	0.10
58	205	78.5	75	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
59	205	81.5	77.5	79.5	39.75	2A	23.5	10	1.78	3.17	0.31				0.00	0.00	0.00	3.17	0.31
60	219	82	80.5	81.2	40.62	2A	21	6.5	1.38	1.54	0.15				0.00	0.00	0.00	1.54	0.15
61	206	77.5	74.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	211	79	78.5	78.8	39.38	2A	18	4.5	1.04	0.76	0.07				0.00	0.00	0.00	0.76	0.07
63	216	79	79	79.0	39.50	2A	19	2	1.16	0.45	0.04				0.00	0.00	0.00	0.45	0.04
64	217	80	77	78.5	39.25	2A	15	5	0.72	0.58	0.06				0.00	0.00	0.00	0.58	0.06
65	213	78.5	77	77.8	38.88	2A	23.5	6.5	1.82	1.99	0.19				0.00	0.00	0.00	1.99	0.19
66	213	77	79.5	78.2	39.12	2A	16	5	0.83	0.66	0.06				0.00	0.00	0.00	0.66	0.06
Total	4641									20.0	1.93					3.24	0.31	23.276	2.2467

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 17

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
46	5A	12	4	0.48	0.29	0.03				0.00	0.00	0.00	0.29	0.03	0.98	0.09	Tray 3
47	5B	11	4	0.39	0.25	0.02	5C	14	4	0.63	0.39	0.04	0.64	0.06	2.78	0.27	Weight(kg) 4.64
48				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
49				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.00	0.19	Vol Top 23.28
50	5B	17	5	0.91	0.75	0.07				0.00	0.00	0.00	0.75	0.07	0.75	0.07	Vol Bottom 14.49
51	5A	17.5	6.5	0.98	1.06	0.10				0.00	0.00	0.00	1.06	0.10	2.32	0.22	Vol Total 37.76
52	5A	17	5.5	0.92	0.83	0.08	5C	15	5	0.71	0.58	0.06	1.41	0.14	2.16	0.21	
53	5C	20	5	1.28	1.07	0.10				0.00	0.00	0.00	1.07	0.10	2.55	0.25	Ea Top 2.25
54	5A	15	3	0.72	0.35	0.03	5C	17	4.5	0.93	0.67	0.06	1.02	0.10	3.47	0.33	Ea Bottom 1.40
55	5B	17	6	0.94	0.92	0.09				0.00	0.00	0.00	0.92	0.09	3.27	0.32	Ea Total 3.64
56	5C	18.5	5.5	1.14	1.00	0.10				0.00	0.00	0.00	1.00	0.10	1.00	0.10	Tray 3
57	5B	19	6	1.17	1.15	0.11				0.00	0.00	0.00	1.15	0.11	2.16	0.21	Top Br 19
58	5A	16.5	5	0.90	0.71	0.07				0.00	0.00	0.00	0.71	0.07	0.71	0.07	Bottom Br 20
59	5B	17.5	6.5	0.98	1.06	0.10	5C	12.5	4	0.49	0.31	0.03	1.38	0.13	4.55	0.44	Br Fruit 19
60				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.54	0.15	Tray 4
61				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br 0
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.76	0.07	Bottom Br 13
63	5A	18	4	1.04	0.68	0.07				0.00	0.00	0.00	0.68	0.07	1.14	0.11	Br Fruit 10
64	5A	20.5	6.5	1.36	1.47	0.14	5C	16.5	4	0.88	0.56	0.05	2.03	0.20	2.61	0.25	Carton
65	5C	12	5	0.47	0.38	0.04				0.00	0.00	0.00	0.38	0.04	2.37	0.23	Top Br 72
66				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.66	0.06	Bottom Br 51
Total						12.0	1.15				2.52	0.24	14.5	1.40	37.762	3.6450	Br Fruit 70

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 17

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	222	80	79	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	215	77	82	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	205	79	75	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	216	82.5	78.5	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	219	79.5	78.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	218	81.5	77	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	211	77.5	83	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	216	77	78.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	202	80.5	75	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	200	72.5	77	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	210	77.5	77.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	206	77	79	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	207	76.5	76	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	212	78.5	80	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	207	78	76.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	208	78.5	79	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	216	80	78.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	222	79	78	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	208	79	79	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	204	75.5	75.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	218	75.5	78.5	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	210	81.5	75.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4652								0	0	0				0	0	0	0	0

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 17

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
67	5A	10	1.5	0.32	0.07	0.01				0.00	0.00	0.00	0.07	0.01	0.07	0.01	
68	5B	19	4	1.15	0.77	0.07				0.00	0.00	0.00	0.77	0.07	0.77	0.07	Tray 4
69				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 4.65
70	5A	15	5	0.70	0.58	0.06	5C	17	5	0.91	0.75	0.07	1.33	0.13	1.33	0.13	
71	5B	18	7	1.04	1.23	0.12				0.00	0.00	0.00	1.23	0.12	1.23	0.12	Vol Top 0.00
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 13.55
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 13.55
74	5A	21	7.5	1.44	1.81	0.17	5C	15	4	0.73	0.46	0.04	2.27	0.22	2.27	0.22	
75	5A	17.5	5	1.00	0.80	0.08	5C	12	3	0.47	0.21	0.02	1.01	0.10	1.01	0.10	Ea Top 0.00
76				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 1.31
77	5B	25.5	8.5	2.16	3.12	0.30				0.00	0.00	0.00	3.12	0.30	3.12	0.30	Ea Total 1.31
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
79	5A	24	7.5	1.94	2.41	0.23				0.00	0.00	0.00	2.41	0.23	2.41	0.23	Carton
80				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 18.66
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
82	5B	24	3	1.87	1.12	0.11				0.00	0.00	0.00	1.12	0.11	1.12	0.11	Vol Top 91.81
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 43.85
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 135.66
85				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top 8.86
87	5B	12	3	0.47	0.21	0.02				0.00	0.00	0.00	0.21	0.02	0.21	0.02	Ea Bottom 4.23
88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total 13.09
Total					12.1	1.17				1.42	0.14	0.14	13.6	1.31	13.553	1.3082	Ek Carton 109.85

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 18

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	214	80	79	79.5	39.75	2C	23.5	7	1.78	2.13	0.21				0.00	0.00	0.00	2.13	0.21
2	211	78	79	78.5	39.25	2C	15	3	0.72	0.35	0.03				0.00	0.00	0.00	0.35	0.03
3	207	76	80	78.0	39.00	2C	24	6.5	1.89	2.08	0.20				0.00	0.00	0.00	2.08	0.20
4	203	79.5	76	77.8	38.88	2A	18	5.5	1.06	0.94	0.09	2C	16	4	0.83	0.53	0.05	1.46	0.14
5	219	79.5	79.5	79.5	39.75	2C	24	7	1.85	2.23	0.22				0.00	0.00	0.00	2.23	0.22
6	220	79	77	78.0	39.00	2A	18	5.5	1.05	0.94	0.09				0.00	0.00	0.00	0.94	0.09
7	222	81	82	81.5	40.75	2A	20	6.5	1.25	1.39	0.13	2C	26	8.5	2.13	3.22	0.31	4.61	0.44
8	218	79	80	79.5	39.75	2C	18	5	1.03	0.85	0.08				0.00	0.00	0.00	0.85	0.08
9	204	81.5	73	77.2	38.62	2A	21	4	1.45	0.99	0.10				0.00	0.00	0.00	0.99	0.10
10	216	75.5	81	78.2	39.12	2C	14.5	4.5	0.68	0.48	0.05				0.00	0.00	0.00	0.48	0.05
11	207	77	77.5	77.2	38.62	2A	25	7	2.08	2.46	0.24	2C	17	4	0.95	0.60	0.06	3.06	0.30
12	202	77	76	76.5	38.25	2C	21	7	1.47	1.68	0.16				0.00	0.00	0.00	1.68	0.16
13	203	78	79	78.5	39.25	2A	13	3.5	0.54	0.29	0.03	2C	19	5	1.17	0.95	0.09	1.25	0.12
14	211	77	80	78.5	39.25	2A	22	7	1.57	1.85	0.18	2C	15	3	0.72	0.35	0.03	2.19	0.21
15	214	79.5	81.5	80.5	40.25	2A	24	9	1.83	2.91	0.28				0.00	0.00	0.00	2.91	0.28
16	204	77	78.5	77.8	38.88	2C	21	7	1.44	1.68	0.16	2C	23	6	1.74	1.75	0.17	3.43	0.33
17	210	77	77	77.0	38.50	2A	21	6.5	1.46	1.55	0.15				0.00	0.00	0.00	1.55	0.15
18	218	76	82	79.0	39.50	2A	18.5	7	1.10	1.30	0.13	2C	28	6	2.56	2.80	0.27	4.09	0.40
19	220	75	80	77.5	38.75	2C	15	3.5	0.73	0.40	0.04				0.00	0.00	0.00	0.40	0.04
20	211	78.5	78.5	78.5	39.25	2A	22	7	1.57	1.85	0.18				0.00	0.00	0.00	1.85	0.18
21	200	77.5	77	77.2	38.62	2A	19	6	1.19	1.15	0.11				0.00	0.00	0.00	1.15	0.11
22	218	80	79	79.5	39.75	2A	21.5	7.5	1.48	1.89	0.18	2C	23	6.5	1.70	1.88	0.18	3.78	0.36
Total	4652									31.4	3.03					12.1	1.17	43.468	4.1958

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 18

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1	5B	16	3	0.81	0.40	0.04				0.00	0.00	0.00	0.40	0.04	2.53	0.24	
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.35	0.03	Tray 1
3	5C	21	5	1.44	1.20	0.12				0.00	0.00	0.00	1.20	0.12	3.28	0.32	Weight(kg) 4.65
4	5B	27	9	2.42	3.75	0.36				0.00	0.00	0.00	3.75	0.36	5.22	0.50	
5	5C	16	5	0.81	0.66	0.06				0.00	0.00	0.00	0.66	0.06	2.89	0.28	Vol Top 43.47
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.94	0.09	Vol Bottom 23.75
7	5B	17.5	3	0.95	0.49	0.05				0.00	0.00	0.00	0.49	0.05	5.10	0.49	Vol Total 67.22
8				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.85	0.08	
9				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.99	0.10	Ea Top 4.20
10				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.48	0.05	Ea Bottom 2.29
11	5B	16	2	0.84	0.29	0.03				0.00	0.00	0.00	0.29	0.03	3.35	0.32	Ea Total 6.49
12	5C	31	7.5	3.28	4.38	0.42				0.00	0.00	0.00	4.38	0.42	6.07	0.59	
13	5B	13	2	0.54	0.17	0.02				0.00	0.00	0.00	0.17	0.02	1.42	0.14	Top Br 30
14	5B	27	5.5	2.39	2.38	0.23				0.00	0.00	0.00	2.38	0.23	4.58	0.44	Bottom Br 16
15	5B	26	5	2.16	1.99	0.19				0.00	0.00	0.00	1.99	0.19	4.90	0.47	Br Fruit 22
16	5B	22	5	1.59	1.34	0.13				0.00	0.00	0.00	1.34	0.13	4.77	0.46	
17				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.55	0.15	
18				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	4.09	0.40	
19	5B	21	4	1.45	0.99	0.10				0.00	0.00	0.00	0.99	0.10	1.39	0.13	
20	5B	22.5	6	1.65	1.66	0.16				0.00	0.00	0.00	1.66	0.16	3.51	0.34	
21	5B	18	5	1.06	0.85	0.08				0.00	0.00	0.00	0.85	0.08	2.00	0.19	
22	5B	28	7	2.55	3.18	0.31				0.00	0.00	0.00	3.18	0.31	6.96	0.67	
Total					23.8	2.29					0	0	23.8	2.29	67.222	6.4886	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 18

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
23	205	76	77.5	76.8	38.38	2C	17.5	5.5	1.01	0.89	0.09				0.00	0.00	0.00	0.89	0.09
24	217	77.5	80.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
25	219	80	80.5	80.2	40.12	2A	20	6.5	1.27	1.39	0.13	2C	19	5.5	1.14	1.05	0.10	2.44	0.24
26	200	76	78	77.0	38.50	2A	17	5	0.95	0.75	0.07				0.00	0.00	0.00	0.75	0.07
27	212	76.5	75.5	76.0	38.00	2A	23	9	1.78	2.70	0.26	2C	17	5	0.96	0.75	0.07	3.45	0.33
28	213	78.5	78	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
29	208	79.5	77	78.2	39.12	2A	18	5	1.05	0.85	0.08	2C	22	4.5	1.58	1.22	0.12	2.07	0.20
30	214	74	81	77.5	38.75	2A	16.5	4	0.89	0.56	0.05				0.00	0.00	0.00	0.56	0.05
31	204	77	77	77.0	38.50	2C	22.5	7	1.68	1.95	0.19				0.00	0.00	0.00	1.95	0.19
32	213	79.5	79	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
33	212	78	80.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
34	213	79	78.5	78.8	39.38	2A	13.5	6	0.58	0.59	0.06				0.00	0.00	0.00	0.59	0.06
35	213	79	75	77.0	38.50	2A	22	7	1.60	1.86	0.18	2C	20	4.5	1.32	0.98	0.09	2.83	0.27
36	218	77.5	79.5	78.5	39.25	2A	20	5.5	1.30	1.17	0.11	2C	25	8.5	2.04	2.99	0.29	4.16	0.40
37	215	82	73	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
38	222	82.5	77	79.8	39.88	2A	22	6.5	1.55	1.71	0.16	2C	19	6	1.15	1.15	0.11	2.85	0.28
39	214	79.5	79.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	219	79	78.5	78.8	39.38	2A	21	6.5	1.43	1.55	0.15	2C	18	4.5	1.04	0.76	0.07	2.31	0.22
41	207	77	76.5	76.8	38.38	2A	15	4	0.74	0.46	0.04	2C	19	4	1.19	0.78	0.08	1.24	0.12
42	204	77.5	75	76.2	38.12	2A	21	6.5	1.47	1.56	0.15				0.00	0.00	0.00	1.56	0.15
43	210	79.5	81.5	80.5	40.25	2A	20	5	1.26	1.07	0.10				0.00	0.00	0.00	1.07	0.10
44	212	79.5	78.5	79.0	39.50	2A	17	5	0.93	0.75	0.07				0.00	0.00	0.00	0.75	0.07
Total	4664									19.8	1.91					9.67	0.93	29.463	2.8440

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 18

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
23	5A	17	4.5	0.95	0.68	0.07				0.00	0.00	0.00	0.68	0.07	1.56	0.15	
24	5A	16	5	0.82	0.66	0.06				0.00	0.00	0.00	0.66	0.06	0.66	0.06	Tray 2
25	5A	15	7	0.71	0.88	0.08				0.00	0.00	0.00	0.88	0.08	3.32	0.32	Weight(kg) 4.66
26	5B	18	6	1.07	1.03	0.10				0.00	0.00	0.00	1.03	0.10	1.78	0.17	
27	5A	23	7	1.78	2.05	0.20				0.00	0.00	0.00	2.05	0.20	5.50	0.53	Vol Top 29.46
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 21.29
29	5A	23.5	7	1.81	2.13	0.21				0.00	0.00	0.00	2.13	0.21	4.20	0.41	Vol Total 50.75
30	5B	20	8	1.31	1.77	0.17	5C	11	4	0.39	0.25	0.02	2.02	0.19	2.58	0.25	
31	5B	21	5	1.46	1.20	0.12				0.00	0.00	0.00	1.20	0.12	3.15	0.30	Ea Top 2.84
32				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 2.05
33	5C	17	4	0.92	0.60	0.06				0.00	0.00	0.00	0.60	0.06	0.60	0.06	Ea Total 4.90
34	5A	12	4	0.46	0.29	0.03				0.00	0.00	0.00	0.29	0.03	0.88	0.09	
35	5A	23	7	1.76	2.04	0.20	5C	16	5	0.84	0.66	0.06	2.71	0.26	5.54	0.53	Top Br 24
36	5A	13	4	0.54	0.34	0.03				0.00	0.00	0.00	0.34	0.03	4.50	0.43	Bottom Br 20
37				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit 18
38	5B	22	6	1.55	1.58	0.15				0.00	0.00	0.00	1.58	0.15	4.43	0.43	
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
40	5A	20	5	1.29	1.07	0.10				0.00	0.00	0.00	1.07	0.10	3.38	0.33	
41	5B	14	3	0.64	0.30	0.03				0.00	0.00	0.00	0.30	0.03	1.54	0.15	
42	5A	20	4.5	1.33	0.98	0.09	5C	12.5	3	0.52	0.23	0.02	1.21	0.12	2.77	0.27	
43	5B	25.5	7	2.07	2.55	0.25				0.00	0.00	0.00	2.55	0.25	3.61	0.35	
44				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.75	0.07	
Total					20.1	1.94					1.14	0.11	21.3	2.05	50.752	4.8988	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 18

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	212	74.5	78.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	202	79	77	78.0	39.00	2C	23	5.5	1.73	1.62	0.16				0.00	0.00	0.00	1.62	0.16
47	215	81	73.5	77.2	38.62	2C	17	5	0.95	0.75	0.07				0.00	0.00	0.00	0.75	0.07
48	212	81.5	74.5	78.0	39.00	2C	15	4	0.73	0.46	0.04				0.00	0.00	0.00	0.46	0.04
49	204	76.5	79.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
50	217	80	83	81.5	40.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	212	79	80.5	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
52	215	79	79	79.0	39.50	2A	18	2	1.04	0.39	0.04	2C	23	7	1.71	2.03	0.20	2.42	0.23
53	212	80	79	79.5	39.75	2C	18	3	1.03	0.53	0.05				0.00	0.00	0.00	0.53	0.05
54	214	80.5	76	78.2	39.12	2A	14	4.5	0.63	0.45	0.04	2C	13	4	0.54	0.34	0.03	0.79	0.08
55	215	77	82.5	79.8	39.88	2A	15	5	0.71	0.58	0.06	2C	16	6	0.81	0.81	0.08	1.39	0.13
56	221	80	78	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	217	79	78.5	78.8	39.38	2A	21	6.5	1.43	1.55	0.15	2C	21	6	1.43	1.43	0.14	2.97	0.29
58	222	81.5	78.5	80.0	40.00	2C	22	7	1.54	1.84	0.18				0.00	0.00	0.00	1.84	0.18
59	209	79.5	77	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
60	222	80	79.5	79.8	39.88	2A	22	6.5	1.55	1.71	0.16				0.00	0.00	0.00	1.71	0.16
61	210	77.5	78.5	78.0	39.00	2A	13.5	5	0.59	0.47	0.05				0.00	0.00	0.00	0.47	0.05
62	210	77.5	79.5	78.5	39.25	2A	11	4	0.39	0.25	0.02				0.00	0.00	0.00	0.25	0.02
63	217	77.5	80.5	79.0	39.50	2A	18	3.5	1.04	0.61	0.06				0.00	0.00	0.00	0.61	0.06
64	214	76.5	82	79.2	39.62	2A	18	5.5	1.04	0.93	0.09	2C	10	2	0.32	0.10	0.01	1.03	0.10
65	206	79	76.5	77.8	38.88	2A	19	6	1.18	1.15	0.11				0.00	0.00	0.00	1.15	0.11
66	220	80.5	76	78.2	39.12	2A	21	5	1.44	1.20	0.12				0.00	0.00	0.00	1.20	0.12
Total	4698									14.5	1.40					4.71	0.45	19.189	1.8522

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 18

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
46	5A	20	6	1.30	1.28	0.12				0.00	0.00	0.00	1.28	0.12	2.90	0.28	Tray 3
47				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.75	0.07	Weight(kg) 4.70
48	5A	16	4	0.83	0.53	0.05				0.00	0.00	0.00	0.53	0.05	0.98	0.09	
49				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 19.19
50	5B	24	8	1.81	2.55	0.25				0.00	0.00	0.00	2.55	0.25	2.55	0.25	Vol Bottom 20.51
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 39.70
52	5A	22	8	1.56	2.14	0.21				0.00	0.00	0.00	2.14	0.21	4.56	0.44	
53	5A	18	4	1.03	0.68	0.07				0.00	0.00	0.00	0.68	0.07	1.21	0.12	Ea Top 1.85
54	5B	23.5	7.5	1.81	2.29	0.22				0.00	0.00	0.00	2.29	0.22	3.08	0.30	Ea Bottom 1.98
55				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.39	0.13	Ea Total 3.83
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3
57	5A	21	9	1.43	2.25	0.22	5C	19	6.5	1.16	1.26	0.12	3.50	0.34	6.47	0.62	Top Br 21
58	5A	17	5.5	0.91	0.83	0.08	5C	13	4	0.53	0.34	0.03	1.17	0.11	3.01	0.29	Bottom Br 15
59	5B	22	6	1.58	1.58	0.15				0.00	0.00	0.00	1.58	0.15	1.58	0.15	Br Fruit 18
60				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.71	0.16	Tray 4
61	5A	20.5	8	1.37	1.86	0.18				0.00	0.00	0.00	1.86	0.18	2.33	0.23	Top Br 0
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.25	0.02	Bottom Br 10
63	5B	23	8	1.71	2.34	0.23				0.00	0.00	0.00	2.34	0.23	2.95	0.28	Br Fruit 9
64	5A	14	3.5	0.62	0.34	0.03				0.00	0.00	0.00	0.34	0.03	1.37	0.13	Carton
65				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.15	0.11	Top Br 75
66	5A	12	3.5	0.46	0.25	0.02				0.00	0.00	0.00	0.25	0.02	1.45	0.14	Bottom Br 61
Total					18.9	1.83					1.59	0.15	20.5	1.98	39.701	3.8321	Br Fruit 67

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 18

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	219	81	78	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	211	78	76	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	217	76.5	78.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	217	79	76	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	220	78	79	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	215	76	80.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	220	76	79	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	201	77	78.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	204	76	78	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	218	80.5	78.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	202	78	76.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	222	82	78	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	210	79.5	78.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	206	79	76.5	77.8	38.86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	201	80.5	79	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	222	78.5	77	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	206	76.5	77	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	204	75	80	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	212	76.5	77.5	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	216	76.5	79	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	220	76.5	76	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	218	81	77.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4681								0	0	0				0	0	0	0	0

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

88:18/7

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 18

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
68	5A	20	6	1.32	1.29	0.12				0.00	0.00	0.00	1.29	0.12	1.29	0.12	Tray 4
69	5B	24	8	1.90	2.57	0.25				0.00	0.00	0.00	2.57	0.25	2.57	0.25	Weight(kg) 4.68
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 0.00
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 16.66
73	5C	16	5.5	0.83	0.74	0.07				0.00	0.00	0.00	0.74	0.07	0.74	0.07	Vol Total 16.66
74				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top 0.00
76				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 1.61
77	5B	23	7	1.75	2.04	0.20				0.00	0.00	0.00	2.04	0.20	2.04	0.20	Ea Total 1.61
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
79	5B	24	5	1.87	1.64	0.16				0.00	0.00	0.00	1.64	0.16	1.64	0.16	Carton
80	5B	25	9	2.06	3.18	0.31				0.00	0.00	0.00	3.18	0.31	3.18	0.31	Weight(kg) 18.69
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 92.12
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 82.22
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 174.34
85	5B	22	7	1.60	1.86	0.18				0.00	0.00	0.00	1.86	0.18	1.86	0.18	
86	5A	19	6	1.18	1.15	0.11	5C	15	3	0.73	0.35	0.03	1.50	0.14	1.50	0.14	Ea Top 8.89
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 7.94
88	5B	22	7	1.56	1.85	0.18				0.00	0.00	0.00	1.85	0.18	1.85	0.18	Ea Total 16.83
Total				16.3	1.57					0.35	0.03		16.7	1.61	16.662	1.6083	Ek Carton 110.04

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 19

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	211	76	78	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
2	217	80	81	80.5	40.25	2A	23	9	1.68	2.67	0.26	2C	24	7.5	1.83	2.38	0.23	5.05	0.49
3	211	79	77.5	78.2	39.12				0.00	0.00	0.00	2C	24	5	1.89	1.65	0.16	1.65	0.16
4	216	76.5	80.5	78.5	39.25	2A	19	6	1.17	1.15	0.11				0.00	0.00	0.00	1.15	0.11
5	206	76.5	78	77.2	38.62	2A	14.5	3.5	0.69	0.37	0.04				0.00	0.00	0.00	0.37	0.04
6	205	78	77.5	77.8	38.88	2A	19.5	6	1.24	1.22	0.12				0.00	0.00	0.00	1.22	0.12
7	207	77.5	80.5	79.0	39.50	2A	23	7.5	1.71	2.18	0.21	2C	23	6.5	1.71	1.89	0.18	4.07	0.39
8	214	81	78	79.5	39.75	2A	22.5	7	1.63	1.94	0.19	2C	21	6	1.41	1.42	0.14	3.36	0.32
9	220	80	80	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
10	218	80	78.5	79.2	39.62	2A	18.5	7	1.09	1.29	0.12				0.00	0.00	0.00	1.29	0.12
11	218	77.5	83	80.2	40.12	2B	21	6	1.40	1.42	0.14	2D	20	6	1.27	1.28	0.12	2.70	0.26
12	213	80.5	78	79.2	39.62				0.00	0.00	0.00	2C	19.5	8	1.22	1.68	0.16	1.68	0.16
13	212	77.5	81.5	79.5	39.75	2B	14	3	0.62	0.30	0.03	2D	21	7.5	1.41	1.80	0.17	2.10	0.20
14	214	78.5	78.5	78.5	39.25				0.00	0.00	0.00	2C	21	6.5	1.43	1.55	0.15	1.55	0.15
15	211	80	78	79.0	39.50	2B	29	10	2.76	4.88	0.47				0.00	0.00	0.00	4.88	0.47
16	208	77.5	77.5	77.5	38.75	2A	25	7	2.07	2.46	0.24	2C	14	4	0.64	0.40	0.04	2.85	0.28
17	215	77.5	78.5	78.0	39.00	2B	20.5	6	1.37	1.35	0.13				0.00	0.00	0.00	1.35	0.13
18	209	79	78	78.5	39.25	2A	13	5	0.54	0.44	0.04	2C	20	8.5	1.30	1.91	0.18	2.35	0.23
19	200	77	77	77.0	38.50	2A	15.5	5.5	0.79	0.69	0.07	2C	15	5	0.74	0.58	0.06	1.27	0.12
20	206	75	80	77.5	38.75	2A	19	6	1.18	1.15	0.11				0.00	0.00	0.00	1.15	0.11
21	206	75	80	77.5	38.75	2A	21.5	8	1.52	2.05	0.20				0.00	0.00	0.00	2.05	0.20
22	206	79	78.5	78.8	39.38	2A	27	10	2.39	4.19	0.40				0.00	0.00	0.00	4.19	0.40
Total	4643									29.8	2.87					16.5	1.60	46.296	4.4687

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

88:19/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 19

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	5C	17.5	3	0.96	0.49	0.05				0.00	0.00	0.00	0.49	0.05	5.55	0.54	Tray 1
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.65	0.16	Weight(kg) 4.64
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.15	0.11	
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.37	0.04	Vol Top 46.30
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.22	0.12	Vol Bottom 8.96
7				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	4.07	0.39	Vol Total 55.26
8	5B	18	5	1.03	0.85	0.08				0.00	0.00	0.00	0.85	0.08	4.20	0.41	
9	5B	15	6	0.71	0.72	0.07				0.00	0.00	0.00	0.72	0.07	0.72	0.07	Ea Top 4.47
10	5B	18	5	1.04	0.85	0.08				0.00	0.00	0.00	0.85	0.08	2.14	0.21	Ea Bottom 0.87
11	5B	24	6	1.84	1.92	0.19				0.00	0.00	0.00	1.92	0.19	4.62	0.45	Ea Total 5.33
12	5B	20	5	1.28	1.07	0.10				0.00	0.00	0.00	1.07	0.10	2.75	0.27	
13				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.10	0.20	Top Br 28
14				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.55	0.15	Bottom Br 8
15				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	4.88	0.47	Br Fruit 21
16	5B	23	8	1.75	2.35	0.23				0.00	0.00	0.00	2.35	0.23	5.20	0.50	
17				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.35	0.13	
18	5B	15	6	0.72	0.72	0.07				0.00	0.00	0.00	0.72	0.07	3.07	0.30	
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.27	0.12	
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.15	0.11	
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.05	0.20	
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	4.19	0.40	
Total					8.96	0.87					0	0	8.96	0.87	55.261	5.3340	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 19

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
23	204	78.5	79	78.8	39.38	2A	17.5	5	0.98	0.80	0.08	2C	18.5	6	1.10	1.09	0.11	1.89	0.18
24	213	79	79	79.0	39.50	2A	17.5	6.5	0.98	1.06	0.10	2C	22	7	1.56	1.85	0.18	2.91	0.28
25	203	77	79.5	78.2	39.12	2C	23	7.5	1.73	2.19	0.21				0.00	0.00	0.00	2.19	0.21
26	214	75	80.5	77.8	38.88	2B	24.5	6.5	1.98	2.19	0.21				0.00	0.00	0.00	2.19	0.21
27	204	78	78	78.0	39.00	2A	23	9	1.73	2.68	0.26	2C	21	7	1.44	1.68	0.16	4.36	0.42
28	208	77.5	79.5	78.5	39.25	2C	13	4	0.54	0.34	0.03				0.00	0.00	0.00	0.34	0.03
29	213	79.5	80	79.8	39.88	2A	11	3	0.38	0.18	0.02	2C	26	8	2.18	3.04	0.29	3.22	0.31
30	211	77.5	77.5	77.5	38.75	2A	10	3.5	0.32	0.17	0.02		28	8	2.62	3.62	0.35	3.80	0.37
31	206	81.5	77	79.2	39.62	2A	19	5	1.16	0.95	0.09				0.00	0.00	0.00	0.95	0.09
32	212	79	77.5	78.2	39.12	2B	12	3.5	0.46	0.25	0.02	2C	9	3.5	0.26	0.14	0.01	0.39	0.04
33	214	79	77.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
34	214	79	78.5	78.8	39.38	2A	21.5	6.5	1.50	1.63	0.16	2C	31	10	3.18	5.66	0.55	7.29	0.70
35	217	81	76	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
36	207	76.5	78.5	77.5	38.75	2A	23.5	8	1.82	2.46	0.24	2C	20	6	1.31	1.29	0.12	3.74	0.36
37	205	76	77.5	76.8	38.38	2A	12	2	0.47	0.14	0.01	2C	20	7	1.33	1.52	0.15	1.67	0.16
38	211	79	80	79.5	39.75	2A	19	6	1.15	1.15	0.11	2C	20	6.5	1.28	1.39	0.13	2.54	0.25
39	207	79.5	79	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	214	79.5	77	78.2	39.12	2C	25	7.5	2.05	2.62	0.25				0.00	0.00	0.00	2.62	0.25
41	208	77	78	77.5	38.75	2A	16	6	0.83	0.82	0.08	2C	23	6	1.75	1.75	0.17	2.57	0.25
42	213	76.5	82.5	79.5	39.75	2A	10	3	0.32	0.15	0.01	2C	14.5	4.5	0.67	0.48	0.05	0.63	0.06
43	205	77.5	76.5	77.0	38.50	2A	13.5	4.5	0.60	0.42	0.04				0.00	0.00	0.00	0.42	0.04
44	207	79.5	79.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4610									20.2	1.95					23.5	2.27	43.710	4.2191

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 19

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
23	5C	17	5	0.93	0.75	0.07				0.00	0.00	0.00	0.75	0.07	2.64	0.25	
24	5B	20	6	1.29	1.28	0.12				0.00	0.00	0.00	1.28	0.12	4.19	0.40	Tray 2
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.19	0.21	Weight(kg)
26	5A	22	8.5	1.59	2.30	0.22				0.00	0.00	0.00	2.30	0.22	4.48	0.43	4.61
27	5A	16	4	0.83	0.53	0.05				0.00	0.00	0.00	0.53	0.05	4.89	0.47	Vol Top
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.34	0.03	Vol Bottom
29	5B	20	7	1.27	1.51	0.15				0.00	0.00	0.00	1.51	0.15	4.73	0.46	Vol Total
30	5A	16	5.5	0.83	0.74	0.07				0.00	0.00	0.00	0.74	0.07	4.53	0.44	63.87
31	5A	14	5	0.62	0.51	0.05				0.00	0.00	0.00	0.51	0.05	1.46	0.14	Ea Top
32	5B	18	6.5	1.05	1.13	0.11				0.00	0.00	0.00	1.13	0.11	1.52	0.15	Ea Bottom
33	5A	19	6.5	1.17	1.26	0.12				0.00	0.00	0.00	1.26	0.12	1.26	0.12	Ea Total
34	5A	21	8.5	1.43	2.09	0.20				0.00	0.00	0.00	2.09	0.20	9.38	0.91	6.16
35	5B	22.5	6.5	1.65	1.80	0.17				0.00	0.00	0.00	1.80	0.17	1.80	0.17	Top Br
36	5A	15	5	0.73	0.58	0.06	5C	10	4	0.32	0.21	0.02	0.79	0.08	4.53	0.44	Bottom Br
37				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.67	0.16	Br Fruit
38	5A	15	7	0.71	0.88	0.08	5C	13	4	0.54	0.34	0.03	1.22	0.12	3.76	0.36	21
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
40	5A	19	6.5	1.17	1.26	0.12				0.00	0.00	0.00	1.26	0.12	3.88	0.37	
41	5B	21	6	1.45	1.43	0.14				0.00	0.00	0.00	1.43	0.14	4.00	0.39	
42	5A	15	4	0.71	0.46	0.04				0.00	0.00	0.00	0.46	0.04	1.08	0.10	
43				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.42	0.04	
44	5A	18	6.5	1.03	1.12	0.11				0.00	0.00	0.00	1.12	0.11	1.12	0.11	
Total					19.6	1.89					0.54	0.05	20.2	1.95	63.867	6.1647	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 19

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	220	76	83	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	213	76	77.5	76.8	38.38	2A	16.5	4.5	0.90	0.63	0.06				0.00	0.00	0.00	0.63	0.06
47	219	80	79	79.5	39.75	2C	17	6.5	0.92	1.01	0.10				0.00	0.00	0.00	1.01	0.10
48	209	74.5	80.5	77.5	38.75	2C	17	8	0.94	1.31	0.13				0.00	0.00	0.00	1.31	0.13
49	212	79	78.5	78.8	39.38	2A	21	7.5	1.43	1.81	0.17				0.00	0.00	0.00	1.81	0.17
50	209	79.5	82	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	220	78	81	79.5	39.75	2A	17	6	0.92	0.92	0.09				0.00	0.00	0.00	0.92	0.09
52	209	78.5	75	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
53	211	76.5	76	76.2	38.12	2C	22	6	1.62	1.59	0.15				0.00	0.00	0.00	1.59	0.15
54	216	79.5	81	80.2	40.12	2A	17	5	0.91	0.75	0.07	2C	15	4	0.71	0.46	0.04	1.20	0.12
55	206	79	77	78.0	39.00	2A	19	6.5	1.17	1.26	0.12	2C	14.5	4.5	0.68	0.48	0.05	1.74	0.17
56	209	78	75	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	211	77	78	77.5	38.75	2A	12	3.5	0.47	0.25	0.02	2C	17.5	5.5	1.00	0.88	0.09	1.13	0.11
58	205	78	77	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
59	212	81.5	79.5	80.5	40.25	2A	17.5	5.5	0.96	0.88	0.08				0.00	0.00	0.00	0.88	0.08
60	204	78	77	77.5	38.75	2A	27.5	9	2.52	3.91	0.38	2C	14	4	0.64	0.40	0.04	4.30	0.42
61	221	80.5	83.5	82.0	41.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	204	79	78.5	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	208	76.5	75.5	76.0	38.00	2A	13.5	6	0.60	0.60	0.06				0.00	0.00	0.00	0.60	0.06
64	212	80	79.5	79.8	39.88	2C	22	6	1.55	1.58	0.15				0.00	0.00	0.00	1.58	0.15
65	211	76.5	80	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
66	205	80	78	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4646									16.5	1.59					2.22	0.21	18.700	1.8051

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 19

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary		
45					0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00			
46	5B	17	5.5	0.95	0.83	0.08					0.00	0.00	0.00	0.83	0.08	1.47	0.14	Tray 3	
47					0.00	0.00					0.00	0.00	0.00	0.00	0.00	1.01	0.10	Weight(kg)	4.65
48	5B	17	5	0.94	0.75	0.07					0.00	0.00	0.00	0.75	0.07	2.07	0.20		
49	5A	15.5	5	0.77	0.62	0.06	5D	13.5	4.5	0.58	0.42	0.04	1.04	0.10	2.84	0.27	Vol Top	18.70	
50	5B	20	6	1.26	1.28	0.12					0.00	0.00	0.00	1.28	0.12	1.28	0.12	Vol Bottom	17.81
51					0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.92	0.09	Vol Total	36.52
52	5B	23	6.5	1.76	1.90	0.18					0.00	0.00	0.00	1.90	0.18	1.90	0.18		
53	5A	18	4	1.08	0.69	0.07					0.00	0.00	0.00	0.69	0.07	2.28	0.22	Ea Top	1.81
54	5C	19	5	1.14	0.95	0.09					0.00	0.00	0.00	0.95	0.09	2.15	0.21	Ea Bottom	1.72
55	5A	11	5	0.39	0.33	0.03					0.00	0.00	0.00	0.33	0.03	2.07	0.20	Ea Total	3.52
56					0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3	
57	5B	25.5	8	2.16	2.93	0.28					0.00	0.00	0.00	2.93	0.28	4.07	0.39	Top Br	17
58					0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	18
59	5A	17	6.5	0.91	1.00	0.10					0.00	0.00	0.00	1.00	0.10	1.88	0.18	Br Fruit	18
60	5A	20	7	1.31	1.52	0.15	5C	20	4.5	1.31	0.97	0.09	2.49	0.24	6.80	0.66	Tray 4		
61	5A	16.5	5	0.84	0.70	0.07					0.00	0.00	0.00	0.70	0.07	0.70	0.07	Top Br	0
62					0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	13
63	5B	19	5	1.21	0.96	0.09					0.00	0.00	0.00	0.96	0.09	1.56	0.15	Br Fruit	13
64	5B	18	6	1.03	1.03	0.10					0.00	0.00	0.00	1.03	0.10	2.60	0.25	Carton	
65		16	4.5	0.83	0.59	0.06					0.00	0.00	0.00	0.59	0.06	0.59	0.06	Top Br	75
66	5A	14	3.5	0.63	0.34	0.03					0.00	0.00	0.00	0.34	0.03	0.34	0.03	Bottom Br	58
Total					16.4	1.59					1.39	0.13	17.8	1.72	36.515	3.5246	Br Fruit	73	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 19

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	211	75.5	79.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	207	80.5	79	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	210	77	78.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	218	78.5	82	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	216	76.5	81.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	211	76.5	81.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	203	80	79	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	214	77.5	78	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	201	77.5	81	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	210	79	76	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	216	78.5	81.5	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	218	79	79.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	213	78	78	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	212	78	77.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	214	81.5	77	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	206	76	75.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	217	76.5	81.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	214	79	79	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	203	77	77	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	211	78.5	79.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	214	77	77.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	217	77.5	80	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4656								0	0	0				0	0	0	0	0

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E -Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

88:19/7

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 19

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
68	5A	13.5	3	0.58	0.27	0.03				0.00	0.00	0.00	0.27	0.03	0.27	0.03	Tray 4
69	5B	23	4	1.74	1.24	0.12				0.00	0.00	0.00	1.24	0.12	1.24	0.12	Weight(kg) 4.66
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 0.00
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 9.11
72	5C	16	3	0.82	0.40	0.04				0.00	0.00	0.00	0.40	0.04	0.40	0.04	Vol Total 9.11
73	5C	12	2	0.46	0.14	0.01				0.00	0.00	0.00	0.14	0.01	0.14	0.01	
74	5C	10	4	0.32	0.21	0.02				0.00	0.00	0.00	0.21	0.02	0.21	0.02	
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top 0.00
76				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 0.88
77	5A	18	4.5	1.03	0.76	0.07				0.00	0.00	0.00	0.76	0.07	0.76	0.07	Ea Total 0.88
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
79				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton
80	5B	25	9.5	2.06	3.38	0.33				0.00	0.00	0.00	3.38	0.33	3.38	0.33	Weight(kg) 18.56
81	5D	14	4	0.62	0.39	0.04				0.00	0.00	0.00	0.39	0.04	0.39	0.04	
82	5B	11	3.5	0.40	0.21	0.02				0.00	0.00	0.00	0.21	0.02	0.21	0.02	Vol Top 108.71
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 56.04
84	5A	14.5	4.5	0.67	0.48	0.05				0.00	0.00	0.00	0.48	0.05	0.48	0.05	Vol Total 164.75
85	5A	13.5	4	0.60	0.37	0.04				0.00	0.00	0.00	0.37	0.04	0.37	0.04	
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top 10.49
87	5A	13	3.5	0.55	0.29	0.03				0.00	0.00	0.00	0.29	0.03	0.29	0.03	Ea Bottom 5.41
88	5A	16.5	6.5	0.87	0.95	0.09				0.00	0.00	0.00	0.95	0.09	0.95	0.09	Ea Total 15.90
Total					9.11	0.88				0	0	0	9.11	0.88	9.1075	0.8791	Ek Carton 109.21

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E -Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

88:19/8

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 20

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	209	79.5	77	78.2	39.12	2C	19.5	6.5	1.23	1.33	0.13				0.00	0.00	0.00	1.33	0.13
2	210	82	77.5	79.8	39.88	2C	26	6	2.18	2.32	0.22				0.00	0.00	0.00	2.32	0.22
3	203	72.5	80.5	76.5	38.25					0.00	0.00				0.00	0.00	0.00	0.00	0.00
4	206	80	78	79.0	39.50	2A	16	4	0.82	0.52	0.05	2C	22	6	1.56	1.58	0.15	2.10	0.20
5	217	76.5	80	78.2	39.12	2A	17	6	0.93	0.92	0.09	2C	15	4	0.73	0.46	0.04	1.37	0.13
6	211	80	80.5	80.2	40.12	2B	25	6	2.00	2.11	0.20				0.00	0.00	0.00	2.11	0.20
7	204	75.5	78.5	77.0	38.50	2A	21	8.5	1.46	2.10	0.20				0.00	0.00	0.00	2.10	0.20
8	212	81.5	74	77.8	38.88	2A	12.5	3	0.51	0.23	0.02				0.00	0.00	0.00	0.23	0.02
9	207	76.5	76	76.2	38.12	2A	12	4	0.48	0.29	0.03	2C	18	5	1.08	0.85	0.08	1.14	0.11
10	202	78.5	76	77.2	38.62	2A	13	5.5	0.55	0.50	0.05				0.00	0.00	0.00	0.50	0.05
11	216	83	76	79.5	39.75	2A	23	8	1.70	2.34	0.23	2C	18	7	1.03	1.23	0.12	3.57	0.34
12	221	80	76.5	78.2	39.12	2C	29	7	2.79	3.48	0.34				0.00	0.00	0.00	3.48	0.34
13	209	76	79	77.5	38.75	2A	16.5	5.5	0.89	0.78	0.08	2C	16.5	5	0.89	0.71	0.07	1.49	0.14
14	222	83	78.5	80.8	40.38	2A	21.5	6	1.46	1.49	0.14	2C	24	7	1.82	2.22	0.21	3.71	0.36
15	214	77	80.5	78.8	39.38					0.00	0.00				0.00	0.00	0.00	0.00	0.00
16	207	83	75.5	79.2	39.62	2A	14	4	0.62	0.39	0.04	2C	24	4	1.86	1.37	0.13	1.77	0.17
17	209	77.5	79	78.2	39.12	2A	21	6	1.44	1.43	0.14				0.00	0.00	0.00	1.43	0.14
18	205	77.5	80.5	79.0	39.50					0.00	0.00				0.00	0.00	0.00	0.00	0.00
19	206	77	74.5	75.8	37.88					0.00	0.00				0.00	0.00	0.00	0.00	0.00
20	207	79	77	78.0	39.00	2C	20	6	1.30	1.28	0.12				0.00	0.00	0.00	1.28	0.12
21	205	76	77.5	76.8	38.38	2A	16	4	0.84	0.53	0.05	2C	14	4	0.64	0.40	0.04	0.92	0.09
22	212	78.5	80	79.2	39.62	2A	23	7	1.71	2.03	0.20	2C	15	5	0.72	0.58	0.06	2.61	0.25
Total	4614									24.1	2.32				9.39	0.91		33.478	3.2314

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 20

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.33	0.13	
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.32	0.22	Tray 1
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)
4	5B	21	2	1.42	0.60	0.06				0.00	0.00	0.00	0.60	0.06	2.70	0.26	4.61
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.37	0.13	Vol Top
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.11	0.20	33.48
7	5B	24.5	5	2.00	1.74	0.17				0.00	0.00	0.00	1.74	0.17	3.84	0.37	Vol Bottom
8				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.23	0.02	12.83
9				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.14	0.11	Vol Total
10				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.50	0.05	46.31
11	5B	23	7	1.70	2.03	0.20				0.00	0.00	0.00	2.03	0.20	5.60	0.54	Ea Top
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.48	0.34	3.23
13	5B	25.5	5	2.16	1.92	0.19				0.00	0.00	0.00	1.92	0.19	3.41	0.33	Ea Bottom
14	5C	23	4	1.67	1.23	0.12				0.00	0.00	0.00	1.23	0.12	4.94	0.48	1.24
15				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br
16	5C	28	4	2.56	2.07	0.20				0.00	0.00	0.00	2.07	0.20	3.84	0.37	Bottom Br
17	5B	14	5	0.63	0.51	0.05				0.00	0.00	0.00	0.51	0.05	1.93	0.19	9
18	5C	26	7	2.20	2.68	0.26				0.00	0.00	0.00	2.68	0.26	2.68	0.26	Br Fruit
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	19
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.28	0.12	
21	5C	8	2	0.21	0.06	0.01				0.00	0.00	0.00	0.06	0.01	0.98	0.09	
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.61	0.25	
Total						12.8	1.24				0	0	12.8	1.24	46.309	4.4700	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 20

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top	
23	216	76	79.5	77.8	38.88	2A	17.5	5	1.00	0.80	0.08					0.00	0.00	0.00	0.80	0.08
24	222	80	78.5	79.2	39.62	2C	23	6.5	1.71	1.89	0.18					0.00	0.00	0.00	1.89	0.18
25	219	78.5	77	77.8	38.88	2C	18.5	6	1.12	1.09	0.11					0.00	0.00	0.00	1.09	0.11
26	214	78	76.5	77.2	38.62	2A	18.5	6.5	1.12	1.19	0.12					0.00	0.00	0.00	1.19	0.12
27	222	80	79	79.5	39.75	2A	14	3	0.62	0.30	0.03	2C	20	7	1.28	1.51	0.15	1.81	0.17	
28	206	78.5	79	78.8	39.38					0.00	0.00					0.00	0.00	0.00	0.00	0.00
29	222	75.5	80	77.8	38.88	2A	14	3.5	0.64	0.34	0.03					0.00	0.00	0.00	0.34	0.03
30	222	81	74.5	77.8	38.88	2C	26.5	8	2.33	3.19	0.31					0.00	0.00	0.00	3.19	0.31
31	210	79.5	79.5	79.5	39.75	2C	14	4	0.62	0.39	0.04					0.00	0.00	0.00	0.39	0.04
32	210	76	77	76.5	38.25	2D	12	4	0.47	0.29	0.03					0.00	0.00	0.00	0.29	0.03
33	216	77.5	79	78.2	39.12					0.00	0.00					0.00	0.00	0.00	0.00	0.00
34	220	80.5	82	81.2	40.62	2A	21.5	5.5	1.45	1.37	0.13	2C	22	6.5	1.52	1.70	0.16	3.07	0.30	
35	218	77.5	77	77.2	38.62					0.00	0.00					0.00	0.00	0.00	0.00	0.00
36	209	79	78	78.5	39.25					0.00	0.00					0.00	0.00	0.00	0.00	0.00
37	220	80	80	80.0	40.00	2A	16.5	3	0.86	0.43	0.04	2D	15	5	0.71	0.58	0.06	1.01	0.10	
38	211	81.5	76	78.8	39.38	2B	24	8	1.87	2.56	0.25					0.00	0.00	0.00	2.56	0.25
39	214	77	81	79.0	39.50	2C	21	5	1.42	1.20	0.12					0.00	0.00	0.00	1.20	0.12
40	205	79	77	78.0	39.00	2A	14	2.5	0.63	0.25	0.02	2C	21	6	1.44	1.43	0.14	1.68	0.16	
41	222	79.5	79.5	79.5	39.75					0.00	0.00					0.00	0.00	0.00	0.00	0.00
42	210	75.5	81	78.2	39.12	2A	17.5	5	0.99	0.80	0.08					0.00	0.00	0.00	0.80	0.08
43	217	77.5	76.5	77.0	38.50	2A	16.5	4.5	0.89	0.63	0.06	2C	15	4	0.74	0.46	0.04	1.09	0.11	
44	201	76.5	75	75.8	37.88					0.00	0.00					0.00	0.00	0.00	0.00	0.00
Total	4726									16.7	1.61					5.68	0.55	22.405	2.1626	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

88:20/3

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 20

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary		
23	5A	21.5	8	1.52	2.05	0.20					0.00	0.00	0.00	2.05	0.20	2.84	0.27		
24	5B	21	7	1.42	1.67	0.16					0.00	0.00	0.00	1.67	0.16	3.56	0.34	Tray 2	
25	5A	15	4	0.73	0.46	0.04					0.00	0.00	0.00	0.46	0.04	1.55	0.15	Weight(kg)	4.73
26	5A	16	3	0.84	0.40	0.04	5C	15.5	4.5	0.79	0.55	0.05	0.96	0.09	2.15	0.21			
27	5B	15.5	5	0.76	0.62	0.06					0.00	0.00	0.00	0.62	0.06	2.43	0.23	Vol Top	22.40
28	5C	13	3.5	0.54	0.29	0.03					0.00	0.00	0.00	0.29	0.03	0.29	0.03	Vol Bottom	22.72
29				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.34	0.03	Vol Total	45.13
30	5B	21	6	1.44	1.43	0.14					0.00	0.00	0.00	1.43	0.14	4.62	0.45		
31	5A	17	6	0.92	0.92	0.09					0.00	0.00	0.00	0.92	0.09	1.31	0.13	Ea Top	2.16
32	5C	12.5	5	0.51	0.41	0.04					0.00	0.00	0.00	0.41	0.04	0.70	0.07	Ea Bottom	2.19
33	5A	17	6	0.93	0.92	0.09					0.00	0.00	0.00	0.92	0.09	0.92	0.09	Ea Total	4.36
34	5B	25	8	1.97	2.78	0.27					0.00	0.00	0.00	2.78	0.27	5.85	0.56		
35				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br	21
36	5A	18	5	1.05	0.85	0.08					0.00	0.00	0.00	0.85	0.08	0.85	0.08	Bottom Br	20
37				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	1.01	0.10	Br Fruit	20
38	5A	21.5	8	1.50	2.04	0.20					0.00	0.00	0.00	2.04	0.20	4.60	0.44		
39	5B	19	5	1.16	0.95	0.09					0.00	0.00	0.00	0.95	0.09	2.15	0.21		
40	5A	19.5	5.5	1.24	1.11	0.11					0.00	0.00	0.00	1.11	0.11	2.79	0.27		
41				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00		
42	5B	26	8.5	2.22	3.25	0.31					0.00	0.00	0.00	3.25	0.31	4.05	0.39		
43	5A	17	3.5	0.95	0.53	0.05	5C	14	5	0.64	0.51	0.05	1.04	0.10	2.13	0.21			
44	5A	17.5	6	1.02	0.98	0.09					0.00	0.00	0.00	0.98	0.09	0.98	0.09		
Total					21.7	2.09					1.06	0.10	22.7	2.19	45.126	4.3558			

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 20

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	220	80	82	81.0	40.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	209	76	77.5	76.8	38.38	2A	23.5	7	1.84	2.14	0.21				0.00	0.00	0.00	2.14	0.21
47	207	77.5	75.5	76.5	38.25	2C	19.5	5.5	1.26	1.12	0.11				0.00	0.00	0.00	1.12	0.11
48	206	79.5	75	77.2	38.62	2C	24.5	6.5	1.99	2.19	0.21				0.00	0.00	0.00	2.19	0.21
49	212	78.5	78.5	78.5	39.25	2A	15	2	0.72	0.25	0.02	2C	18.5	5.5	1.11	0.99	0.10	1.24	0.12
50	209	78.5	77.5	78.0	39.00	2A	16	5	0.83	0.66	0.06				0.00	0.00	0.00	0.66	0.06
51	222	80	79	79.5	39.75	2A	20	7	1.28	1.51	0.15				0.00	0.00	0.00	1.51	0.15
52	211	77	78.5	77.8	38.88	2C	29	7	2.81	3.49	0.34				0.00	0.00	0.00	3.49	0.34
53	200	80.5	72	76.2	38.12	2A	12	3	0.48	0.21	0.02	2C	23	6	1.78	1.76	0.17	1.97	0.19
54	215	78.5	82	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
55	209	79	77	78.0	39.00	2A	15	6	0.73	0.72	0.07	2C	14	4.5	0.63	0.45	0.04	1.17	0.11
56	203	77.5	76.5	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	208	80	78	79.0	39.50	2C	24	5.5	1.87	1.78	0.17				0.00	0.00	0.00	1.78	0.17
58	214	79	80.5	79.8	39.88	2C	21	6.5	1.41	1.54	0.15				0.00	0.00	0.00	1.54	0.15
59	208	77.5	74.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
60	209	78.5	78	78.2	39.12	2A	17.5	6.5	0.99	1.07	0.10				0.00	0.00	0.00	1.07	0.10
61	214	80.5	80	80.2	40.12	2A	22.5	8.5	1.61	2.39	0.23				0.00	0.00	0.00	2.39	0.23
62	221	78	80.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	203	77	77.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
64	222	82.5	78.5	80.5	40.25	2A	13	3	0.53	0.25	0.02	2C	18.5	5.5	1.08	0.99	0.10	1.24	0.12
65	212	76	79.5	77.8	38.88	2A	22	7	1.59	1.85	0.18				0.00	0.00	0.00	1.85	0.18
66	208	75.5	76.5	76.0	38.00	2C	14	4	0.65	0.40	0.04				0.00	0.00	0.00	0.40	0.04
Total	4642									21.6	2.08					4.19	0.40	25.763	2.4868

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 20

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
46	5B	28	8.5	2.64	3.85	0.37				0.00	0.00	0.00	3.85	0.37	5.99	0.58	Tray 3	
47	5A	16	4.5	0.85	0.59	0.06				0.00	0.00	0.00	0.59	0.06	1.71	0.17	Weight(kg)	4.64
48	5B	21	6.5	1.45	1.55	0.15				0.00	0.00	0.00	1.55	0.15	3.74	0.36		
49	5A	18	6	1.05	1.03	0.10				0.00	0.00	0.00	1.03	0.10	2.27	0.22	Vol Top	25.76
50	5A	22	8	1.58	2.14	0.21				0.00	0.00	0.00	2.14	0.21	2.80	0.27	Vol Bottom	27.69
51	5C	12	3	0.46	0.21	0.02				0.00	0.00	0.00	0.21	0.02	1.72	0.17	Vol Total	53.45
52	5A	14	5	0.64	0.51	0.05				0.00	0.00	0.00	0.51	0.05	4.00	0.39		
53	5A	23	7	1.78	2.05	0.20				0.00	0.00	0.00	2.05	0.20	4.02	0.39	Ea Top	2.49
54	5A	14	4	0.62	0.39	0.04				0.00	0.00	0.00	0.39	0.04	0.39	0.04	Ea Bottom	2.67
55	5A	17	5.5	0.94	0.83	0.08				0.00	0.00	0.00	0.83	0.08	2.00	0.19	Ea Total	5.16
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3	
57	5A	27.5	9.5	2.47	4.12	0.40				0.00	0.00	0.00	4.12	0.40	5.90	0.57	Top Br	20
58	5A	18.5	6	1.09	1.09	0.10	5C	14.5	2	0.66	0.23	0.02	1.31	0.13	2.85	0.28	Bottom Br	19
59	5A	23.5	8	1.86	2.47	0.24				0.00	0.00	0.00	2.47	0.24	2.47	0.24	Br Fruit	20
60				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.07	0.10	Tray 4	
61	5B	20.5	6	1.33	1.35	0.13				0.00	0.00	0.00	1.35	0.13	3.74	0.36	Top Br	0
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	10
63	5B	21	6.5	1.45	1.55	0.15				0.00	0.00	0.00	1.55	0.15	1.55	0.15	Br Fruit	10
64	5A	22	8	1.53	2.13	0.21				0.00	0.00	0.00	2.13	0.21	3.37	0.33	Carton	
65	5B	18	5.5	1.06	0.94	0.09				0.00	0.00	0.00	0.94	0.09	2.79	0.27	Top Br	68
66	5B	16	5	0.85	0.66	0.06				0.00	0.00	0.00	0.66	0.06	1.06	0.10	Bottom Br	58
Total					27.5	2.65					0.23	0.02	27.7	2.67	53.453	5.1595	Br Fruit	69

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 20

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	216	82	77.5	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	220	80	79	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	203	79	75	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	214	78.5	81.5	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	205	75	77	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	213	76	80.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	208	73.5	78.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	221	80	78.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	213	78.5	78.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	206	82.5	78	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	218	80.5	80	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	217	80.5	78.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	210	78	78.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	217	78.5	78.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	216	77.5	81	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	217	79	82	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	210	78.5	78.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	200	77.5	79	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	217	79.5	81	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	210	77.5	77	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	218	78.5	78	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	205	76.5	78	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4674								0	0	0				0	0	0	0	0

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 20

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
67					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
68					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 4
69					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 4.67
70					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
71	5B	17	4.5	0.96	0.68	0.07				0.00	0.00	0.00	0.68	0.07	0.68	0.07	Vol Top 0.00
72					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 17.77
73	5B	26	9	2.29	3.48	0.34				0.00	0.00	0.00	3.48	0.34	3.48	0.34	Vol Total 17.77
74	5B	18.5	5.5	1.09	0.99	0.10				0.00	0.00	0.00	0.99	0.10	0.99	0.10	
75					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top 0.00
76					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 1.72
77					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total 1.72
78					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
79	5B	27.5	8	2.50	3.47	0.33				0.00	0.00	0.00	3.47	0.33	3.47	0.33	Carton
80	5B	22.5	8	1.65	2.24	0.22				0.00	0.00	0.00	2.24	0.22	2.24	0.22	Weight(kg) 18.66
81	5B	21	5.5	1.42	1.31	0.13				0.00	0.00	0.00	1.31	0.13	1.31	0.13	
82					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 81.65
83					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 81.01
84	5B	19	6.5	1.17	1.26	0.12				0.00	0.00	0.00	1.26	0.12	1.26	0.12	Vol Total 162.66
85	5B	19	7	1.14	1.36	0.13				0.00	0.00	0.00	1.36	0.13	1.36	0.13	
86	5B	24	7	1.91	2.24	0.22				0.00	0.00	0.00	2.24	0.22	2.24	0.22	Ea Top 7.88
87					0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 7.82
88	5B	17	5	0.95	0.75	0.07				0.00	0.00	0.00	0.75	0.07	0.75	0.07	Ea Total 15.70
Total					17.8	1.72				0	0	0	17.8	1.72	17.771	1.7153	Ek Carton 109.81

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 14.10.93

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**TABLES 6.3 FULL RESULTS OF DROP TEST DATA COUNT 100
ARTONS 1 - 10 AT 8% MOISTURE CONTENT**

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 1

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	181	75.5	77	76.2	38.12	1B	13	4	0.56	0.34	0.04				0.00	0.00	0.00	0.34	0.04
2	180	73	74.5	73.8	36.88	1B	17	5	0.99	0.76	0.08				0.00	0.00	0.00	0.76	0.08
3	184	74.5	75	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
4	180	71	76.5	73.8	36.88	1B	14	4	0.67	0.40	0.04				0.00	0.00	0.00	0.40	0.04
5	178	74.5	69	71.8	35.88	1B	15	4	0.79	0.46	0.05				0.00	0.00	0.00	0.46	0.05
6	181	76	72	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
7	176	72.5	72.5	72.5	36.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
8	189	76.5	72.5	74.5	37.25	1B	14	5	0.66	0.51	0.06				0.00	0.00	0.00	0.51	0.06
9	186	73.5	71	72.2	36.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
10	183	74.5	74.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
11	183	76.5	74	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
12	184	75.5	73	74.2	37.12	1C	14	3	0.67	0.30	0.03				0.00	0.00	0.00	0.30	0.03
13	193	74.5	78.5	76.5	38.25	1B	18.5	6.5	1.14	1.19	0.13	3B	18.5	5.5	1.14	1.00	0.11	2.19	0.24
14	182	77.5	74	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
15	177	74	75.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
16	181	77	72.5	74.8	37.38	2A	11	3	0.41	0.18	0.02	3B	15	4.5	0.76	0.52	0.06	0.70	0.08
17	178	72.5	75.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
18	180	75.5	74.5	75.0	37.50	3B	12	2	0.48	0.15	0.02				0.00	0.00	0.00	0.15	0.02
19	174	74	72.5	73.2	36.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
20	183	75.5	73.5	74.5	37.25	3B	18.5	6	1.17	1.10	0.12				0.00	0.00	0.00	1.10	0.12
Total	3633									5.39	0.60					1.52	0.17	6.9019	0.7652

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:1/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 1

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.34	0.04	Tray 1
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.76	0.08	Weight(kg): 3.63
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.40	0.04	Vol Top 6.90
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.46	0.05	Vol Bottom 6.09
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 12.99
7	5B	18	3.5	1.14	0.62	0.07				0.00	0.00	0.00	0.62	0.07	0.62	0.07	
8	5C	21	5	1.51	1.21	0.13				0.00	0.00	0.00	1.21	0.13	1.72	0.19	Ea Top 0.77
9	5C	16	4	0.90	0.53	0.06				0.00	0.00	0.00	0.53	0.06	0.53	0.06	Ea Bottom 0.68
10	5C	17	3.5	0.98	0.54	0.06				0.00	0.00	0.00	0.54	0.06	0.54	0.06	Ea Total 1.44
11	5B	12	3	0.48	0.21	0.02				0.00	0.00	0.00	0.21	0.02	0.21	0.02	
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.30	0.03	Top Br 12
13	5C	21	5	1.47	1.20	0.13				0.00	0.00	0.00	1.20	0.13	3.40	0.38	Bottom Br 9
14				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit 15
15				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
16				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.70	0.08	
17	5B	14	4	0.67	0.40	0.04				0.00	0.00	0.00	0.40	0.04	0.40	0.04	
18	5C	22	4	1.65	1.12	0.12				0.00	0.00	0.00	1.12	0.12	1.27	0.14	
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
20	5C	13	3	0.57	0.25	0.03				0.00	0.00	0.00	0.25	0.03	1.35	0.15	
Total					6.09	0.68					0	0	6.09	0.68	12.994	1.4405	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:1/2

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 1

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
21	195	77.5	76	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
22	180	77	73	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
23	187	77	74.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
24	192	74	72.5	73.2	36.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
25	186	75.5	76.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
26	193	74	76.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
27	193	76.5	73.5	75.0	37.50	3B	10	2	0.33	0.10	0.01				0.00	0.00	0.00	0.10	0.01
28	176	69.5	74.5	72.0	36.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
29	193	76.5	79.5	78.0	39.00	3B	26	9	2.23	3.46	0.38				0.00	0.00	0.00	3.46	0.38
30	191	75.5	77.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
31	186	77	73	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
32	191	73	78.5	75.8	37.88	3B	18	5	1.08	0.85	0.09				0.00	0.00	0.00	0.85	0.09
33	176	75.5	71	73.2	36.62	3B	18	7	1.12	1.24	0.14				0.00	0.00	0.00	1.24	0.14
34	175	71.5	74	72.8	36.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
35	189	75.5	77	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
36	194	77.5	76	76.8	38.38	3B	14	3.5	0.64	0.35	0.04				0.00	0.00	0.00	0.35	0.04
37	192	75.5	73	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
38	196	80	74	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
39	175	73	71.5	72.2	36.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	192	75	74.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3752									5.99	0.66					0	0	5.9924	0.6644

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:1/3

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 1

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 2
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 3.75
23				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
24				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 5.99
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 1.58
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 7.57
27	5A	11	3.5	0.41	0.21	0.02				0.00	0.00	0.00	0.21	0.02	0.31	0.03	
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top 0.66
29	1B	19	5.5	1.17	1.05	0.12				0.00	0.00	0.00	1.05	0.12	4.51	0.50	Ea Bottom 0.18
30				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total 0.84
31				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
32				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.85	0.09	Top Br 5
33				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.24	0.14	Bottom Br 3
34				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit 6
35	5B	13.5	3.5	0.60	0.32	0.04				0.00	0.00	0.00	0.32	0.04	0.32	0.04	
36				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.35	0.04	
37				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
40				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total					1.58	0.18					0	0	1.58	0.18	7.5741	0.8397	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:1/4

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 1

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
41	187	73.5	78	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
42	176	78	73.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
43	194	77.5	75.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
44	175	74.5	76	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
45	193	74	78	76.0	38.00	3B	20.5	6.5	1.41	1.48	0.16				0.00	0.00	0.00	1.48	0.16
46	180	73.5	75	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
47	195	73.5	77	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
48	189	77	72.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
49	196	76	78.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
50	194	77	78	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	194	79	74.5	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
52	195	78.5	75	76.8	38.38	3B	20.5	6	1.39	1.36	0.15				0.00	0.00	0.00	1.36	0.15
53	185	74.5	77	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
54	194	77	75.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
55	179	76.5	75	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
56	181	76.5	74	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	187	77	75	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
58	195		74	37.0	18.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
59	195	74	76	75.0	37.50	2B	18	2	1.10	0.40	0.04				0.00	0.00	0.00	0.40	0.04
60	191	77.5	74	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3775								3.24	0.36					0	0		3.2385	0.3590

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:1/5

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 1

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
41				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3	
42				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.78
43				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	3.24
44				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.76
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.48	0.16	Vol Total	4.00
46	5A	17	5	0.99	0.76	0.08				0.00	0.00	0.00	0.76	0.08	0.76	0.08		
47				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
48				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	0.36
49				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.08
50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.44
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
52				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.36	0.15	Top Br	3
53				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	1
54				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit	4
55				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
57				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
58				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
59				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.40	0.04		
60				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Total				0.76	0.08					0	0		0.76	0.08	3.9959	0.4430		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:1/6

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 1

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
61	177	74.5	77	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	176	71.5	75.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	190	76.5	75.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
64	195	74.5	75	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
65	178	76.5	72.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
66	194	75	78	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
67	184	77	75.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	178	74.5	73	73.8	36.88	2B	18.5	6.5	1.18	1.20	0.13				0.00	0.00	0.00	1.20	0.13
69	191	76	76	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	176	76	75	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	178	72.5	77	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	192	76	75.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	183	76.5	73	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	177	73	76.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	177	74.5	75	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	184	76.5	75.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	185	75.5	73.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	192	70.5	73.5	72.0	36.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	184	73.5	74	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	194	75	78	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3685									1.20	0.13					0	0	1.2013	0.1332

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:1/7

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 1

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary		
61				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 4		
62	4B	12	3	0.49	0.21	0.02				0.00	0.00	0.00	0.21	0.02	0.21	0.02	Weight(kg)	3.68	
63				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00			
64				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	1.20	
65				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.31	
66				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	1.51	
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00			
68				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.20	0.13	Ea Top	0.13	
69				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.03	
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.17	
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00			
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br	1	
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	2	
74	4C	10	2	0.34	0.10	0.01				0.00	0.00	0.00	0.10	0.01	0.10	0.01	Br Fruit	3	
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00			
76				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00			
77				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton		
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br	21	
79				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	15	
80				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit	28	
Total				0.31	0.03					0	0	0.31	0.03	0.31	0.03	1.5118	0.1676		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:1/8

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 1

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
81	182	76.5	75.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	188	79	74.5	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	191	74	75	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	193	76	79	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	190	74.5	74.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	190	73.5	77	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	189	74.5	76	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	182	74.5	75	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
89	183	74	75	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
90	187	77.5	72	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
91	192	77	74.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
92	186	75.5	74	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
93	190	73.5	76.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
94	187	74.5	75.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
95	175	74.5	73.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
96	195	78.5	72	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
97	175	72.5	74.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
98	191	76.5	76.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
99	188	76	77.5	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
100	195	75.5	76.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3749								0	0	0				0	0	0	0	0

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:1/9

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 1

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 5	
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.75
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	0.00
85				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.00
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	0.00
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	0.00
89				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.00
90				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.00
91				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
92				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton	
93				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	18.59
94				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
95				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	17.33
96				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	8.74
97				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	26.08
98				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
99				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	1.92
100				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.97
Total				0	0	0				0	0	0	0	0	0	0	Ea Total	2.89

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:1/10

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 2

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	179	73	73	73.0	36.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
2	195	72	78	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
3	195	76	77	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
4	180	74	69.5	71.8	35.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
5	188	74	77	75.5	37.75	1B	16	5	0.86	0.67	0.07	3B	14	4	0.65	0.40	0.04	1.06	0.12
6	190	74.5	79	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
7	193	75	75	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
8	184	76	75.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
9	175	76.5	71	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
10	177	75	74.5	74.8	37.38	3C	11	4	0.41	0.25	0.03				0.00	0.00	0.00	0.25	0.03
11	180	76	71.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
12	185	74	78.5	76.2	38.12	1B	11	4	0.40	0.25	0.03				0.00	0.00	0.00	0.25	0.03
13	195	71	80	75.5	37.75	1B	18	7	1.09	1.24	0.14	3B	24	8	1.96	2.58	0.29	3.82	0.42
14	193	74.5	75	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
15	186	76	75.5	75.8	37.88	3B	18	5.5	1.08	0.94	0.10				0.00	0.00	0.00	0.94	0.10
16	184	74.5	74.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
17	175	74.5	73.5	74.0	37.00	3B	11	3	0.41	0.18	0.02				0.00	0.00	0.00	0.18	0.02
18	195	76	76.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
19	192	77	75	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
20	194	74	77.5	75.8	37.88	3B	18	6.5	1.08	1.13	0.13				0.00	0.00	0.00	1.13	0.13
Total	3735								4.65	0.51					2.98	0.33		7.6270	0.8456

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:2/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 2

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 1
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.73
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top
5	5C	21.5	4.5	1.56	1.16	0.13				0.00	0.00	0.00	1.16	0.13	2.23	0.25	Vol Bottom
6	5C	20	4	1.33	0.88	0.10				0.00	0.00	0.00	0.88	0.10	0.88	0.10	Vol Total
7				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.19
8	5C	25	6	2.12	2.15	0.24				0.00	0.00	0.00	2.15	0.24	2.15	0.24	Ea Top
9	5C	18	4	1.12	0.69	0.08				0.00	0.00	0.00	0.69	0.08	0.69	0.08	Ea Bottom
10	5C	15	5	0.76	0.58	0.06				0.00	0.00	0.00	0.58	0.06	0.83	0.09	Ea Total
11	5B	21	7	1.53	1.69	0.19				0.00	0.00	0.00	1.69	0.19	1.69	0.19	
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.25	0.03	Top Br
13				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.82	0.42	Bottom Br
14	5B	25	5	2.15	1.85	0.20				0.00	0.00	0.00	1.85	0.20	1.85	0.20	Br Fruit
15				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.94	0.10	
16	5C	18	5	1.10	0.86	0.09				0.00	0.00	0.00	0.86	0.09	0.86	0.09	
17				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.18	0.02	
18	5B	20	3	1.33	0.70	0.08				0.00	0.00	0.00	0.70	0.08	0.70	0.08	
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.13	0.13	
Total					10.6	1.17					0	0	10.6	1.17	18.195	2.0171	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:2/2

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 2

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
21	195	76.5	75	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
22	183	73.5	71.5	72.5	36.25	2C	17	5	1.01	0.76	0.08				0.00	0.00	0.00	0.76	0.08
23	190	77	75.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
24	183	76	70.5	73.2	36.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
25	183	73	76	74.5	37.25	3B	11	2	0.41	0.12	0.01				0.00	0.00	0.00	0.12	0.01
26	180	74	73.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
27	175	71.5	72	71.8	35.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
28	192	72.5	75.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
29	176	74	73	73.5	36.75	3B	27	7.5	2.57	3.18	0.35				0.00	0.00	0.00	3.18	0.35
30	195	75	75	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
31	176	72.5	76	74.2	37.12	3B	14.5	3.5	0.71	0.37	0.04				0.00	0.00	0.00	0.37	0.04
32	183	74	72	73.0	36.50	2B	16	5	0.89	0.67	0.07				0.00	0.00	0.00	0.67	0.07
33	188	73	75	74.0	37.00	3C	20	7	1.38	1.53	0.17				0.00	0.00	0.00	1.53	0.17
34	195	76.5	76.5	76.5	38.25	3B	19	7	1.20	1.37	0.15				0.00	0.00	0.00	1.37	0.15
35	173	75	68.5	71.8	35.88	3B	12	4	0.51	0.29	0.03				0.00	0.00	0.00	0.29	0.03
36	180	76.5	73.5	75.0	37.50	3B	15	5	0.76	0.58	0.06				0.00	0.00	0.00	0.58	0.06
37	195	77.5	75	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
38	180	76	71.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
39	192	77	77.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	184	75.5	75	75.2	37.62	3B	15	8	0.76	1.07	0.12				0.00	0.00	0.00	1.07	0.12
Total	3698								9.95	1.10					0	0		9.9454	1.1026

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:2/3

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 2

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 2	
22	5A	18	5	1.14	0.86	0.10				0.00	0.00	0.00	0.86	0.10	1.62	0.18	Weight(kg)	3.70
23	5A	13	4	0.56	0.34	0.04				0.00	0.00	0.00	0.34	0.04	0.34	0.04	Vol Top	9.95
24				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	6.41
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.12	0.01	Vol Total	16.36
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
27				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	1.10
29	6C	15	4.5	0.77	0.52	0.06				0.00	0.00	0.00	0.52	0.06	3.70	0.41	Ea Bottom	0.71
30				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	1.81
31				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.37	0.04		
32	5B	14	4	0.68	0.40	0.04				0.00	0.00	0.00	0.40	0.04	1.07	0.12	Top Br	9
33	5A	20	6	1.38	1.30	0.14				0.00	0.00	0.00	1.30	0.14	2.83	0.31	Bottom Br	8
34	5A	17	6	0.96	0.92	0.10				0.00	0.00	0.00	0.92	0.10	2.29	0.25	Br Fruit	9
35	5C	18.5	6	1.21	1.10	0.12				0.00	0.00	0.00	1.10	0.12	1.40	0.15		
36	5A	12	3	0.48	0.21	0.02				0.00	0.00	0.00	0.21	0.02	0.80	0.09		
37				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
40	5A	17	5	0.97	0.76	0.08				0.00	0.00	0.00	0.76	0.08	1.82	0.20		
Total					6.41	0.71					0	0	6.41	0.71	16.358	1.8135		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:2/4

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 2

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
41	175	75	70	72.5	36.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
42	187	75	75	75.0	37.50	3A	12	2	0.48	0.15	0.02				0.00	0.00	0.00	0.15	0.02
43	195	77	73.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
44	195	75.5	74	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
45	190	75.5	75	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	193	77.5	74.5	76.0	38.00	3B	17.5	6	1.02	0.98	0.11				0.00	0.00	0.00	0.98	0.11
47	195	79.5	76	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
48	190	73.5	76.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
49	190	75.5	78	76.8	38.38	3C	17	6	0.95	0.92	0.10				0.00	0.00	0.00	0.92	0.10
50	182	74	75.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	191	79	75	77.0	38.50	3B	18	4.5	1.07	0.77	0.09				0.00	0.00	0.00	0.77	0.09
52	180	75.5	74.5	75.0	37.50	3B	23	8	1.81	2.36	0.26				0.00	0.00	0.00	2.36	0.26
53	185	77.5	74.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
54	186	71.5	80.5	76.0	38.00	3B	18.5	5	1.14	0.91	0.10				0.00	0.00	0.00	0.91	0.10
55	190	73	78.5	75.8	37.88	3B	16.5	4.5	0.91	0.64	0.07				0.00	0.00	0.00	0.64	0.07
56	191	75.5	79	77.2	38.62	3B	15	6.5	0.74	0.80	0.09				0.00	0.00	0.00	0.80	0.09
57	182	76	71.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
58	182	73.5	74.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
59	176	73	77	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
60	184	73	74.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3739									7.51	0.83					0	0	7.5130	0.8329

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:2/5

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 2

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
41				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3	
42	5A	15	5.5	0.76	0.65	0.07				0.00	0.00	0.00	0.65	0.07	0.80	0.09	Weight(kg)	3.74
43				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
44	5A	11	3	0.41	0.18	0.02				0.00	0.00	0.00	0.18	0.02	0.18	0.02	Vol Top	7.51
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	2.78
46	5B	16.5	5	0.91	0.71	0.08				0.00	0.00	0.00	0.71	0.08	1.68	0.19	Vol Total	10.29
47				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
48				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	0.83
49				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.92	0.10	Ea Bottom	0.31
50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	1.14
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.77	0.09		
52	6B	13	5	0.57	0.44	0.05				0.00	0.00	0.00	0.44	0.05	2.81	0.31	Top Br	8
53				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	6
54	5B	15.5	5	0.80	0.62	0.07				0.00	0.00	0.00	0.62	0.07	1.53	0.17	Br Fruit	9
55	5A	11	3	0.40	0.18	0.02				0.00	0.00	0.00	0.18	0.02	0.81	0.09		
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.80	0.09		
57				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
58				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
59				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
60				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Total					2.78	0.31					0	0	2.78	0.31	10.293	1.1412		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:2/6

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 2

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
61	181	61	76.5	68.8	34.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	180	76.5	73.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	190	75	74	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
64	191	74	76.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
65	191	74	79.5	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
66	195	76.5	74.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
67	185	74.5	75.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	188	73	76.5	74.8	37.38	3B	14	3.5	0.66	0.35	0.04				0.00	0.00	0.00	0.35	0.04
69	181	74	72.5	73.2	36.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	195	77	74	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	195	80	75	77.5	38.75	3B	11	2	0.39	0.12	0.01				0.00	0.00	0.00	0.12	0.01
72	189	73.5	78	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	183	75	73	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	173	74.5	72	73.2	36.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	189	74	76.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	185	75	77.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	181	73	73	73.0	36.50	3B	12	3.5	0.50	0.25	0.03				0.00	0.00	0.00	0.25	0.03
78	191	76	78	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	178	72.5	75	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	195	76	79	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3736									0.72	0.08					0	0	0.7169	0.0795

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:2/7

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 2

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
61				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 4
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)
63				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.74
64				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top
65				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72
66				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
68				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.35	0.04	Ea Top
69				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.12	0.01	Ea Total
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
74				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
76				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
77				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.25	0.03	Carton
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
79				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
80				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total				0	0	0				0	0	0	0	0	0.7169	0.0795	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:2/8

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 2

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
81	191	77	75.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	186	73.5	77	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	189	75.5	73.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	195	75	80.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	190	75	76.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	196	76.5	77	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	181	75.5	76.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	184	77	73.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
89	180	76	73	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
90	186	73.5	73.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
91	185	73.5	75	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
92	181	75	75	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
93	189	76	79	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
94	188	72.5	77	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
95	190	77.5	75	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
96	171	73	76	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
97	190	72	76	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
98	177	75	73.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
99	188	75	76	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
100	192	77	77	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3729									0	0					0	0	0	0

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in ml, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple ml, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple ml, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple ml, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:2/9

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 2

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 5	
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.73
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	0.00
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.00
85				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	0.00
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	0.00
89				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.00
90				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.00
91				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
92				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton	
93				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	18.64
94				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
95				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	25.80
96				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	19.76
97				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	45.56
98				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
99				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	2.86
100				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	2.19
Total					0	0					0	0	0	0	0	0	Ea Total	5.05

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in ml, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple ml, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple ml, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple ml, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:2/10

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 3

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	185	73.5	74.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
2	177	73.5	76.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
3	195	77.5	75	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
4	185	74.5	76.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
5	181	74	76	75.0	37.50	1B	19.5	3.5	1.29	0.75	0.08				0.00	0.00	0.00	0.75	0.08
6	189	74	75.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
7	188	73	75.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
8	184	72	77	74.5	37.25	1B	18.5	6.5	1.17	1.20	0.13				0.00	0.00	0.00	1.20	0.13
9	195	75.5	75	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
10	186	75.5	77.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
11	195	78.5	76.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
12	179	74.5	73.5	74.0	37.00	3C	15	5	0.77	0.58	0.06				0.00	0.00	0.00	0.58	0.06
13	180	72	74.5	73.2	36.62	1C	17	4.5	1.00	0.68	0.08	3B	14	3.5	0.68	0.35	0.04	1.03	0.11
14	186	73	74.5	73.8	36.88	3B	14	4	0.67	0.40	0.04				0.00	0.00	0.00	0.40	0.04
15	190	75.5	76.5	76.0	38.00	3B	14	4.5	0.65	0.45	0.05				0.00	0.00	0.00	0.45	0.05
16	181	74.5	78.5	76.5	38.25	3B	18	5	1.07	0.85	0.09				0.00	0.00	0.00	0.85	0.09
17	183	74	75	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
18	192	76	75.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
19	183	75.5	75.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
20	178	76	72	74.0	37.00	3C	16	5	0.88	0.67	0.07				0.00	0.00	0.00	0.67	0.07
Total	3712									5.58	0.62					0.35	0.04	5.9283	0.6572

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:3/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 3

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 1
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.71
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top
5	5B	15	3	0.76	0.35	0.04				0.00	0.00	0.00	0.35	0.04	1.10	0.12	5.93
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom
7	5B	22	5	1.67	1.35	0.15				0.00	0.00	0.00	1.35	0.15	1.35	0.15	11.65
8	5B	22	5.5	1.66	1.47	0.16				0.00	0.00	0.00	1.47	0.16	2.67	0.30	17.58
9				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total
10	5B	14	4	0.65	0.40	0.04				0.00	0.00	0.00	0.40	0.04	0.40	0.04	0.66
11	5C	18	5	1.06	0.85	0.09				0.00	0.00	0.00	0.85	0.09	0.85	0.09	1.29
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.58	0.06	Ea Top
13	5B	22	4	1.69	1.13	0.13				0.00	0.00	0.00	1.13	0.13	2.16	0.24	0.66
14	5C	22	4	1.68	1.13	0.12				0.00	0.00	0.00	1.13	0.12	1.52	0.17	1.29
15				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.45	0.05	Ea Bottom
16	5B	21.5	4	1.54	1.05	0.12				0.00	0.00	0.00	1.05	0.12	1.90	0.21	1.95
17	5B	15.5	3	0.82	0.38	0.04				0.00	0.00	0.00	0.38	0.04	0.38	0.04	0.66
18	5C	27	7	2.49	2.96	0.33				0.00	0.00	0.00	2.96	0.33	2.96	0.33	1.29
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total
20	5C	15	5	0.77	0.58	0.06				0.00	0.00	0.00	0.58	0.06	1.25	0.14	0.66
Total					11.7	1.29					0	0	11.7	1.29	17.579	1.9489	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:3/2

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 3

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
21	195	77	78	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
22	192	77	77.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
23	178	75	73	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
24	186	75.5	76	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
25	193	77.5	75	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
26	194	75.5	77.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
27	183	74.5	74.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
28	187	71.5	76.6	74.1	37.03	3B	18.5	6	1.17	1.10	0.12				0.00	0.00	0.00	1.10	0.12
29	191	76.8	76	76.4	38.20	1B	12	3	0.47	0.21	0.02	3B	14	6	0.65	0.64	0.07	0.85	0.09
30	182	74	75.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
31	195	77.5	77.5	77.5	38.75	3B	13	4	0.55	0.34	0.04				0.00	0.00	0.00	0.34	0.04
32	192	75	76	75.5	37.75	3B	16	5	0.86	0.67	0.07				0.00	0.00	0.00	0.67	0.07
33	179	74	77	75.5	37.75	3B	15.5	5	0.80	0.62	0.07				0.00	0.00	0.00	0.62	0.07
34	174	71	74	72.5	36.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
35	186	72	76.5	74.2	37.12	3B	14	4.5	0.67	0.45	0.05				0.00	0.00	0.00	0.45	0.05
36	189	76	76.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
37	187	74	73	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
38	192	77	73.5	75.2	37.62	5B	22	5.5	1.64	1.47	0.16				0.00	0.00	0.00	1.47	0.16
39	188	78	73	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	186	75	77	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3749									4.86	0.54					0.64	0.07	5.4988	0.6096

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:3/3

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 3

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 2	
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.75
23				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
24				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	5.50
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	1.47
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	6.97
27				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.10	0.12	Ea Top	0.61
29				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.85	0.09	Ea Bottom	0.16
30				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.77
31				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.34	0.04		
32				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.67	0.07	Top Br	8
33				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.62	0.07	Bottom Br	0
34				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit	7
35				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.45	0.05		
36				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
37				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
38	5B	22	5.5	1.64	1.47	0.16				0.00	0.00	0.00	1.47	0.16	2.94	0.33		
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
40				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Total					1.47	0.16					0	0	1.47	0.16	6.9690	0.7726		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:3/4

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 3

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
41	193	72.5	74.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
42	185	75	77	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
43	194	74	74	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
44	187	74	73	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
45	187	72.5	78	75.2	37.62	3B	14	4.5	0.66	0.45	0.05				0.00	0.00	0.00	0.45	0.05
46	175	76.5	71.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
47	175	74.5	74	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
48	182	76.5	75.5	76.0	38.00	3B	13	3.5	0.56	0.30	0.03				0.00	0.00	0.00	0.30	0.03
49	180	75	74.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
50	195	76.5	77.5	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	188	74	77.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
52	185	76.5	71.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
53	189	75.5	75.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
54	194	75	78	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
55	195	76.5	74.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
56	193	79	73.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	186	74.5	76.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
58	188	75	76	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
59	195	77	78	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
60	179	74.5	73	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3745								0.75	0.08					0	0		0.7467	0.0828

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:3/5

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 3

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
41				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3	
42				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.74
43				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	0.75
44				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.23
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.45	0.05	Vol Total	0.98
46				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
47				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
48				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.30	0.03	Ea Top	0.08
49				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.03
50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.11
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
52				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br	3
53				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	1
54				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit	4
55				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
57				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
58	5B	12.5	3	0.52	0.23	0.03				0.00	0.00	0.00	0.23	0.03	0.23	0.03		
59				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
60				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Total					0.23	0.03					0	0	0.23	0.03	0.9792	0.1086		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:3/6

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 3

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
61	189	77	76.5	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	189	75	76	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	189	74.5	77.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
64	190	76.5	76	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
65	191	75	72.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
66	190	72.5	75	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
67	183	73	75.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	192	77.5	77.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	181	75	74.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	194	73	79.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	191	77	73.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	184	77.5	74.5	76.0	38.00	2B	20	6.5	1.34	1.40	0.16				0.00	0.00	0.00	1.40	0.16
73	184	75	74.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	193	73	76	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	191	74.5	73.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	184	75	74.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	175	76	71	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	178	71.5	75.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	192	74	74.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	178	74.5	71	72.8	36.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3738									1.40	0.16					0	0	1.4041	0.1557

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:3/7

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 3

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
61				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 4	
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.74
63	6A	9	2	0.27	0.08	0.01				0.00	0.00	0.00	0.08	0.01	0.08	0.01	Vol Top	1.40
64				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.08
65				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	1.48
66				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
68				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	0.16
69				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.01
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.16
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.40	0.16	Top Br	1
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	1
74				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit	2
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
76				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
77				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton	
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br	21
79				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	13
80				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit	26
Total				0.08	0.01					0	0	0.08	0.01		1.4810	0.1642		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:3/8

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 3

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
81	181	71	73	72.0	36.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	182	76	74.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	185	75	73.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	195	74	80	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	185	76	72.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	180	73	74	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	189	75	72.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	178	73	72.5	72.8	36.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
89	190	74.5	77	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
90	179	74.5	73.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
91	183	73.5	77.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
92	195	76.5	80	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
93	176	73	72	72.5	36.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
94	185	75	71	73.0	36.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
95	177	74	71	72.5	36.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
96	179	71.5	76	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
97	192	77	75	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
98	175	71.5	70.5	71.0	35.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
99	184	74	73.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
100	184	73	77.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3674								0	0	0				0	0	0	0	0

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:3/9

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 3

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 5	
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.67
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	0.00
85				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.00
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	0.00
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	0.00
89				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.00
90				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.00
91				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
92				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton	
93				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	18.62
94				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
95				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	13.58
96				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	13.43
97				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	27.01
98				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
99				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	1.51
100				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	1.49
Total						0					0	0	0	0	0	0	Ea Total	2.99

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:3/10

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 4

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	195	75.5	76.5	76.0	38.00	1C	17	4.5	0.96	0.68	0.08				0.00	0.00	0.00	0.68	0.08
2	195	74	76.5	75.2	37.62	1B	13	3.5	0.57	0.30	0.03				0.00	0.00	0.00	0.30	0.03
3	195	77.5	79.5	78.5	39.25	1B	19	6.5	1.17	1.26	0.14				0.00	0.00	0.00	1.26	0.14
4	184	75	76	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
5	181	74	75.5	74.8	37.38	1B	18	7	1.10	1.24	0.14				0.00	0.00	0.00	1.24	0.14
6	186	74.5	74	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
7	188	76	76.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
8	184	74.5	73.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
9	185	75	76.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
10	191	76.5	75.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
11	185	76	74.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
12	193	76	79	77.5	38.75	1B	21	6	1.45	1.43	0.16				0.00	0.00	0.00	1.43	0.16
13	186	75.5	71.5	73.5	36.75	3B	20	7	1.39	1.53	0.17				0.00	0.00	0.00	1.53	0.17
14	191	77	75	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
15	187	72	77.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
16	184	74.5	78.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
17	184	75	74.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
18	179	75	74.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
19	186	74.5	73.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
20	186	74	76	75.0	37.50	3B	15	5	0.76	0.58	0.06				0.00	0.00	0.00	0.58	0.06
Total	3745									7.01	0.78					0	0	7.0124	0.7774

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:4/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 4

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.68	0.08	Tray 1
2	5B	23	6	1.80	1.77	0.20				0.00	0.00	0.00	1.77	0.20	2.06	0.23	Weight(kg)
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.26	0.14	
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.24	0.14	Vol Bottom
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total
7	5C	27.5	6.5	2.57	2.89	0.32				0.00	0.00	0.00	2.89	0.32	2.89	0.32	
8	5C	20	3	1.38	0.71	0.08				0.00	0.00	0.00	0.71	0.08	0.71	0.08	Ea Top
9				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom
10	5C	15	4	0.75	0.46	0.05				0.00	0.00	0.00	0.46	0.05	0.46	0.05	Ea Total
11	5B	13	3	0.57	0.25	0.03				0.00	0.00	0.00	0.25	0.03	0.25	0.03	
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.43	0.16	Top Br
13	5B	20	4	1.39	0.89	0.10				0.00	0.00	0.00	0.89	0.10	2.42	0.27	Bottom Br
14	5B	24	6	1.94	1.95	0.22				0.00	0.00	0.00	1.95	0.22	1.95	0.22	Br Fruit
15	5B	24	6	1.98	1.95	0.22				0.00	0.00	0.00	1.95	0.22	1.95	0.22	
16				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
17				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
18	5B	21	6	1.51	1.44	0.16				0.00	0.00	0.00	1.44	0.16	1.44	0.16	
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
20	5C	16	4	0.86	0.53	0.06				0.00	0.00	0.00	0.53	0.06	1.11	0.12	
Total					12.8	1.42					0	0	12.8	1.42	19.851	2.2008	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:4/2

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 4

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
21	190	76	72	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
22	178	74	77	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
23	181	72	76.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
24	195	73	80	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
25	185	74.5	77.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
26	191	74.5	75.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
27	195	77	81	79.0	39.50	2C	14	5	0.63	0.51	0.06				0.00	0.00	0.00	0.51	0.06
28	193	75	73	74.0	37.00	3B	14	5	0.67	0.51	0.06				0.00	0.00	0.00	0.51	0.06
29	195	76	77	76.5	38.25	3B	18	4	1.07	0.69	0.08				0.00	0.00	0.00	0.69	0.08
30	184	74.5	72.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
31	184	77	78	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
32	187	76	75	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
33	191	75	74	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
34	195	76.5	79	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
35	191	79	72.5	75.8	37.88	3B	15	5	0.75	0.58	0.06				0.00	0.00	0.00	0.58	0.06
36	190	78	75	76.5	38.25	3B	19	7	1.20	1.37	0.15				0.00	0.00	0.00	1.37	0.15
37	195	78	73.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
38	189	76.5	75.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
39	192	78.5	73	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	178	74	74	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3779									3.66	0.41					0	0	3.6592	0.4057

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:4/3

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 4

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 2	
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.78
23				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	3.66
24				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.69
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	4.35
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
27	4B	15	3	0.72	0.35	0.04				0.00	0.00	0.00	0.35	0.04	0.85	0.09	Ea Top	0.41
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.51	0.06	Ea Bottom	0.08
29	4C	14	3.5	0.65	0.35	0.04				0.00	0.00	0.00	0.35	0.04	1.03	0.11	Ea Total	0.48
30				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
31				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
32				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br	5
33				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	2
34				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit	6
35				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.58	0.06		
36				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.37	0.15		
37				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
40				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Total					0.69	0.08					0	0	0.69	0.08	4.3507	0.4823		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:4/4

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 4

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
41	181	72	75	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
42	179	76	72.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
43	195	81.5	77.5	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
44	191	74.5	76	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
45	187	75	73.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	195	79	75	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
47	183	75	75	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
48	195	76.5	75.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
49	195	75	79	77.0	38.50	1B	14	4	0.64	0.40	0.04				0.00	0.00	0.00	0.40	0.04
50	176	73	75.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	195	80.5	74	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
52	184	74	75.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
53	184	74.5	75	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
54	194	76.5	74.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
55	179	75.5	76	75.8	37.88	3B	11	2.5	0.40	0.15	0.02				0.00	0.00	0.00	0.15	0.02
56	182	74.5	76.5	75.5	37.75	1B	14	5	0.65	0.51	0.06				0.00	0.00	0.00	0.51	0.06
57	193	75	79.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
58	188	75.5	76	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
59	189	74.5	79.5	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
60	194	77	75.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3759									1.05	0.12					0	0	1.0522	0.1167

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:4/5

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 4

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
41				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3	
42				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.76
43				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
44				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	1.05
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.89
46				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	1.94
47				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
48				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	0.12
49	4A	17.5	5.5	1.01	0.89	0.10				0.00	0.00	0.00	0.89	0.10	1.28	0.14	Ea Bottom	0.10
50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.21
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
52				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br	4
53				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	1
54				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit	3
55				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.15	0.02		
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.51	0.06		
57				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
58				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
59				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
60				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Total					0.89	0.10					0	0	0.89	0.10	1.9375	0.2148		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:4/6

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 4

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
61	183	75.5	73	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	181	77	73	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	176	71	71.5	71.2	35.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
64	189	71.5	79	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
65	176	74.5	72.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
66	175	74.5	73	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
67	183	75	73.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	193	77	79.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	192	75	77	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	180	76.5	72	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	195	76.5	79	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	174	74.5	74	74.2	37.12	2B	10	2.5	0.34	0.12	0.01				0.00	0.00	0.00	0.12	0.01
73	181	73	76.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	176	73.5	74	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	193	75.5	75	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	196	73.5	76.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	179	73.5	72	72.8	36.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	189	77.5	75.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	176	71.5	76.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	195	77.5	76	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3682									0.12	0.01					0	0	0.1207	0.0134

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mis, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:4/7

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 4

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
61				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 4	
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.68
63	5A	11	2	0.43	0.12	0.01				0.00	0.00	0.00	0.12	0.01	0.12	0.01		
64				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	0.12
65				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.12
66				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	0.24
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
68				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	0.01
69				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.01
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.03
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.12	0.01	Top Br	1
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	1
74				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit	2
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
76				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
77				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton	
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br	17
79				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	14
80				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit	25
Total				0.12	0.01						0	0	0.12	0.01	0.2410	0.0267		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mis, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:4/8

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 4

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
81	192	74.5	76	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	189	73	71.5	72.2	36.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	179	76.5	73.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	195	76.5	78.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	187	75.5	74.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	187	78	74.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	177	73	73	73.0	36.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	193	78.5	75	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
89	185	75	77	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
90	182	76	74	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
91	180	74	75	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
92	191	77.5	75	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
93	177	72.5	73.5	73.0	36.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
94	195	76.5	76.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
95	175	74.5	72	73.2	36.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
96	177	74.5	72.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
97	178	76	71.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
98	175	77	74	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
99	190	74	73	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
100	178	70.5	72.5	71.5	35.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3682									0	0					0	0	0	0

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:4/9

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 4

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 5	
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.68
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	0.00
85				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.00
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	0.00
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	0.00
89				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.00
90				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.00
91				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
92				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton	
93				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	18.65
94				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
95				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	11.84
96				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	14.54
97				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	26.38
98				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
99				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	1.31
100				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	1.61
Total						0					0	0			0	0	Ea Total	2.92

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:4/10

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 5

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	195	74	77	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
2	179	75.5	72	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
3	192	73	77	75.0	37.50	1B	14	2	0.66	0.21	0.02				0.00	0.00	0.00	0.21	0.02
4	195	75	75	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
5	189	77.5	72.5	75.0	37.50	1B	14	3.5	0.66	0.35	0.04				0.00	0.00	0.00	0.35	0.04
6	175	75.5	74	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
7	195	77	74.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
8	182	71	78	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
9	176	73	73	73.0	36.50	3B	13.5	4	0.63	0.37	0.04				0.00	0.00	0.00	0.37	0.04
10	192	76	77	76.5	38.25	3B	12	3.5	0.47	0.25	0.03				0.00	0.00	0.00	0.25	0.03
11	195	78	75.5	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
12	195	82	76.5	79.2	39.62	1C	19	5	1.16	0.95	0.11	3B	16	6	0.82	0.81	0.09	1.77	0.20
13	187	76	73.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
14	185	76.5	76.5	76.5	38.25	1B	13	3.5	0.56	0.30	0.03	3C	10	3	0.33	0.15	0.02	0.44	0.05
15	178	74	75	74.5	37.25	3B	14	4.5	0.66	0.45	0.05				0.00	0.00	0.00	0.45	0.05
16	186	76.5	76.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
17	178	71.5	75	73.2	36.62	3B	13	4	0.58	0.34	0.04				0.00	0.00	0.00	0.34	0.04
18	179	74	73	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
19	184	75	75.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
20	189	75	75.5	75.2	37.62	3B	20	6	1.35	1.29	0.14				0.00	0.00	0.00	1.29	0.14
Total	3726								4.51	0.50					0.96	0.11		5.4714	0.6066

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:5/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 5

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 1
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.21	0.02	
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top
5	5C	17	3.5	0.98	0.54	0.06				0.00	0.00	0.00	0.54	0.06	0.88	0.10	Vol Bottom
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total
7	5B	17	2	0.97	0.34	0.04				0.00	0.00	0.00	0.34	0.04	0.34	0.04	
8	5B	18	5	1.10	0.86	0.09				0.00	0.00	0.00	0.86	0.09	0.86	0.09	Ea Top
9				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.37	0.04	Ea Bottom
10	5C	17	3.5	0.96	0.53	0.06				0.00	0.00	0.00	0.53	0.06	0.78	0.09	Ea Total
11	5B	15	4.5	0.74	0.52	0.06				0.00	0.00	0.00	0.52	0.06	0.52	0.06	
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.77	0.20	Top Br
13	5B	22	5	1.66	1.35	0.15				0.00	0.00	0.00	1.35	0.15	1.35	0.15	Bottom Br
14				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.44	0.05	Br Fruit
15	5B	16	4	0.87	0.53	0.06				0.00	0.00	0.00	0.53	0.06	0.98	0.11	
16	5B	14	3.5	0.65	0.35	0.04				0.00	0.00	0.00	0.35	0.04	0.35	0.04	
17	5C	13	4	0.58	0.34	0.04				0.00	0.00	0.00	0.34	0.04	0.68	0.08	
18	5B	16	3	0.88	0.41	0.05				0.00	0.00	0.00	0.41	0.05	0.41	0.05	
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
20	5C	15	3	0.76	0.35	0.04				0.00	0.00	0.00	0.35	0.04	1.64	0.18	
Total					6.11	0.68					0	0	6.11	0.68	11.586	1.2844	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:5/2

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 5

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
21	195	77.5	72.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
22	191	76.5	76	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
23	192	77	73.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
24	192	77	75.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
25	195	75	78.5	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
26	177	73	75	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
27	191	76.5	76	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
28	191	76.5	76.5	76.5	38.25	3B	16	5	0.85	0.66	0.07				0.00	0.00	0.00	0.66	0.07
29	185	77	74	75.5	37.75	1B	17	3	0.97	0.47	0.05	3B	12	5	0.48	0.38	0.04	0.85	0.09
30	194	76.5	77	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
31	175	73.5	74.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
32	178	73.5	75.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
33	186	74	78.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
34	191	75.5	76.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
35	179	73.5	74.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
36	195	74.5	80	77.2	38.62	1B	17	4	0.95	0.60	0.07	3B	24	8	1.91	2.57	0.29	3.18	0.35
37	188	80	72	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
38	178	73	77	75.0	37.50	3B	14.5	3.5	0.71	0.37	0.04				0.00	0.00	0.00	0.37	0.04
39	194	75	79	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	195	73.5	75.5	74.5	37.25	2A	10	2.5	0.34	0.12	0.01				0.00	0.00	0.00	0.12	0.01
Total	3762								2.23	0.25					2.95	0.33		5.1844	0.5748

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:5/3

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 5

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 2	
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.76
23				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
24				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	5.18
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.47
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	5.65
27				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.66	0.07	Ea Top	0.57
29				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.85	0.09	Ea Bottom	0.05
30				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.63
31				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
32				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br	7
33				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	2
34				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit	6
35				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
36	4C	12	4	0.47	0.29	0.03				0.00	0.00	0.00	0.29	0.03	3.47	0.38		
37	5C	13	2	0.56	0.18	0.02				0.00	0.00	0.00	0.18	0.02	0.18	0.02		
38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.37	0.04		
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
40				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.12	0.01		
Total				0.47	0.05					0	0		0.47	0.05	5.6495	0.6263		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:5/4

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 5

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
41	190	77.5	77.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
42	193	74.5	76	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
43	185	73.5	74.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
44	188	76.5	78.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
45	185	74	74	74.0	37.00	3B	16	3.5	0.88	0.47	0.05				0.00	0.00	0.00	0.47	0.05
46	188	74.5	77	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
47	193	76.5	80.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
48	175	74	70	72.0	36.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
49	187	75	77	76.0	38.00	1B	14.5	4	0.70	0.43	0.05				0.00	0.00	0.00	0.43	0.05
50	181	78.5	73	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	191	74.5	78.5	76.5	38.25	3B	10	2	0.33	0.10	0.01				0.00	0.00	0.00	0.10	0.01
52	195	74.5	76	75.2	37.62	3B	16	5	0.86	0.67	0.07				0.00	0.00	0.00	0.67	0.07
53	185	78	74.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
54	183	74	76.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
55	187	72.5	78	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
56	189	74.5	75	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	178	73.5	74.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
58	195	77.5	75.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
59	193	75.5	76	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
60	191	77	74	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3752									1.66	0.18					0	0	1.6565	0.1836

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:5/5

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 5

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
41				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3
42				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)
43				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.75
44				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.47	0.05	Vol Bottom
46				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.66
47				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total
48				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.98
49	5C	12	2	0.48	0.15	0.02				0.00	0.00	0.00	0.15	0.02	0.57	0.06	Ea Top
50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18
51	5C	13	2	0.56	0.17	0.02				0.00	0.00	0.00	0.17	0.02	0.27	0.03	Ea Bottom
52				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.67	0.07	0.04
53				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22
54				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total
55				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
57				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
58				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
59				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
60				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total					0.32	0.04					0	0	0.32	0.04	1.9766	0.2191	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:5/6

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 5

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
61	188	75.5	73.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	185	74.5	73	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	193	78	75	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
64	181	76.5	74	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
65	189	74.5	78	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
66	192	77.5	77	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
67	178	71	77.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	195	76	74	75.0	37.50	3C	18.5	4.5	1.16	0.82	0.09				0.00	0.00	0.00	0.82	0.09
69	175	75.5	73	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	193	77	74.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	189	77	75.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	191	73.5	77.5	75.5	37.75	3B	17	6	0.97	0.92	0.10				0.00	0.00	0.00	0.92	0.10
73	186	77	74.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	195	74.5	78.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	195	76.5	76.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	195	77.5	75.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	185	75	79	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	187	75	77.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	178	72.5	70	71.2	35.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	192	78.5	72.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3762								1.74	0.19					0	0		1.7420	0.1931

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:5/7

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 5

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
61				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 4
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)
63				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.76
64				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top
65				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.74
66				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
68				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.82	0.09	Ea Top
69				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.92	0.10	Top Br
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br
74				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	2
76				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
77				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br
79				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br
80				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit
Total				0	0					0	0		0	0	1.7420	0.1931	27

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:5/8

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 5

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
81	195	78	79	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	195	77	76	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	175	75	75	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	190	75	76.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	177	73.5	74	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	188	79	75.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	192	77	74	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	193	76	73.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
89	178	71.5	72.5	72.0	36.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
90	187	77	75.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
91	178	74	73.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
92	182	75.5	74	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
93	175	77	70	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
94	181	77.5	72	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
95	195	76	76	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
96	192	76.5	75.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
97	177	74.5	74	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
98	195	76	77.5	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
99	182	77	73.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
100	194	75.5	74	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3721									0	0					0	0	0	0

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mis, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:5/9

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 5

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 5	
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.72
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	0.00
85				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.00
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	0.00
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	0.00
89				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.00
90				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.00
91				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
92				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton	
93				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	18.72
94				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
95				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	14.05
96				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	6.90
97				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	20.95
98				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
99				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	1.56
100				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.76
Total					0	0					0	0	0	0	0	0	Ea Total	2.32

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mis, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 23 10.93

100:5/10

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 6

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	194	77	75.5	76.2	38.12	1B	19	5.5	1.20	1.06	0.12				0.00	0.00	0.00	1.06	0.12
2	180	73	76	74.5	37.25					0.00	0.00				0.00	0.00	0.00	0.00	0.00
3	171	75.5	73	74.2	37.12					0.00	0.00				0.00	0.00	0.00	0.00	0.00
4	184	75	72.5	73.8	36.88	3C	12	3.5	0.49	0.25	0.03				0.00	0.00	0.00	0.25	0.03
5	186	73	78.5	75.8	37.88	3C	18	7	1.08	1.24	0.14				0.00	0.00	0.00	1.24	0.14
6	175	76	71	73.5	36.75					0.00	0.00				0.00	0.00	0.00	0.00	0.00
7	188	76	76.5	76.2	38.12	1B	15	4.5	0.74	0.52	0.06				0.00	0.00	0.00	0.52	0.06
8	193	73	76	74.5	37.25	3B	16	5	0.87	0.67	0.07				0.00	0.00	0.00	0.67	0.07
9	177	73	75.5	74.2	37.12					0.00	0.00				0.00	0.00	0.00	0.00	0.00
10	173	74.5	71	72.8	36.38					0.00	0.00				0.00	0.00	0.00	0.00	0.00
11	188	75.5	77.5	76.5	38.25					0.00	0.00				0.00	0.00	0.00	0.00	0.00
12	179	75.5	74	74.8	37.38	1C	13	3.5	0.57	0.30	0.03				0.00	0.00	0.00	0.30	0.03
13	175	75	72	73.5	36.75					0.00	0.00				0.00	0.00	0.00	0.00	0.00
14	175	74.5	72	73.2	36.62					0.00	0.00				0.00	0.00	0.00	0.00	0.00
15	195	75.5	80	77.8	38.88	1B	16	5	0.83	0.66	0.07	3B	18	5	1.06	0.85	0.09	1.51	0.17
16	183	78.5	75	76.8	38.38	1B	12	3	0.47	0.21	0.02	2C	12	3	0.47	0.21	0.02	0.43	0.05
17	185	73	77.5	75.2	37.62	2A	12	3	0.48	0.21	0.02	3C	14	3.5	0.66	0.35	0.04	0.56	0.06
18	187	74	75.5	74.8	37.38	3C	13	4	0.57	0.34	0.04				0.00	0.00	0.00	0.34	0.04
19	184	75	75	75.0	37.50					0.00	0.00				0.00	0.00	0.00	0.00	0.00
20	186	72	79	75.5	37.75					0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3658									5.45	0.60				1.41	0.16		6.8617	0.7607

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:6/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 6

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.06	0.12	Tray 1	
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.66
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
4	5A	19	5	1.24	0.97	0.11				0.00	0.00	0.00	0.97	0.11	1.22	0.14	Vol Top	6.86
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.24	0.14	Vol Bottom	9.31
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	16.17
7	5B	16	3	0.85	0.40	0.04				0.00	0.00	0.00	0.40	0.04	0.92	0.10		
8				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.67	0.07	Ea Top	0.76
9	5C	11	2	0.41	0.12	0.01				0.00	0.00	0.00	0.12	0.01	0.12	0.01	Ea Bottom	1.03
10	5B	22	8	1.70	2.17	0.24				0.00	0.00	0.00	2.17	0.24	2.17	0.24	Ea Total	1.79
11	5B	18.5	4	1.14	0.73	0.08				0.00	0.00	0.00	0.73	0.08	0.73	0.08		
12	5B	17	5	0.98	0.76	0.08				0.00	0.00	0.00	0.76	0.08	1.05	0.12	Top Br	15
13	5B	17	2.5	1.00	0.41	0.05				0.00	0.00	0.00	0.41	0.05	0.41	0.05	Bottom Br	10
14				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit	15
15	5C	23	6.5	1.74	1.89	0.21				0.00	0.00	0.00	1.89	0.21	3.40	0.38		
16	3B	15.5	4	0.79	0.49	0.05				0.00	0.00	0.00	0.49	0.05	0.92	0.10		
17	5C	20	5	1.35	1.08	0.12				0.00	0.00	0.00	1.08	0.12	1.64	0.18		
18				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.34	0.04		
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
20	5A	12	4	0.48	0.29	0.03				0.00	0.00	0.00	0.29	0.03	0.29	0.03		
Total					9.31	1.03					0	0	9.31	1.03	16.174	1.7932		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:6/2

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 6

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
21	175	71.5	73.5	72.5	36.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
22	177	73	74.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
23	187	76	76	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
24	189	73.5	74.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
25	189	77.5	73.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
26	190	74.5	75.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
27	177	74.5	77	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
28	195	76	79	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
29	176	73	70.5	71.8	35.88	3B	12	3	0.51	0.21	0.02				0.00	0.00	0.00	0.21	0.02
30	175	72	73.5	72.8	36.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
31	180	71.5	73.5	72.5	36.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
32	192	75.5	80.5	78.0	39.00	3C	18	5	1.05	0.85	0.09				0.00	0.00	0.00	0.85	0.09
33	182	72.5	77	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
34	191	74	76.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
35	175	72	72.5	72.2	36.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
36	185	75.5	73.5	74.5	37.25	3B	11	2	0.41	0.12	0.01				0.00	0.00	0.00	0.12	0.01
37	184	74.5	76	75.2	37.62	3C	14.5	4	0.71	0.43	0.05				0.00	0.00	0.00	0.43	0.05
38	180	72	75.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
39	185	73	78.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	189	78	73.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3673								1.61	0.18					0	0		1.6106	0.1786

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in ml, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple ml, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple ml, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple ml, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:6/3

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 6

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 2
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)
23				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.67
24				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.61
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom
27				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.05
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total
29				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.66
30	5A	15	5	0.78	0.59	0.06				0.00	0.00	0.00	0.59	0.06	0.59	0.06	Ea Top
31				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18
32				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.85	0.09	Ea Bottom
33				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12
34				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total
35				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29
36	5B	15	4	0.76	0.46	0.05				0.00	0.00	0.00	0.46	0.05	0.58	0.06	Top Br
37				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.43	0.05	4
38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	2
40				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit
Total				1.05	0.12					0	0		1.05	0.12	2.6574	0.2946	5

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in ml, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple ml, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple ml, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple ml, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:6/4

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 6

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
41	184	77.5	74.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
42	177	74	74	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
43	195	73.5	73	73.2	36.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
44	187	71.5	78	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
45	182	74	73.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	175	74.5	72.5	73.5	36.75	1A	10	2	0.34	0.10	0.01				0.00	0.00	0.00	0.10	0.01
47	188	76	76	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
48	187	77.5	76	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
49	193	77	74.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
50	188	77	76	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	191	74.5	72.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
52	195	76	74	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
53	178	73	77.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
54	187	75.5	74.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
55	188	74	71.5	72.8	36.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
56	195	76.5	77	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	195	75	75.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
58	190	75.5	73.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
59	184	75.5	75.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
60	175	73.5	75	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3734									0.10	0.01					0	0	0.0968	0.0107

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:6/5

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 6

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
41				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3	
42				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.73
43	6B	10	2	0.34	0.10	0.01				0.00	0.00	0.00	0.10	0.01	0.10	0.01		
44				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	0.10
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.39
46				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.10	0.01	Vol Total	0.49
47				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
48				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	0.01
49				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.04
50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.05
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
52				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br	2
53				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	1
54				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit	3
55	4B	12	4	0.50	0.29	0.03				0.00	0.00	0.00	0.29	0.03	0.29	0.03		
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
57				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
58				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
59				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
60				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Total					0.39	0.04					0	0	0.39	0.04	0.4856	0.0538		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:6/6

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 6

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
61	182	74	71.5	72.8	36.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	191	77	76	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	190	77.5	77	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
64	186	73.5	73	73.2	36.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
65	189	76.5	75.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
66	177	74	74	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
67	177	73.5	72	72.8	36.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	182	74.5	75.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	192	76.5	74	75.2	37.62	1C	12	3	0.48	0.21	0.02				0.00	0.00	0.00	0.21	0.02
70	183	73	74.5	73.8	36.88	3B	12	2	0.49	0.15	0.02				0.00	0.00	0.00	0.15	0.02
71	188	77	74.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	190	76.5	74	75.2	37.62	3B	13.5	15	0.61	2.95	0.33				0.00	0.00	0.00	2.95	0.33
73	195	75	78	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	179	77.5	76	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	192	73.5	74	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	183	75.5	73	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	189	76	75.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	183	74	77	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	188	75.5	73.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	176	74	73	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3712									3.31	0.37					0	0	3.3140	0.3674

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:6/7

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 6

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
61				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 4
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)
63				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.71
64				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top
65				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.31
66	5A	11.5	3	0.45	0.20	0.02				0.00	0.00	0.00	0.20	0.02	0.20	0.02	Vol Bottom
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
68				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
69				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.21	0.02	Ea Top
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.15	0.02	0.37
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.95	0.33	0.02
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total
74				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br
76				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	3
77				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
79				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit
80				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	4
Total				0.20	0.02					0	0	0.20	0.02		3.5093	0.3891	Carton
																	Top Br
																	24
																	Bottom Br
																	14
																	Br Fruit
																	27

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:6/8

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 6

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
81	194	77.5	76	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	186	74	72	73.0	36.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	195	75	78	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	188	75.5	74	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	183	74.5	72.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	180	73	74	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	184	74	74.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	178	74	75	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
89	189	74	75	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
90	179	74	75.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
91	190	75.5	78	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
92	192	76	76	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
93	181	73	74.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
94	189	75.5	77	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
95	196	78.5	74.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
96	189	75.5	73.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
97	185	75.5	72.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
98	195	77	74.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
99	187	77	78	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
100	188	74.5	75	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3748								0	0	0				0	0	0	0	0

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:6/9

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 6

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 5	
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.75
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	0.00
85				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.00
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	0.00
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	0.00
89				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.00
90				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.00
91				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
92				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton	
93				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	18.53
94				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
95				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	11.88
96				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	10.94
97				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	22.83
98				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
99				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	1.32
100				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	1.21
Total					0	0					0	0	0	0	0	0	Ea Total	2.53

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:6/10

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 7

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	185	75	77	76.0	38.00	1B	12	3.5	0.48	0.25	0.02				0.00	0.00	0.00	0.25	0.02
2	177	73	73	73.0	36.50	1B	14	3.5	0.68	0.35	0.03				0.00	0.00	0.00	0.35	0.03
3	180	74	75	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
4	177	72.5	73.5	73.0	36.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
5	175	74.5	72	73.2	36.62	1B	14	4	0.68	0.40	0.04	3B	11	4	0.42	0.25	0.02	0.65	0.06
6	177	74.5	72.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
7	178	76	71.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
8	190	74	73	73.5	36.75	2A	16	4	0.88	0.53	0.05				0.00	0.00	0.00	0.53	0.05
9	180	76.5	72	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
10	189	71.5	79	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
11	176	74.5	72.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
12	175	74.5	73	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
13	176	73	75.5	74.2	37.12	1B	16	6	0.87	0.82	0.08				0.00	0.00	0.00	0.82	0.08
14	193	75	79.5	77.2	38.62	3C	15.5	5.5	0.79	0.69	0.07				0.00	0.00	0.00	0.69	0.07
15	188	75.5	76	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
16	189	74.5	79.5	77.0	38.50	1B	19	7	1.19	1.37	0.13				0.00	0.00	0.00	1.37	0.13
17	191	74.5	76	75.2	37.62	3B	16	6.5	0.86	0.90	0.09				0.00	0.00	0.00	0.90	0.09
18	187	75	73.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
19	195	79	75	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
20	195	76.5	75.5	76.0	38.00	3B	14	4	0.65	0.40	0.04				0.00	0.00	0.00	0.40	0.04
Total	3673									5.71	0.55					0.25	0.02	5.9570	0.5750

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:7/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 7

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.25	0.02	Tray 1	
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.35	0.03	Weight(kg)	3.67
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
4	5C	17	3	1.00	0.47	0.05				0.00	0.00	0.00	0.47	0.05	0.47	0.05	Vol Top	5.96
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.65	0.06	Vol Bottom	5.83
6	5C	14.5	2.5	0.72	0.28	0.03				0.00	0.00	0.00	0.28	0.03	0.28	0.03	Vol Total	11.79
7				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
8	5B	21	4.5	1.53	1.11	0.11				0.00	0.00	0.00	1.11	0.11	1.64	0.16	Ea Top	0.57
9				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.56
10	5B	14	4	0.66	0.40	0.04				0.00	0.00	0.00	0.40	0.04	0.40	0.04	Ea Total	1.14
11	5C	18	5	1.12	0.86	0.08				0.00	0.00	0.00	0.86	0.08	0.86	0.08		
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br	10
13				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.82	0.08	Bottom Br	8
14				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.69	0.07	Br Fruit	15
15	5B	22	5	1.63	1.35	0.13				0.00	0.00	0.00	1.35	0.13	1.35	0.13		
16				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.37	0.13		
17				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.90	0.09		
18	5C	18.5	5	1.17	0.91	0.09				0.00	0.00	0.00	0.91	0.09	0.91	0.09		
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
20	5B	15	4	0.75	0.46	0.04				0.00	0.00	0.00	0.46	0.04	0.86	0.08		
Total					5.83	0.56					0	0	5.83	0.56	11.785	1.1376		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:7/2

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 7

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
21	177	74.5	77	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
22	190	76.5	75.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
23	195	74.5	75	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
24	184	77	75.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
25	176	76	75	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
26	178	72.5	77	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
27	192	76	75.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
28	183	76.5	73	74.8	37.38	3B	23	7	1.81	2.06	0.20				0.00	0.00	0.00	2.06	0.20
29	177	74.5	75	74.8	37.38	3A	19	4	1.23	0.78	0.08				0.00	0.00	0.00	0.78	0.08
30	185	75.5	73.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
31	188	79	74.5	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
32	191	74	75	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
33	193	76	79	77.5	38.75	3B	14	5	0.64	0.51	0.05				0.00	0.00	0.00	0.51	0.05
34	190	74.5	74.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
35	182	74.5	75	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
36	187	74.5	75.5	75.0	37.50	2B	17	5	0.98	0.76	0.07				0.00	0.00	0.00	0.76	0.07
37	175	74.5	73.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
38	175	72.5	74.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
39	191	76.5	76.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	188	76	77.5	76.8	38.38	2A	14	6	0.64	0.64	0.06				0.00	0.00	0.00	0.64	0.06
Total	3697									4.74	0.46					0	0	4.7402	0.4575

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:7/3

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 7

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 2
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 3.70
23				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
24				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 4.74
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 1.09
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 5.83
27				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
28	5A	15	5	0.76	0.58	0.06				0.00	0.00	0.00	0.58	0.06	2.64	0.25	Ea Top 0.46
29				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.78	0.08	Ea Bottom 0.11
30				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total 0.56
31				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
32				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br 5
33				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.51	0.05	Bottom Br 2
34				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit 5
35				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
36	4A	14	5	0.66	0.51	0.05				0.00	0.00	0.00	0.51	0.05	1.27	0.12	
37				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
40				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.64	0.06	
Total					1.09	0.11					0	0	1.09	0.11	5.8336	0.5631	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:7/4

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 7

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
41	191	75	72.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
42	183	73	75.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
43	181	75	74.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
44	175	76	71	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
45	178	71.5	75.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	192	74	74.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
47	178	74.5	71	72.8	36.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
48	176	73	72	72.5	36.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
49	192	77	75	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
50	175	71.5	70.5	71.0	35.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	184	74	73.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
52	194	75	78	76.5	38.25	3B	19	6	1.20	1.16	0.11				0.00	0.00	0.00	1.16	0.11
53	191	76	76	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
54	181	73	76.5	74.8	37.38	2B	15	4	0.76	0.46	0.04				0.00	0.00	0.00	0.46	0.04
55	193	75.5	75	75.2	37.62	2A	12	4	0.48	0.29	0.03				0.00	0.00	0.00	0.29	0.03
56	195	73.5	76.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	189	77.5	75.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
58	176	71.5	76.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
59	195	77.5	76	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
60	187	75	73	74.0	37.00		10	3	0.34	0.15	0.01				0.00	0.00	0.00	0.15	0.01
Total	3706									2.05	0.20					0	0	2.0535	0.1982

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mis, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:7/5

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 7

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
41				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3	
42				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.71
43				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
44				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	2.05
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.00
46				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	2.05
47				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
48				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	0.20
49				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.00
50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.20
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
52				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.16	0.11	Top Br	4
53				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	0
54				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.46	0.04	Br Fruit	4
55				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.29	0.03		
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
57				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
58				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
59				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
60				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.15	0.01		
Total						0					0	0	0	0	2.0535	0.1982		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mis, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:7/6

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 7

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
61	185	74.5	75.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	181	74	72.5	73.2	36.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	195	77	74	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
64	189	73.5	78	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
65	189	74	76.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
66	178	72.5	75	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
67	191	77	75.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	195	75	80.5	77.8	38.88	3C	17	5.5	0.94	0.83	0.08				0.00	0.00	0.00	0.83	0.08
69	190	75	76.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	196	76.5	77	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	181	75.5	76.5	76.0	38.00	3C	12	3.5	0.48	0.25	0.02				0.00	0.00	0.00	0.25	0.02
72	184	77	73.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	180	76	73	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	186	73.5	73.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	181	75	75	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	188	72.5	77	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	189	75.5	75	75.2	37.62	3C	15	4	0.76	0.46	0.04				0.00	0.00	0.00	0.46	0.04
78	177	75	73.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	190	72	76	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	192	77	77	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3737								1.54	0.15					0	0		1.5425	0.1489

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:77

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 7

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
61				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 4
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 3.74
63				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 1.54
64				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 0.00
65				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 1.54
66				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
68				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.83	0.08	Ea Top 0.15
69				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 0.00
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total 0.15
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.25	0.02	
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br 3
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br 0
74				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit 3
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
76				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
77				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.46	0.04	Carton
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br 22
79				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br 10
80				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit 27
Total				0	0					0	0		0	0	1.5425	0.1489	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:78

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 7

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
81	186	74	72	73.0	36.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	195	75	78	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	188	75.5	74	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	183	74.5	72.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	189	74	75	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	179	74	75.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	190	75.5	78	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	192	76	76	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
89	181	73	74.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
90	189	75.5	77	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
91	196	78.5	74.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
92	189	75.5	73.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
93	195	77	74.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
94	187	77	78	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
95	195	78	79	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
96	190	75	76.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
97	193	76	73.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
98	178	74	73.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
99	182	75.5	74	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
100	175	77	70	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3752								0	0	0				0	0	0	0	0

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:7/9

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 7

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 5	
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.75
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	0.00
85				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.00
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	0.00
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	0.00
89				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.00
90				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.00
91				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
92				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton	
93				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	18.56
94				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
95				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	14.29
96				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	6.92
97				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	21.22
98				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
99				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	1.38
100				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.67
Total				0	0	0				0	0	0	0	0	0	0	Ea Total	2.05

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:7/10

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 8

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	197	77	76	76.5	38.25	1B	17	5	0.96	0.75	0.08				0.00	0.00	0.00	0.75	0.08
2	194	79	74.5	76.8	38.38	1B	16	5	0.84	0.66	0.07				0.00	0.00	0.00	0.66	0.07
3	183	77.5	76	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
4	183	76	72	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
5	195	73.5	75	74.2	37.12	1C	15	3.5	0.77	0.40	0.04				0.00	0.00	0.00	0.40	0.04
6	186	73.5	74	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
7	195	76.5	76.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
8	185	74	74	74.0	37.00	2A	13	3	0.58	0.25	0.03				0.00	0.00	0.00	0.25	0.03
9	187	75	76	75.5	37.75	2C	10	3	0.33	0.15	0.02				0.00	0.00	0.00	0.15	0.02
10	183	73	76	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
11	176	76.5	72	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
12	190	75	75	75.0	37.50	1C	16	5.5	0.86	0.74	0.08				0.00	0.00	0.00	0.74	0.08
13	191	77.5	77.5	77.5	38.75	1B	12	4	0.47	0.29	0.03	3B	18	5	1.06	0.85	0.09	1.14	0.13
14	175	71	75	73.0	36.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
15	182	73	74	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
16	175	74.5	74	74.2	37.12	2A	12	3.5	0.49	0.25	0.03				0.00	0.00	0.00	0.25	0.03
17	179	73	76	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
18	184	74.5	74.5	74.5	37.25	2A	14	4	0.66	0.40	0.04				0.00	0.00	0.00	0.40	0.04
19	185	75.5	75.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
20	183	69.5	76	72.8	36.38	3B	20	5.5	1.40	1.19	0.13				0.00	0.00	0.00	1.19	0.13
Total	3708									5.09	0.56					0.85	0.09	5.9432	0.6589

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:8/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 8

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.75	0.08	Tray 1
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.66	0.07	Weight(kg) 3.71
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 5.94
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.40	0.04	Vol Bottom 10.10
6	5C	21	4	1.53	1.00	0.11				0.00	0.00	0.00	1.00	0.11	1.00	0.11	Vol Total 16.04
7				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
8	5C	24	5	2.00	1.67	0.19				0.00	0.00	0.00	1.67	0.19	1.93	0.21	Ea Top 0.66
9				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.15	0.02	Ea Bottom 1.12
10	5C	18	7	1.10	1.24	0.14				0.00	0.00	0.00	1.24	0.14	1.24	0.14	Ea Total 1.78
11	5B	17	5.5	0.99	0.84	0.09				0.00	0.00	0.00	0.84	0.09	0.84	0.09	
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.74	0.08	Top Br 11
13	5C	20	4.5	1.31	0.97	0.11				0.00	0.00	0.00	0.97	0.11	2.11	0.23	Bottom Br 8
14	5C	21	5.5	1.54	1.33	0.15				0.00	0.00	0.00	1.33	0.15	1.33	0.15	Br Fruit 14
15				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
16	5C	24.5	7	2.08	2.37	0.26				0.00	0.00	0.00	2.37	0.26	2.62	0.29	
17				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
18				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.40	0.04	
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
20	5C	16	5	0.89	0.67	0.07				0.00	0.00	0.00	0.67	0.07	1.86	0.21	
Total					10.1	1.12					0	0	10.1	1.12	16.043	1.7786	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:8/2

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 8

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
21	179	75	73.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
22	184	74	78	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
23	181	74	73.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
24	192	74.5	75	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
25	179	76.5	74.5	75.5	37.75	2D	20	5	1.35	1.08	0.12				0.00	0.00	0.00	1.08	0.12
26	185	73	79	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
27	178	74	73	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
28	183	71	76.5	73.8	36.88	3B	17	5	0.99	0.76	0.08				0.00	0.00	0.00	0.76	0.08
29	175	75	75	75.0	37.50	3B	16	4	0.86	0.53	0.06				0.00	0.00	0.00	0.53	0.06
30	181	71	78.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
31	180	74.5	72.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
32	180	76	75	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
33	195	75	78	76.5	38.25	3B	15	5	0.74	0.58	0.06				0.00	0.00	0.00	0.58	0.06
34	188	75.5	81.5	78.5	39.25	3B	18.5	5	1.11	0.90	0.10				0.00	0.00	0.00	0.90	0.10
35	176	72	74.5	73.2	36.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
36	179	70	73.5	71.8	35.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
37	188	75.5	76.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
38	185	79	76	77.5	38.75	3B	15	4	0.73	0.46	0.05				0.00	0.00	0.00	0.46	0.05
39	183	76.5	76.5	76.5	38.25	3B	14	4	0.65	0.40	0.04				0.00	0.00	0.00	0.40	0.04
40	176	72.5	74	73.2	36.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3647									4.70	0.52					0	0	4.7036	0.5215

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:8/3

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 8

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 2	
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.65
23				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	4.70
24				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.39
25	4B	13	4.5	0.56	0.39	0.04				0.00	0.00	0.00	0.39	0.04	1.47	0.16	Vol Total	5.09
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
27				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.76	0.08	Ea Top	0.52
29				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.53	0.06	Ea Bottom	0.04
30				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.56
31				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
32				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br	7
33				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.58	0.06	Bottom Br	1
34				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.90	0.10	Br Fruit	7
35				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
36				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
37				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.46	0.05		
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.40	0.04		
40				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Total					0.39	0.04					0	0	0.39	0.04	5.0932	0.5647		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:8/4

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 8

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
41	177	74.5	74	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
42	195	76.5	74	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
43	185	74	73.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
44	182	73	74	73.5	36.75	3B	15	5	0.77	0.59	0.06				0.00	0.00	0.00	0.59	0.06
45	191	75.5	78	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	186	75	73	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
47	195	76	77.5	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
48	194	75	76.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
49	175	71	74.5	72.8	36.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
50	195	77.5	76.5	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	185	72.5	78.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
52	193	75.5	77	76.2	38.12	2A	15	4	0.74	0.46	0.05	3B	10	3	0.33	0.15	0.02	0.61	0.07
53	187	75.5	73	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
54	193	76	76	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
55	191	78.5	73.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
56	184	73.5	78.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	194	76	76.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
58	187	80.5	74	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
59	184	73.5	75	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
60	184	73.5	77.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3757								1.04	0.12					0.15	0.02		1.1905	0.1320

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:8/5

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 8

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
41				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3
42				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)
43				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.76
44	6A	18	5.5	1.12	0.95	0.10	4A	12	4	0.49	0.29	0.03	1.24	0.14	1.82	0.20	Vol Top
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.19
46	5A	14	4	0.67	0.40	0.04				0.00	0.00	0.00	0.40	0.04	0.40	0.04	Vol Bottom
47				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.78
48				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total
49	4A	10	3	0.35	0.15	0.02				0.00	0.00	0.00	0.15	0.02	0.15	0.02	2.97
50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
52				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.61	0.07	Ea Bottom
53				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
54				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total
55				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br
57				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	3
58				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br
59				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	4
60				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit
60				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	5
Total				1.49	0.17					0.29	0.03	1.78	0.20	2.9739	0.3297		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:8/6

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 8

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
61	185	74	72	73.0	36.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	188	77.5	71.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	185	75.5	71.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
64	195	73.5	76	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
65	182	75.5	73.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
66	186	76.5	70.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
67	186	75.5	75.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	192	74.5	77.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	178	72	73.5	72.8	36.38	3B	13	4	0.59	0.34	0.04				0.00	0.00	0.00	0.34	0.04
70	176	72	70	71.0	35.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	195	75.5	75.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	179	74	71.5	72.8	36.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	195	78	73	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	176	73.5	75.5	74.5	37.25	3B	14	4	0.66	0.40	0.04				0.00	0.00	0.00	0.40	0.04
75	184	76.5	77	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	193	74.5	75.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	182	74.5	74.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	187	73	73.5	73.2	36.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	192	76	73	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	192	78	76.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3728									0.74	0.08					0	0	0.7404	0.0821

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:8/7

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 8

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
61				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 4
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)
63				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.73
64				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top
65				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.74
66				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
68				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total
69				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.34	0.04	0.74
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
74				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.40	0.04	Ea Total
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
76				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
77				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton
79				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br
80				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br
Total				0	0	0				0	0	0	0	0	0.7404	0.0821	23
																	13
																	28

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:8/8

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 8

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
81	175	74	74	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	193	75	77.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	190	77	74	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	193	79	76	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	195	76.5	79.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	180	71	75.5	73.2	36.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	183	74.5	72	73.2	36.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	188	74	76.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
89	179	73.5	72	72.8	36.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
90	195	77.5	75.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
91	194	75	76	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
92	194	77	77	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
93	195	77.5	74.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
94	195	74.5	79.5	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
95	183	74	74.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
96	187	75	73	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
97	194	72.5	77	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
98	190	77	76	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
99	174	71	75	73.0	36.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
100	192	75	74.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3769								0	0	0				0	0	0	0	0

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:8/9

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 8

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 5	
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.77
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	0.00
85				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.00
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	0.00
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	0.00
89				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.00
90				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.00
91				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
92				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton	
93				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	18.61
94				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
95				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	12.58
96				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	12.27
97				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	24.85
98				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
99				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	1.39
100				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	1.36
Total					0	0					0	0	0	0	0	0	Ea Total	2.75

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:8/10

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 9

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top	
1	196	74.5	78	76.2	38.12	1B	19	6.5	1.20	1.26	0.14					0.00	0.00	0.00	1.26	0.14
2	196	75.5	77.5	76.5	38.25	1A	15	5	0.74	0.58	0.06					0.00	0.00	0.00	0.58	0.06
3	182	79	73	76.0	38.00	1C	18	5	1.08	0.85	0.09					0.00	0.00	0.00	0.85	0.09
4	192	77	76.5	76.8	38.38				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
5	176	74.5	79.5	77.0	38.50	2D	11	3	0.39	0.18	0.02					0.00	0.00	0.00	0.18	0.02
6	185	73.5	77.5	75.5	37.75				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
7	188	73	78	75.5	37.75	1B	17.5	5	1.03	0.80	0.09					0.00	0.00	0.00	0.80	0.09
8	186	74.5	77	75.8	37.88				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
9	191	71.5	74.5	73.0	36.50	2D	13	4.5	0.58	0.39	0.04					0.00	0.00	0.00	0.39	0.04
10	190	76.5	76.5	76.5	38.25				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
11	188	74.5	75.5	75.0	37.50				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
12	183	76	72.5	74.2	37.12	1B	13.5	4.5	0.62	0.42	0.05					0.00	0.00	0.00	0.42	0.05
13	195	78	75.5	76.8	38.38	1B	21.5	7.5	1.54	1.91	0.21					0.00	0.00	0.00	1.91	0.21
14	179	74.5	71.5	73.0	36.50				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
15	188	76.5	77.5	77.0	38.50	3C	11	3	0.39	0.18	0.02					0.00	0.00	0.00	0.18	0.02
16	177	73	73	73.0	36.50				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
17	195	79	74	76.5	38.25				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
18	195	76	75	75.5	37.75	3B	18.5	6.5	1.15	1.20	0.13					0.00	0.00	0.00	1.20	0.13
19	186	75.5	77.5	76.5	38.25				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
20	182	76.5	70.5	73.5	36.75	2B	18.5	6.5	1.18	1.20	0.13					0.00	0.00	0.00	1.20	0.13
Total	3750									8.97	0.99					0	0		8.9707	0.9945

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:9/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 9

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.26	0.14	Tray 1
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.58	0.06	Weight(kg) 3.75
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.85	0.09	
4	5B	20	4	1.33	0.88	0.10				0.00	0.00	0.00	0.88	0.10	0.88	0.10	Vol Top 8.97
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.18	0.02	Vol Bottom 7.83
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 16.80
7				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.80	0.09	
8				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top 0.99
9				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.39	0.04	Ea Bottom 0.87
10	5C	18.5	5	1.14	0.90	0.10				0.00	0.00	0.00	0.90	0.10	0.90	0.10	Ea Total 1.86
11	5B	18	4	1.10	0.69	0.08				0.00	0.00	0.00	0.69	0.08	0.69	0.08	
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.42	0.05	Top Br 11
13	5B	25	7	2.09	2.46	0.27				0.00	0.00	0.00	2.46	0.27	4.37	0.48	Bottom Br 7
14	5B	22	5	1.70	1.36	0.15				0.00	0.00	0.00	1.36	0.15	1.36	0.15	Br Fruit 16
15				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.18	0.02	
16				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
17				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
18	5C	18	3	1.09	0.54	0.06				0.00	0.00	0.00	0.54	0.06	1.74	0.19	
19	5B	21	4	1.47	0.99	0.11				0.00	0.00	0.00	0.99	0.11	0.99	0.11	
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.20	0.13	
Total					7.83	0.87					0	0	7.83	0.87	16.802	1.8627	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:9/2

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 9

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
21	188	72.5	78	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
22	178	73	70.5	71.8	35.88	2D	13	3	0.59	0.26	0.03				0.00	0.00	0.00	0.26	0.03
23	192	77	73.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
24	188	73.5	78.5	76.0	38.01				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
25	190	72	80.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
26	189	74	78	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
27	187	74.5	78.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
28	177	74.5	72	73.2	36.62	3C	15	3.5	0.78	0.41	0.04				0.00	0.00	0.00	0.41	0.04
29	182	77	74.5	75.8	37.88	2B	17	4.5	0.97	0.68	0.08				0.00	0.00	0.00	0.68	0.08
30	179	73.5	74.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
31	195	73.5	78	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
32	179	73.5	72	72.8	36.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
33	191	75	77.5	76.2	38.12	3B	20	7	1.33	1.52	0.17				0.00	0.00	0.00	1.52	0.17
34	192	77	77.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
35	187	75	74.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
36	173	69.5	78.5	74.0	37.00	3C	17	6.5	0.99	1.02	0.11				0.00	0.00	0.00	1.02	0.11
37	190	74	78.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
38	181	76	75	75.5	37.75	3B	13	2	0.56	0.18	0.02				0.00	0.00	0.00	0.18	0.02
39	185	77	73	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	183	77	73.5	75.2	37.62	3C	16	5	0.86	0.67	0.07				0.00	0.00	0.00	0.67	0.07
Total	3706									4.72	0.52					0	0	4.7167	0.5229

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:9/3

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 9

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 2	
22	5A	17	5	1.02	0.76	0.08				0.00	0.00	0.00	0.76	0.08	1.02	0.11	Weight(kg)	3.71
23				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
24				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	4.72
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	3.23
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	7.94
27				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
28	5A	13	4.5	0.58	0.39	0.04				0.00	0.00	0.00	0.39	0.04	0.80	0.09	Ea Top	0.52
29				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.68	0.08	Ea Bottom	0.36
30	5A	17.5	6	1.05	0.98	0.11				0.00	0.00	0.00	0.98	0.11	0.98	0.11	Ea Total	0.88
31				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
32	5A	14	5	0.68	0.51	0.06				0.00	0.00	0.00	0.51	0.06	0.51	0.06	Top Br	6
33	5A	15	5	0.74	0.58	0.06				0.00	0.00	0.00	0.58	0.06	2.10	0.23	Bottom Br	4
34				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit	8
35				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
36				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.02	0.11		
37				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.18	0.02		
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
40				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.67	0.07		
Total					3.23	0.36					0	0	3.23	0.36	7.9434	0.8806		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:9/4

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 9

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
41	182	74	77	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
42	194	76.5	79	77.8	38.88	3A	16	6	0.83	0.82	0.09				0.00	0.00	0.00	0.82	0.09
43	191	76	74.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
44	182	76	78	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
45	187	73.5	77	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	189	73	81	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
47	194	78	77.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
48	195	77.5	75.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
49	184	77.5	73	75.2	37.62	3C	13	4	0.57	0.34	0.04				0.00	0.00	0.00	0.34	0.04
50	175	76	73.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	191	74	76	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
52	190	74	78	76.0	38.00	3B	13.5	5.5	0.60	0.53	0.06				0.00	0.00	0.00	0.53	0.06
53	178	74	73.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
54	195	74	76.5	75.2	37.62	3B	14.5	5.5	0.71	0.61	0.07				0.00	0.00	0.00	0.61	0.07
55	189	76.5	71.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
56	195	75	77.5	76.2	38.12	3C	17.5	5.5	1.02	0.89	0.10				0.00	0.00	0.00	0.89	0.10
57	183	76	71.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
58	192	77	78.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
59	173	75.5	70	72.8	36.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
60	183	77	69	73.0	36.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3742									3.19	0.35					0	0	3.1865	0.3533

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:9/5

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 9

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
41				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3	
42				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.82	0.09	Weight(kg)	3.74
43				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
44				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	3.19
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.00
46				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	3.19
47				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
48				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	0.35
49				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.34	0.04	Ea Bottom	0.00
50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.35
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
52				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.53	0.06	Top Br	5
53				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	0
54				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.61	0.07	Br Fruit	5
55				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.89	0.10		
57				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
58				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
59				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
60				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Total						0					0	0	0	0	3.1865	0.3533		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:9/6

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 9

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
61	185	74	75.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	181	76.5	73.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	177	73	73.5	73.2	36.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
64	178	72.5	73.5	73.0	36.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
65	185	76	75	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
66	195	77	81.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
67	195	76.5	74	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	189	74	78	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	187	76.5	73.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	180	74.5	74.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	178	73	73.5	73.2	36.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	175	72.5	75.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	195	76.5	74.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	187	75	72	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	195	76	71.5	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	195	81	75.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	177	72.5	75.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	182	74.5	75.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	183	71.5	78.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	184	77	73	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3703								0	0	0				0	0	0	0	0

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:9/7

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 9

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
61	4A	14	6	0.66	0.64	0.07				0.00	0.00	0.00	0.64	0.07	0.64	0.07	Tray 4	
62	4A	10	3	0.33	0.15	0.02				0.00	0.00	0.00	0.15	0.02	0.15	0.02	Weight(kg)	
63				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.70	
64				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	
65				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
66				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.78
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.78
68				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
69				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
74				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
76				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
77				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
79				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
80				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total				0.78	0.09					0	0	0	0.78	0.09	0.7846	0.0870		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:9/8

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 9

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
81	186	73	75	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	192	76	75.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	191	71.5	76.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	192	76.5	79	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	185	72.5	75.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	188	70.5	76	73.2	36.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	182	75.5	75.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	192	76.5	75	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
89	189	78	76.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
90	195	76.5	75	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
91	178	71.5	76	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
92	186	74	76	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
93	180	73	71	72.0	36.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
94	176	74.5	73	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
95	184	73.5	74	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
96	183	73	76	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
97	191	72	75	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
98	180	74.5	73.7	74.1	37.05				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
99	187	74.5	71	72.8	36.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
100	184	73	69.5	71.2	35.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3721								0	0	0				0	0	0	0	0

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:9/9

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 9

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 5
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 3.72
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 0.00
85				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 0.00
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 0.00
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top 0.00
89				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 0.00
90				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total 0.00
91				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
92				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton
93				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 18.62
94				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
95				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 16.87
96				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 11.84
97				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 28.72
98				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
99				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top 1.87
100				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 1.31
Total				0	0	0				0	0	0	0	0	0	0	Ea Total 3.18

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:9/10

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 10

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	178	74.5	75	74.8	37.38	1B	9	2.5	0.27	0.10	0.01				0.00	0.00	0.00	0.10	0.01
2	182	73	75.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
3	187	78.5	72.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
4	195	78	75	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
5	181	74	72.5	73.2	36.62	1C	18	5.5	1.12	0.95	0.10				0.00	0.00	0.00	0.95	0.10
6	183	73.5	75	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
7	175	73	72	72.5	36.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
8	194	78	71.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
9	176	76.5	70.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
10	192	75	69	72.0	36.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
11	195	77.5	74.5	76.0	38.00	3C	16	5	0.85	0.66	0.07				0.00	0.00	0.00	0.66	0.07
12	190	76	75.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
13	194	73.5	75.5	74.5	37.25	1B	19	5	1.23	0.96	0.11	3C	12	3.5	0.49	0.25	0.03	1.22	0.13
14	186	74	76	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
15	184	75.5	71.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
16	191	74.5	77.5	76.0	38.00	1B	16	5	0.85	0.66	0.07	2A	15	5	0.75	0.58	0.06	1.25	0.14
17	191	77.6	75.5	76.6	38.28	2A	15	5	0.74	0.58	0.06				0.00	0.00	0.00	0.58	0.06
18	180	76.5	76	76.2	38.12	2A	14	5	0.65	0.51	0.06				0.00	0.00	0.00	0.51	0.06
19	186	74.5	74	74.2	37.12	2B	17	5.5	0.99	0.84	0.09				0.00	0.00	0.00	0.84	0.09
20	185	72	71	71.5	35.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3725									5.27	0.58					0.83	0.09	6.1006	0.6763

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:10/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 10

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.10	0.01	Tray 1	
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.72
3	5B	20	4.5	1.35	0.98	0.11				0.00	0.00	0.00	0.98	0.11	0.98	0.11		
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	6.10
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.95	0.10	Vol Bottom	10.71
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	16.81
7	5C	19	3.5	1.27	0.71	0.08				0.00	0.00	0.00	0.71	0.08	0.71	0.08		
8	5B	15	4	0.76	0.46	0.05				0.00	0.00	0.00	0.46	0.05	0.46	0.05	Ea Top	0.68
9				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	1.19
10	5C	20	3	1.42	0.71	0.08				0.00	0.00	0.00	0.71	0.08	0.71	0.08	Ea Total	1.86
11	5B	17	5	0.96	0.75	0.08				0.00	0.00	0.00	0.75	0.08	1.42	0.16		
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br	10
13				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.22	0.13	Bottom Br	10
14	5C	17	4	0.98	0.61	0.07				0.00	0.00	0.00	0.61	0.07	0.61	0.07	Br Fruit	14
15	5B	29	7.5	2.98	3.77	0.42				0.00	0.00	0.00	3.77	0.42	3.77	0.42		
16	5B	15	3	0.75	0.35	0.04				0.00	0.00	0.00	0.35	0.04	1.60	0.18		
17	5B	20	3	1.33	0.70	0.08				0.00	0.00	0.00	0.70	0.08	1.28	0.14		
18				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.51	0.06		
19	5A	24	5	1.99	1.67	0.19				0.00	0.00	0.00	1.67	0.19	2.51	0.28		
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Total					10.7	1.19					0	0	10.7	1.19	16.811	1.8638		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:10/2

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 10

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
21	179	74.5	75	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
22	195	75.5	74	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
23	183	74	75	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
24	178	72	74.5	73.2	36.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
25	175	76	73.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
26	193	74	76	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
27	192	79.5	72	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
28	189	77	72.5	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
29	187	75.5	77	76.2	38.12	3B	16.5	5	0.90	0.71	0.08				0.00	0.00	0.00	0.71	0.08
30	183	77	74	75.5	37.75	3B	12	3	0.48	0.21	0.02				0.00	0.00	0.00	0.21	0.02
31	185	77	73.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
32	195	75	77.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
33	186	74.5	76.5	75.5	37.75	2D	15	5	0.75	0.58	0.06				0.00	0.00	0.00	0.58	0.06
34	182	78.5	72	75.2	37.62	2D	19	6	1.22	1.16	0.13				0.00	0.00	0.00	1.16	0.13
35	192	80.5	74.5	77.5	38.75	3B	12	3	0.47	0.21	0.02				0.00	0.00	0.00	0.21	0.02
36	191	75.5	74.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
37	178	72.5	71	71.8	35.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
38	182	75.5	77	76.2	38.12	2C	15	4	0.74	0.46	0.05				0.00	0.00	0.00	0.46	0.05
39	193	77.5	76	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	180	75.5	75.5	75.5	37.75	3B	16	4	0.86	0.53	0.06				0.00	0.00	0.00	0.53	0.06
Total	3718									3.86	0.43					0	0	3.8631	0.4283

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:10/3

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 10

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 2
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)
23				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.72
24				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.86
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom
27	4B	16	5	0.85	0.66	0.07				0.00	0.00	0.00	0.66	0.07	0.66	0.07	0.81
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total
29				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.71	0.08	4.67
30				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.21	0.02	Ea Top
31				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43
32				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom
33				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.21	0.02	0.09
34				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total
35				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.52
36				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br
37				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	7
38	6D	12	2	0.48	0.15	0.02				0.00	0.00	0.00	0.15	0.02	0.60	0.07	Bottom Br
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	2
40				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.53	0.06	Br Fruit
Total				0.81	0.09					0	0	0.81	0.09		4.6731	0.5181	8

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:10/4

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 10

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
41	183	71.5	77.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
42	195	79	74	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
43	188	72.5	73.5	73.0	36.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
44	180	75	75	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
45	182	75	73.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	186	72	78	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
47	195	78	76.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
48	175	78	71.5	74.8	37.38	1B	15	4.5	0.76	0.52	0.06				0.00	0.00	0.00	0.52	0.06
49	192	74	75	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
50	195	75	77	76.0	38.00	3B	10	2.5	0.33	0.12	0.01				0.00	0.00	0.00	0.12	0.01
51	194	78	72.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
52	175	73	73.5	73.2	36.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
53	180	74.5	75.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
54	184	74	73	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
55	192	76.5	72.5	74.5	37.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
56	192	72.5	77	74.8	37.38	1C	13	4.5	0.57	0.39	0.04				0.00	0.00	0.00	0.39	0.04
57	191	77	74	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
58	190	77.5	75	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
59	184	74	77	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
60	182	72.5	73	72.8	36.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3735									1.03	0.11					0	0	1.0306	0.1143

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:10/5

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 10

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
41				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3
42				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 3.73
43				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
44				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 1.03
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 0.91
46				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 1.94
47				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
48				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.52	0.06	Ea Top 0.11
49				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 0.10
50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.12	0.01	Ea Total 0.22
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
52				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br 3
53				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br 1
54	5A	18.5	5	1.18	0.91	0.10				0.00	0.00	0.00	0.91	0.10	0.91	0.10	Br Fruit 4
55				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.39	0.04	
57				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
58				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
59				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
60				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total					0.91	0.10					0	0	0.91	0.10	1.9421	0.2153	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:10/6

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 10

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
61	191	74.5	74	74.2	37.12	3B	8	2	0.22	0.06	0.01				0.00	0.00	0.00	0.06	0.01
62	192	76.5	78	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	179	75	73.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
64	185	76.5	71.5	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
65	180	69.5	72	70.8	35.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
66	195	77	74	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
67	194	79.5	74.5	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	189	75	79.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	182	74.5	73	73.8	36.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	193	74.5	80	77.2	38.62	3B	14	4	0.64	0.40	0.04				0.00	0.00	0.00	0.40	0.04
71	188	77	74	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	195	73.5	79.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	188	76.5	74.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	181	75	73.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	190	75.5	76.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	195	76	77	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	178	75.5	71.5	73.5	36.75	2B	22	8	1.68	2.16	0.24				0.00	0.00	0.00	2.16	0.24
78	186	73	73	73.0	36.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	183	73	75	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	193	76.5	75.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3757									2.62	0.29					0	0	2.6203	0.2905

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:10/7

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 10

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
61				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.06	0.01	Tray 4	
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.76
63				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
64				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	2.62
65				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.00
66				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	2.62
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
68				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	0.29
69				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.00
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.40	0.04	Ea Total	0.29
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br	3
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	0
74				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit	3
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
76				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
77				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.16	0.24	Carton	
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br	23
79				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	13
80				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit	29
Total						0					0	0	0	0	2.6203	0.2905		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:10/8

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 10

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
81	193	74.5	78.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	179	73.5	73.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	185	75.5	74.5	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	179	75	71	73.0	36.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	195	76.5	78.3	77.4	38.70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	182	75	75	75.0	37.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	187	76.5	77.5	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	193	77	76	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
89	177	70	74.5	72.2	36.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
90	191	75.5	75	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
91	195	77	78.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
92	189	75	73.5	74.2	37.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
93	183	75	73	74.0	37.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
94	180	77	69.5	73.2	36.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
95	186	78	72.5	75.2	37.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
96	177	72.5	78.5	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
97	175	71.5	75.5	73.5	36.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
98	181	73.5	78.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
99	191	76.5	75	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
100	187	75.5	77.5	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	3705								0	0	0				0	0	0	0	0

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed In Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:10/9

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 100 Carton 10

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 5	
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	3.70
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	0.00
85				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.00
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	0.00
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	0.00
89				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	0.00
90				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.00
91				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
92				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton	
93				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	18.64
94				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
95				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	13.61
96				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	12.43
97				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	26.05
98				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
99				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top	1.51
100				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom	1.38
Total					0	0					0	0	0	0	0	0	Ea Total	2.89

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed In Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. 26 10.93

100:10/10

**TABLES 6.4 FULL RESULTS OF DROP TEST DATA COUNT 88
CARTONS ONE OFF TESTS AT 8% MOISTURE CONTENT**

CARTON 21 - Double Trays

CARTON 22 - Hardened Trays

CARTON 23 - Thickened Trays

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 21

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	209	77	76.5	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
2	209	76.5	75.5	76.0	38.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
3	210	78.5	78	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
4	210	75.5	78.5	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
5	203	78	79	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
6	206	79.5	79	79.2	39.62	2A	19	6	1.16	1.15	0.13				0.00	0.00	0.00	1.15	0.13
7	220	79.5	80.5	80.0	40.00	2A	24	6.5	1.84	2.07	0.23				0.00	0.00	0.00	2.07	0.23
8	209	78	76	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
9	213	78.5	82	80.2	40.12	2A	15	4.5	0.71	0.52	0.06	2C	15	4.5	0.71	0.52	0.06	1.03	0.11
10	204	76.5	80.5	78.5	39.25	2A	14.5	4.5	0.68	0.48	0.05				0.00	0.00	0.00	0.48	0.05
11	212	76	76.5	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
12	204	76	76.5	76.2	38.12	2A	17.5	6	1.02	0.98	0.11				0.00	0.00	0.00	0.98	0.11
13	208	77.5	83	80.2	40.12	2A	10	2	0.31	0.10	0.01				0.00	0.00	0.00	0.10	0.01
14	215	79	78.5	78.8	39.38	2A	15.5	2.5	0.77	0.32	0.04				0.00	0.00	0.00	0.32	0.04
15	208	76.5	81	78.8	39.38	2A	25	5.5	2.04	1.97	0.22				0.00	0.00	0.00	1.97	0.22
16	210	79.5	78.5	79.0	39.50	2A	29.5	7	2.86	3.62	0.40				0.00	0.00	0.00	3.62	0.40
17	211	80.5	76.5	78.5	39.25	2A	19.5	5	1.23	1.01	0.11				0.00	0.00	0.00	1.01	0.11
18	212	78.5	80	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
19	211	76	81.5	78.8	39.38	2B	20	2	1.29	0.52	0.06				0.00	0.00	0.00	0.52	0.06
20	214	77	79.5	78.2	39.12	2B	22.5	5	1.65	1.41	0.16				0.00	0.00	0.00	1.41	0.16
21	203	77	78	77.5	38.75	2B	20.5	5.5	1.38	1.24	0.14				0.00	0.00	0.00	1.24	0.14
22	215	79	79.5	79.2	39.62	2A	20	6	1.28	1.28	0.14	2C	16.5	3.5	0.87	0.49	0.05	1.78	0.20
Total	4616									16.7	1.84					1.01	0.11	17.673	1.9506

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Double Trays 28.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 21

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary		
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00			
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 1		
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	4.62	
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	17.67	
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.83	
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.15	0.13	Vol Total	18.50	
7				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.07	0.23			
8	5A	10.5	3.5	0.36	0.19	0.02				0.00	0.00	0.00	0.19	0.02	0.19	0.02	Ea Top	1.95	
9				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.03	0.11	Ea Bottom	0.09	
10				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.48	0.05	Ea Total	2.04	
11				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00			
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.98	0.11	Top Br	16	
13				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.10	0.01	Bottom Br	3	
14	5B	19.5	2.5	1.23	0.57	0.06				0.00	0.00	0.00	0.57	0.06	0.89	0.10	Br Fruit	15	
15	5B	8.5	2	0.23	0.07	0.01				0.00	0.00	0.00	0.07	0.01	2.04	0.22			
16				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.62	0.40			
17				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.01	0.11			
18				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00			
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.52	0.06			
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.41	0.16			
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.24	0.14			
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.78	0.20			
Total						0.83						0	0	0.83	0.09	18.501	2.0420		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Double Trays 28.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 21

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
23	214	77.5	77.5	77.5	38.75	2A	13.5	3.5	0.59	0.32	0.04				0.00	0.00	0.00	0.32	0.04
24	206	79	76.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
25	217	78	78.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
26	222	76	78	77.0	38.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
27	217	79.5	82	80.8	40.38	2B	13.5	3	0.57	0.27	0.03	2C	18	6	1.02	1.02	0.11	1.30	0.14
28	208	78.5	81	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
29	221	78.5	81	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
30	222	79.5	80	79.8	39.88	2B	28	5.5	2.54	2.60	0.29				0.00	0.00	0.00	2.60	0.29
31	219	82	82	82.0	41.00	2C	21	6	1.37	1.41	0.16				0.00	0.00	0.00	1.41	0.16
32	207	78.5	82	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
33	210	74.5	78.5	76.5	38.25	2A	17	2.5	0.96	0.40	0.04				0.00	0.00	0.00	0.40	0.04
34	203	78.5	77	77.8	38.88	2A	26	7.5	2.24	2.87	0.32				0.00	0.00	0.00	2.87	0.32
35	218	81	78	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
36	219	80.5	76.5	78.5	39.25	2C	20	5	1.30	1.07	0.12				0.00	0.00	0.00	1.07	0.12
37	211	83	78.5	80.8	40.38	2A	20.5	5	1.32	1.13	0.12				0.00	0.00	0.00	1.13	0.12
38	203	81	78.5	79.8	39.88	2A	22.5	6	1.62	1.66	0.18	2C	11.5	3.5	0.42	0.23	0.03	1.89	0.21
39	202	77.5	79	78.2	39.12	2B	10	2.5	0.32	0.12	0.01				0.00	0.00	0.00	0.12	0.01
40	211	75	76.5	75.8	37.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
41	208	76	77.5	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
42	221	79.5	78.5	79.0	39.50	2B	33	6	3.61	4.29	0.47				0.00	0.00	0.00	4.29	0.47
43	215	78.5	77	77.8	38.88	2A	20	6.5	1.31	1.40	0.15				0.00	0.00	0.00	1.40	0.15
44	209	78	79	78.5	39.25	2A	10.5	1.5	0.35	0.08	0.01				0.00	0.00	0.00	0.08	0.01
Total	4683									17.6	1.95				1.25	0.14		18.877	2.0835

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Double Trays 28.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 21

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
23	5B	10.5	3	0.36	0.16	0.02				0.00	0.00	0.00	0.16	0.02	0.48	0.05	
24				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 2
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 4.68
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
27				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.30	0.14	Vol Top 18.88
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 1.10
29				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 19.98
30				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.60	0.29	
31				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.41	0.16	Ea Top 2.08
32				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 0.12
33				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.40	0.04	Ea Total 2.21
34				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.87	0.32	
35				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br 15
36	5A	14	4.5	0.63	0.45	0.05				0.00	0.00	0.00	0.45	0.05	1.52	0.17	Bottom Br 3
37				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.13	0.12	Br Fruit 14
38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.89	0.21	
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.12	0.01	
40	5B	15.5	4	0.80	0.49	0.05				0.00	0.00	0.00	0.49	0.05	0.49	0.05	
41				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
42				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	4.29	0.47	
43				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.40	0.15	
44				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.08	0.01	
Total					1.10	0.12					0	0	1.10	0.12	19.980	2.2053	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mis, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mis, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mis, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Double Trays 28.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 21

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	202	77.5	79.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	204	76	78.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
47	216	79	82	80.5	40.25	2B	10.5	3	0.34	0.16	0.02				0.00	0.00	0.00	0.16	0.02
48	203	77	79.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
49	201	77.5	78	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
50	213	81	81	81.0	40.50	2B	10.5	3	0.34	0.16	0.02				0.00	0.00	0.00	0.16	0.02
51	211	78.5	83	80.8	40.38	2A	18	5.5	1.02	0.93	0.10				0.00	0.00	0.00	0.93	0.10
52	214	80.5	81	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
53	212	78.5	80	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
54	201	79.5	79	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
55	211	78.5	80	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
56	221	79	80.5	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	204	78	76.5	77.2	38.62	2A	16	1.5	0.84	0.24	0.03				0.00	0.00	0.00	0.24	0.03
58	211	79	81	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
59	213	80	78	79.0	39.50	2A	18	3	1.04	0.53	0.06				0.00	0.00	0.00	0.53	0.06
60	212	78.5	78.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
61	214	77	79.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
62	214	77	80	78.5	39.25	2B	12	3	0.46	0.21	0.02				0.00	0.00	0.00	0.21	0.02
63	218	77	81	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
64	216	82	80	81.0	40.50	2B	29	5	2.68	2.64	0.29				0.00	0.00	0.00	2.64	0.29
65	221	78.5	80	79.2	39.62	2B	16	3	0.82	0.40	0.04				0.00	0.00	0.00	0.40	0.04
66	202	77.5	78.5	78.0	39.00	2C	18.5	5	1.11	0.90	0.10				0.00	0.00	0.00	0.90	0.10
Total	4634									6.17	0.68					0	0	6.1745	0.6815

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Double Trays 28.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 21

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
46				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3
47				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.16	0.02	Weight(kg) 4.63
48				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 6.17
49				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 2.48
50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.16	0.02	Vol Total 8.65
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.93	0.10	
52	5B	14	5	0.61	0.51	0.06				0.00	0.00	0.00	0.51	0.06	0.51	0.06	Ea Top 0.68
53				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 0.27
54				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total 0.96
55				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3
57	5B	13	4	0.55	0.34	0.04				0.00	0.00	0.00	0.34	0.04	0.58	0.06	Top Br 9
58	5B	15.5	5	0.76	0.62	0.07				0.00	0.00	0.00	0.62	0.07	0.62	0.07	Bottom Br 6
59	5B	12	4	0.46	0.29	0.03				0.00	0.00	0.00	0.29	0.03	0.82	0.09	Br Fruit 12
60				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 4
61	5B	11	4	0.39	0.25	0.03				0.00	0.00	0.00	0.25	0.03	0.25	0.03	Top Br 4
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.21	0.02	Bottom Br 2
63				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Br Fruit 5
64	5B	14.5	4.5	0.65	0.48	0.05				0.00	0.00	0.00	0.48	0.05	3.12	0.34	Carton
65				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.40	0.04	Top Br 44
66				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.90	0.10	Bottom Br 14
Total					2.48	0.27					0	0	2.48	0.27	8.6523	0.9550	Br Fruit 46

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Double Trays 28.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 21

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	206	75	76	75.5	37.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	203	79.5	77	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	202	77.5	75	76.2	38.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	216	79	79	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	214	79	77	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	213	78	79	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	219	79.5	81.5	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	204	79.5	81	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	212	79.5	78.5	79.0	39.50	2A	12.5	3.5	0.50	0.27	0.03				0.00	0.00	0.00	0.27	0.03
76	203	78	75.5	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	219	75.5	79	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	203	75	79	77.0	38.50	2C	9.5	3	0.29	0.13	0.01				0.00	0.00	0.00	0.13	0.01
79	220	83.5	78	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	205	78	78	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	213	78.5	78.5	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	206	78	77	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	209	82.5	79	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	205	77	79	78.0	39.00	2B	10	3	0.32	0.15	0.02	2C	14	4.5	0.63	0.45	0.05	0.60	0.07
85	220	79	82.5	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	202	75.5	74	74.8	37.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	217	78	79	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	208	79.5	77	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4619									0.55	0.06					0.45	0.05	0.9983	0.1102

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Double Trays 28.9.93

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Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 21

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
68				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 4
69				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 4.62
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 1.00
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 0.61
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 1.60
74				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.27	0.03	Ea Top 0.11
76				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 0.07
77				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total 0.18
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.13	0.01	
79				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Carton
80				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 18.55
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 43.72
83	5B	13.5	3	0.57	0.27	0.03				0.00	0.00	0.00	0.27	0.03	0.27	0.03	Vol Bottom 5.01
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.60	0.07	Vol Total 48.74
85				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top 4.83
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 0.55
88	5A	12	4.5	0.46	0.33	0.04				0.00	0.00	0.00	0.33	0.04	0.33	0.04	Ea Total 5.38
Total					0.61	0.07					0	0	0.61	0.07	1.6035	0.1770	Ek Carton 109.20

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Double Trays 28.9.93

88:21/8

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 22

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	216	76.5	80	78.2	39.12	2A	21.5	4	1.51	1.05	0.12				0.00	0.00	0.00	1.05	0.12
2	201	78	78.5	78.2	39.12	2B	28	3.5	2.59	1.91	0.21				0.00	0.00	0.00	1.91	0.21
3	209	76	77.5	76.8	38.38	2B	24.5	4.5	2.01	1.60	0.18				0.00	0.00	0.00	1.60	0.18
4	222	80	79	79.5	39.75	2B	32	9	3.36	5.49	0.61				0.00	0.00	0.00	5.49	0.61
5	213	79.5	80	79.8	39.88	2B	34.5	6	3.92	4.82	0.53				0.00	0.00	0.00	4.82	0.53
6	222	79.5	81	80.2	40.12	2A	25.5	7	2.08	2.55	0.28				0.00	0.00	0.00	2.55	0.28
7	210	82.5	78.5	80.5	40.25	2B	22	7	1.53	1.84	0.20	2C	22.5	7	1.60	1.93	0.21	3.77	0.42
8	208	78	77.5	77.8	38.88	2B	26	7	2.24	2.69	0.30				0.00	0.00	0.00	2.69	0.30
9	217	80.5	76.5	78.5	39.25	2A	28	7	2.58	3.19	0.35	2C	19	4.5	1.17	0.86	0.10	4.06	0.45
10	210	76.5	77.5	77.0	38.50	2B	16	5	0.84	0.66	0.07				0.00	0.00	0.00	0.66	0.07
11	214	79	81	80.0	40.00	2A	7	3.5	0.15	0.09	0.01	2C	11	5	0.38	0.33	0.04	0.42	0.05
12	207	79	78	78.5	39.25	2A	31	8.5	3.19	4.85	0.54				0.00	0.00	0.00	4.85	0.54
13	210	79.5	79	79.2	39.62	2B	23	12	1.71	3.88	0.43	2C	22	12	1.56	3.60	0.40	7.48	0.83
14	205	77.5	79	78.2	39.12	2B	23.5	5	1.81	1.56	0.17				0.00	0.00	0.00	1.56	0.17
15	216	78	81	79.5	39.75	2A	23	7.5	1.70	2.18	0.24	2C	24	7.5	1.85	2.39	0.26	4.57	0.50
16	211	79.5	78.5	79.0	39.50	2B	32.5	7	3.50	4.62	0.51				0.00	0.00	0.00	4.62	0.51
17	219	80	79	79.5	39.75	2A	27	8	2.36	3.31	0.37				0.00	0.00	0.00	3.31	0.37
18	215	77	82	79.5	39.75	2A	23.5	7	1.78	2.13	0.23	2C	8.5	3	0.23	0.11	0.01	2.23	0.25
19	200	74	79	76.5	38.25	2B	20	5	1.33	1.08	0.12				0.00	0.00	0.00	1.08	0.12
20	201	75.5	81.5	78.5	39.25	2B	20	7.5	1.30	1.64	0.18	2C	19	7.5	1.17	1.48	0.16	3.12	0.34
21	200	74	79	76.5	38.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
22	201	78	79	78.5	39.25	2C	24	8	1.88	2.56	0.28				0.00	0.00	0.00	2.56	0.28
Total	4627									53.7	5.93					10.7	1.18	64.419	7.1103

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Reinforced trays treated with one coat of sanding sealer 28.9.93

88:22/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 22

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.05	0.12		
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.91	0.21	Tray 1	
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.60	0.18	Weight(kg)	4.63
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	5.49	0.61	Vol Top	64.42
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	4.82	0.53	Vol Bottom	9.95
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.55	0.28	Vol Total	74.37
7				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.77	0.42		
8				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.69	0.30	Ea Top	7.11
9				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	4.06	0.45	Ea Bottom	1.10
10				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.66	0.07	Ea Total	8.21
11				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.42	0.05		
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	4.85	0.54		
13	5B	8.2	5	0.21	0.21	0.02				0.00	0.00	0.00	0.21	0.02	7.68	0.85	Top Br	28
14				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.56	0.17	Bottom Br	3
15				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	4.57	0.50	Br Fruit	21
16	5A	34.5	13	3.97	9.43	1.04				0.00	0.00	0.00	9.43	1.04	14.05	1.55		
17	5B	13.5	3.5	0.58	0.32	0.04				0.00	0.00	0.00	0.32	0.04	3.63	0.40		
18				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.23	0.25		
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.08	0.12		
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.12	0.34		
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.56	0.28		
Total					9.95	1.10					0	0	9.95	1.10	74.369	8.2085		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Reinforced trays treated with one coat of sanding sealer 28.9.93

88:22/2

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 22

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top	
23	216	79	79.5	79.2	39.62	2A	21.5	7.5	1.49	1.89	0.21					0.00	0.00	0.00	1.89	0.21
24	211	77.5	81	79.2	39.62				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
25	221	79	80	79.5	39.75	2A	30.5	7.5	3.04	4.16	0.46					0.00	0.00	0.00	4.16	0.46
26	205	77	79	78.0	39.00	2B	18.5	5.5	1.11	0.99	0.11					0.00	0.00	0.00	0.99	0.11
27	208	79	80	79.5	39.75	2A	19.5	6.5	1.21	1.32	0.15					0.00	0.00	0.00	1.32	0.15
28	216	79.5	77	78.2	39.12	2C	22.5	8.5	1.65	2.40	0.27					0.00	0.00	0.00	2.40	0.27
29	204	76.5	78.5	77.5	38.75	2A	14	5	0.64	0.51	0.06	2B	16	5	0.83	0.66	0.07	1.17	0.13	
30	214	78	81.5	79.8	39.88	2A	19	7	1.15	1.36	0.15	2B	19	7	1.15	1.36	0.15	2.73	0.30	
31	215	77.5	77	77.2	38.62	2B	25.5	8	2.17	2.93	0.32					0.00	0.00	0.00	2.93	0.32
32	200	76	77	76.5	38.25	2A	30.5	7.5	3.17	4.21	0.46					0.00	0.00	0.00	4.21	0.46
33	213	78.5	81	79.8	39.88	2A	12.5	2.5	0.49	0.19	0.02					0.00	0.00	0.00	0.19	0.02
34	203	77	78.5	77.8	38.88	2C	22.5	10.5	1.66	3.12	0.34					0.00	0.00	0.00	3.12	0.34
35	215	79	78	78.5	39.25				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
36	201	76	79.5	77.8	38.88	2B	20	4.5	1.31	0.97	0.11					0.00	0.00	0.00	0.97	0.11
37	215	81	77	79.0	39.50	2C	24	5.5	1.87	1.78	0.20					0.00	0.00	0.00	1.78	0.20
38	206	78	77	77.5	38.75	2B	21	7.5	1.45	1.81	0.20					0.00	0.00	0.00	1.81	0.20
39	213	79	81.5	80.2	40.12				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
40	212	78	81	79.5	39.75				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
41	214	78.5	76.5	77.5	38.75	2A	13.5	4	0.59	0.37	0.04					0.00	0.00	0.00	0.37	0.04
42	207	77.5	77.5	77.5	38.75	2A	18	9.5	1.06	1.84	0.20	2B	18	9.5	1.06	1.84	0.20	3.68	0.41	
43	206	77.5	77.5	77.5	38.75	2A	12	4	0.47	0.29	0.03	2B	13	4	0.55	0.34	0.04	0.63	0.07	
44	217	79.5	80	79.8	39.88				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
Total	4632									30.2	3.33					4.21	0.46		34.373	3.7939

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Reinforced trays treated with one coat of sanding sealer 28.9.93

88:22/3

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 22

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
23				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.89	0.21	
24				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 2
25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	4.16	0.46	Weight(kg) 4.63
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.99	0.11	
27	5C	13	6	0.54	0.56	0.06				0.00	0.00	0.00	0.56	0.06	1.88	0.21	Vol Top 34.37
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.40	0.27	Vol Bottom 2.89
29				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.17	0.13	Vol Total 37.26
30				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.73	0.30	
31				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.93	0.32	Ea Top 3.79
32				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	4.21	0.46	Ea Bottom 0.32
33				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.19	0.02	Ea Total 4.11
34	5A	15.5	4	0.78	0.49	0.05				0.00	0.00	0.00	0.49	0.05	3.61	0.40	
35				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Top Br 21
36				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.97	0.11	Bottom Br 6
37	5B	12.5	4	0.50	0.31	0.03	5C	14	4	0.63	0.39	0.04	0.71	0.08	2.49	0.27	Br Fruit 19
38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.81	0.20	
39	5A	12	4	0.45	0.29	0.03				0.00	0.00	0.00	0.29	0.03	0.29	0.03	
40				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
41				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.37	0.04	
42				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.68	0.41	
43				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.63	0.07	
44	5B	15.5	6.5	0.76	0.85	0.09				0.00	0.00	0.00	0.85	0.09	0.85	0.09	
Total					2.49	0.28					0.39	0.04	2.89	0.32	37.262	4.1128	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Reinforced trays treated with one coat of sanding sealer 28.9.93

88:22/4

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 22

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top	
45	211	79.5	78.5	79.0	39.50	2C	14.5	2.5	0.67	0.27	0.03					0.00	0.00	0.00	0.27	0.03
46	203	80	79	79.5	39.75	2B	14.5	4	0.67	0.42	0.05					0.00	0.00	0.00	0.42	0.05
47	211	80	80	80.0	40.00				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
48	216	78	78.5	78.2	39.12	2B	26.5	5	2.31	2.11	0.23					0.00	0.00	0.00	2.11	0.23
49	213	78	81	79.5	39.75	2B	26	5.5	2.19	2.16	0.24					0.00	0.00	0.00	2.16	0.24
50	218	78.5	79.5	79.0	39.50				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
51	216	76.5	82.5	79.5	39.75	2A	25	9	2.02	3.17	0.35					0.00	0.00	0.00	3.17	0.35
52	204	81	80.5	80.8	40.38	2B	29	7	2.69	3.45	0.38					0.00	0.00	0.00	3.45	0.38
53	214	78	81	79.5	39.75				0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00
54	222	78	83	80.5	40.25	2A	30	8	2.90	4.22	0.47					0.00	0.00	0.00	4.22	0.47
55	203	77	79	78.0	39.00	2B	13	4	0.55	0.34	0.04	2C	10	5	0.32	0.28	0.03	0.62	0.07	
56	213	78.5	77	77.8	38.88	2C	20.5	4	1.38	0.93	0.10					0.00	0.00	0.00	0.93	0.10
57	208	76	77	76.5	38.25	2C	27	9	2.46	3.77	0.42					0.00	0.00	0.00	3.77	0.42
58	204	79	75.5	77.2	38.62	2A	12.5	3.5	0.51	0.27	0.03					0.00	0.00	0.00	0.27	0.03
59	213	76.5	82	79.2	39.62	2A	11.5	5	0.42	0.35	0.04	2C	19	6	1.16	1.15	0.13	1.50	0.17	
60	209	78	78.5	78.2	39.12	2B	20	5	1.30	1.07	0.12					0.00	0.00	0.00	1.07	0.12
61	210	77	76.5	76.8	38.38	2B	14.5	3.5	0.69	0.37	0.04					0.00	0.00	0.00	0.37	0.04
62	205	79	79	79.0	39.50	2B	18.5	5	1.10	0.90	0.10					0.00	0.00	0.00	0.90	0.10
63	215	81	77.5	79.2	39.62	2B	27	5	2.37	2.21	0.24	2C	27	5	2.37	2.21	0.24	4.41	0.49	
64	202	77.5	76.5	77.0	38.50	2B	12.5	3	0.51	0.23	0.03					0.00	0.00	0.00	0.23	0.03
65	220	77.5	81	79.2	39.62	2A	22.5	5	1.63	1.40	0.15	2C	13.5	3	0.58	0.27	0.03	1.68	0.19	
66	200	78	76	77.0	38.50	2C	16	5.5	0.84	0.74	0.08					0.00	0.00	0.00	0.74	0.08
Total	4630									28.4	3.13					3.91	0.43	32.290	3.5640	

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Reinforced trays treated with one coat of sanding sealer 28.9.93

88:22/5

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 22

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.27	0.03	
46				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.42	0.05	Tray 3
47				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 4.63
48				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.11	0.23	
49				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.16	0.24	Vol Top 32.29
50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom 3.16
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.17	0.35	Vol Total 35.45
52				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	3.45	0.38	
53				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top 3.56
54				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	4.22	0.47	Ea Bottom 0.35
55				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.62	0.07	Ea Total 3.91
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.93	0.10	Tray 3
57	5A	13.5	3.5	0.60	0.32	0.04				0.00	0.00	0.00	0.32	0.04	4.08	0.45	Top Br 23
58				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.27	0.03	Bottom Br 5
59	5B	14	6	0.62	0.63	0.07	5C	14	4.5	0.62	0.45	0.05	1.08	0.12	2.58	0.29	Br Fruit 19
60	5B	18	8	1.05	1.45	0.16	5C	11.5	4.5	0.42	0.31	0.03	1.76	0.19	2.83	0.31	Tray 4
61				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.37	0.04	Top Br 5
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.90	0.10	Bottom Br 7
63				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	4.41	0.49	Br Fruit 10
64				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.23	0.03	Carton
65				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.68	0.19	Top Br 77
66				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.74	0.08	Bottom Br 21
Total					2.41	0.27					0.76	0.08	3.16	0.35	35.454	3.9132	Br Fruit 69

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Reinforced trays treated with one coat of sanding sealer 28.9.93

88:22/6

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 22

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	207	79	79	79.0	39.50	2C	10.5	3	0.35	0.16	0.02				0.00	0.00	0.00	0.16	0.02
68	215	83	80	81.5	40.75	2B	12	2.5	0.44	0.18	0.02				0.00	0.00	0.00	0.18	0.02
69	219	76	82	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	209	76	82	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	211	79	79	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	221	84.5	80	82.2	41.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	218	79	83	81.0	40.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	217	80	77.5	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	213	80	78.5	79.2	39.62	2B	18.5	2.5	1.09	0.49	0.05				0.00	0.00	0.00	0.49	0.05
76	213	78	79.5	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	218	79	77.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
78	204	77	79.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	209	75	80	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	212	78.5	80	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	206	76.5	79.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	204	78	77.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	207	77	77.5	77.2	38.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	204	78	79	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	205	79	80	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	217	82	76	79.0	39.50	2B	10	2.5	0.32	0.12	0.01				0.00	0.00	0.00	0.12	0.01
87	204	80	80	80.0	40.00	2A	12	3	0.45	0.21	0.02				0.00	0.00	0.00	0.21	0.02
88	210	79.5	76	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4643									1.16	0.13					0	0	1.1627	0.1283

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Reinforced trays treated with one coat of sanding sealer 28.9.93

88:22/7

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 22

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.16	0.02		
68				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.18	0.02	Tray 4	
69				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	4.64
70				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
71				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	1.16
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	3.92
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	5.08
74				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.49	0.05	Ea Top	0.13
76	5A	10.5	3.5	0.35	0.19	0.02				0.00	0.00	0.00	0.19	0.02	0.19	0.02	Ea Bottom	0.43
77				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	0.56
78	5B	15.5	4.5	0.78	0.55	0.06				0.00	0.00	0.00	0.55	0.06	0.55	0.06		
79	5A	17	5	0.94	0.75	0.08				0.00	0.00	0.00	0.75	0.08	0.75	0.08	Carton	
80	5B	18.5	8	1.09	1.53	0.17				0.00	0.00	0.00	1.53	0.17	1.53	0.17	Weight(kg)	18.53
81	5B	13.5	2.5	0.59	0.23	0.03				0.00	0.00	0.00	0.23	0.03	0.23	0.03		
82	5A	14.5	3	0.68	0.32	0.04	6A	15	3	0.73	0.35	0.04	0.67	0.07	0.67	0.07	Vol Top	132.24
83				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	19.93
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total	152.17
85				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.12	0.01	Ea Top	14.60
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.21	0.02	Ea Bottom	2.20
88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total	16.80
Total					3.58	0.39					0.35	0.04	3.92	0.43	5.0849	0.5613	Ek Carton	109.08

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Reinforced trays treated with one coat of sanding sealer 28.9.93

88:22/8

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 23

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
1	208	78.5	79	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
2	212	79.5	78	78.8	39.38	2A	13.5	5	0.58	0.47	0.05	2C	17	4	0.93	0.60	0.06	1.07	0.12
3	205	79	77	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
4	214	78.5	81	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
5	213	79	80.5	79.8	39.88	2A	20	6	1.27	1.28	0.14				0.00	0.00	0.00	1.28	0.14
6	204	78.5	79	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
7	206	79	76.5	77.8	38.88	2A	14.5	4.5	0.68	0.48	0.05	2C	16	4	0.83	0.53	0.06	1.01	0.11
8	220	78	82	80.0	40.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
9	220	81.5	79	80.2	40.12	2C	12	4	0.45	0.29	0.03				0.00	0.00	0.00	0.29	0.03
10	216	79	77	78.0	39.00	2A	8	2	0.21	0.06	0.01				0.00	0.00	0.00	0.06	0.01
11	215	80	78.5	79.2	39.62	2A	22	6.5	1.56	1.71	0.18	2C	14.5	6	0.67	0.68	0.07	2.38	0.26
12	208	77.5	78.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
13	211	78	80	79.0	39.50	2A	15.5	4.5	0.77	0.55	0.06	2C	16	4	0.82	0.52	0.06	1.08	0.12
14	208	78	79	78.5	39.25	2C	15.5	4	0.77	0.49	0.05				0.00	0.00	0.00	0.49	0.05
15	216	79	81.5	80.2	40.12	2A	14	3	0.62	0.30	0.03				0.00	0.00	0.00	0.30	0.03
16	209	80.5	76	78.2	39.12	2A	18.5	5	1.11	0.90	0.10				0.00	0.00	0.00	0.90	0.10
17	218	78.5	82	80.2	40.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
18	218	77.5	83	80.2	40.12	2A	10.5	2	0.34	0.11	0.01	2C	22.5	6	1.61	1.66	0.18	1.76	0.19
19	219	77	81.5	79.2	39.62	2C	14	5.5	0.62	0.57	0.06				0.00	0.00	0.00	0.57	0.06
20	209	79	79	79.0	39.50	2C	16	5	0.82	0.66	0.07				0.00	0.00	0.00	0.66	0.07
21	212	79	79.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
22	215	79	78.5	78.8	39.38	2A	20	6.5	1.29	1.40	0.15	2C	8	5	0.20	0.20	0.02	1.59	0.17
Total	4676									9.26	0.99					4.18	0.45	13.442	1.4438

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Reinforced trays treated with an additional 25mm strip of tray material underneath pockets 6.10.93

88:23/1

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 23

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
1				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
2				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.07	0.12	Tray 1	
3				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg)	4.68
4				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
5				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.28	0.14	Vol Top	13.44
6				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	0.27
7				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.01	0.11	Vol Total	13.71
8				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
9	5A	10	2	0.31	0.10	0.01				0.00	0.00	0.00	0.10	0.01	0.38	0.04	Ea Top	1.44
10				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.06	0.01	Ea Bottom	0.03
11				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	2.38	0.26	Ea Total	1.47
12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
13				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.08	0.12	Top Br	19
14				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.49	0.05	Bottom Br	2
15				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.30	0.03	Br Fruit	13
16				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.90	0.10		
17				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
18	5B	11	3	0.38	0.18	0.02				0.00	0.00	0.00	0.18	0.02	1.94	0.21		
19				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.57	0.06		
20				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.66	0.07		
21				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
22				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.59	0.17		
Total					0.27	0.03					0	0	0.27	0.03	13.714	1.4730		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Reinforced trays treated with an additional 25mm strip of tray material underneath pockets 6.10.93

88:23/2

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 23

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
23	209	78.5	81.5	80.0	40.00	2A	11	3.5	0.38	0.21	0.02	2C	16	4	0.81	0.52	0.06	0.73	0.08
24	221	80.5	80	80.2	40.12	2C	19.5	6.5	1.20	1.32	0.14				0.00	0.00	0.00	1.32	0.14
25	219	82.5	79	80.8	40.38	2C	20.5	7	1.32	1.59	0.17				0.00	0.00	0.00	1.59	0.17
26	219	77	80.5	78.8	39.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
27	214	77	82	79.5	39.75	2A	10	3	0.32	0.15	0.02	2C	16.5	4.5	0.87	0.63	0.07	0.78	0.08
28	210	81	78.5	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
29	212	76.5	82	79.2	39.62	2C	16	4.5	0.82	0.59	0.06				0.00	0.00	0.00	0.59	0.06
30	219	78.5	81	79.8	39.88	2C	19.5	7.5	1.21	1.56	0.17				0.00	0.00	0.00	1.56	0.17
31	211	75	78.5	76.8	38.38	2C	12	3	0.47	0.21	0.02				0.00	0.00	0.00	0.21	0.02
32	214	75.5	79	77.2	38.62	2A	12	3	0.47	0.21	0.02	2C	15	4	0.74	0.46	0.05	0.67	0.07
33	217	79.5	80	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
34	210	79.5	79.5	79.5	39.75	2C	17	6	0.92	0.92	0.10				0.00	0.00	0.00	0.92	0.10
35	220	78.5	83.5	81.0	40.50	2C	23.5	5	1.74	1.55	0.17				0.00	0.00	0.00	1.55	0.17
36	204	78.5	78.5	78.5	39.25	2C	13.5	4	0.58	0.37	0.04				0.00	0.00	0.00	0.37	0.04
37	203	77	78	77.5	38.75	2B	17	6	0.94	0.92	0.10				0.00	0.00	0.00	0.92	0.10
38	210	80	76	78.0	39.00	2C	21	7	1.44	1.68	0.18				0.00	0.00	0.00	1.68	0.18
39	205	75.5	78	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
40	214	81	80	80.5	40.25	2C	16	6.5	0.80	0.90	0.10				0.00	0.00	0.00	0.90	0.10
41	213	78	77	77.5	38.75	2C	19	6	1.18	1.15	0.12				0.00	0.00	0.00	1.15	0.12
42	202	76	80.5	78.2	39.12	2C	12	4	0.46	0.29	0.03				0.00	0.00	0.00	0.29	0.03
43	218	76.5	78.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
44	216	76.5	78.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4680									13.6	1.46					1.61	0.17	15.209	1.6336

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Reinforced trays treated with an additional 25mm strip of tray material underneath pockets 6.10.93

88:23/3

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 23

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary	
23				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.73	0.08		
24	5B	14.5	5	0.66	0.54	0.06				0.00	0.00	0.00	0.54	0.06	1.86	0.20	Tray 2	
25	5A	8	2	0.20	0.06	0.01				0.00	0.00	0.00	0.06	0.01	1.65	0.18	Weight(kg)	4.68
26				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
27				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.78	0.08	Vol Top	15.21
28				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	8.41
29	5B	16	6	0.82	0.81	0.09				0.00	0.00	0.00	0.81	0.09	1.40	0.15	Vol Total	23.62
30				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	1.56	0.17		
31	5A	17	5	0.95	0.75	0.08				0.00	0.00	0.00	0.75	0.08	0.97	0.10	Ea Top	1.63
32				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.67	0.07	Ea Bottom	0.90
33	5A	14	5	0.62	0.51	0.05				0.00	0.00	0.00	0.51	0.05	0.51	0.05	Ea Total	2.54
34	5B	13	3.5	0.54	0.29	0.03				0.00	0.00	0.00	0.29	0.03	1.21	0.13		
35	5B	16.5	4.5	0.85	0.63	0.07				0.00	0.00	0.00	0.63	0.07	2.18	0.23	Top Br	19
36	5B	13	3	0.54	0.25	0.03				0.00	0.00	0.00	0.25	0.03	0.62	0.07	Bottom Br	13
37				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.92	0.10	Br Fruit	18
38	5B	13	4	0.55	0.34	0.04				0.00	0.00	0.00	0.34	0.04	2.02	0.22		
39				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
40	5A	23	6	1.68	1.74	0.19				0.00	0.00	0.00	1.74	0.19	2.63	0.28		
41	5A	17.5	6	1.00	0.97	0.10				0.00	0.00	0.00	0.97	0.10	2.13	0.23		
42	5B	16	5	0.83	0.66	0.07				0.00	0.00	0.00	0.66	0.07	0.95	0.10		
43				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00		
44	5A	18	5	1.06	0.85	0.09				0.00	0.00	0.00	0.85	0.09	0.85	0.09		
Total					8.41	0.90					0	0	8.41	0.90	23.619	2.5370		

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Reinforced trays treated with an additional 25mm strip of tray material underneath pockets 6.10.93

88:23/4

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 23

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
45	213	79.5	78.5	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
46	209	81	80.5	80.8	40.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
47	203	78.5	79.5	79.0	39.50	2D	9	3	0.26	0.12	0.01				0.00	0.00	0.00	0.12	0.01
48	213	78.5	78	78.2	39.12	2C	13	5	0.54	0.44	0.05				0.00	0.00	0.00	0.44	0.05
49	211	78.5	78	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
50	213	75.5	79.5	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
51	211	78.5	73.5	76.0	38.00	2A	15	4	0.75	0.46	0.05				0.00	0.00	0.00	0.46	0.05
52	219	80	77	78.5	39.25	2A	17	4	0.93	0.60	0.06	2C	12.5	4	0.50	0.31	0.03	0.91	0.10
53	213	78	77.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
54	206	78	79.5	78.8	39.38	2A	12	4	0.46	0.29	0.03				0.00	0.00	0.00	0.29	0.03
55	210	79	80	79.5	39.75	2A	17	5	0.92	0.75	0.08				0.00	0.00	0.00	0.75	0.08
56	213	79	80	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
57	210	77.5	77	77.2	38.62	2B	21.5	5.5	1.53	1.39	0.15	2C	15	5	0.74	0.58	0.06	1.97	0.21
58	209	79	79	79.0	39.50	2C	18.5	5	1.10	0.90	0.10				0.00	0.00	0.00	0.90	0.10
59	215	79	77	78.0	39.00	2A	17.5	4	0.99	0.64	0.07				0.00	0.00	0.00	0.64	0.07
60	216	78.5	82	80.2	40.12	2B	14.5	5.5	0.66	0.61	0.07				0.00	0.00	0.00	0.61	0.07
61	217	79	82.5	80.8	40.38	2A	15.5	3	0.75	0.37	0.04				0.00	0.00	0.00	0.37	0.04
62	214	77	79	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
63	203	78.5	78	78.2	39.12	2C	14	3	0.63	0.30	0.03				0.00	0.00	0.00	0.30	0.03
64	200	75	75.5	75.2	37.62	2C	21.5	7	1.57	1.77	0.19				0.00	0.00	0.00	1.77	0.19
65	216	81	79	80.0	40.00	2A	16	5.5	0.81	0.73	0.08				0.00	0.00	0.00	0.73	0.08
66	208	76	80.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4642									9.37	1.01					0.90	0.10	10.261	1.1022

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Reinforced trays treated with an additional 25mm strip of tray material underneath pockets 6.10.93

88:23/5

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 23

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary		
45				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00			
46	5A	13	5	0.53	0.44	0.05				0.00	0.00	0.00	0.44	0.05	0.44	0.05	Tray 3		
47	5B	13	3	0.54	0.25	0.03				0.00	0.00	0.00	0.25	0.03	0.37	0.04	Weight(kg)	4.64	
48	5B	19.5	7	1.23	1.44	0.15				0.00	0.00	0.00	1.44	0.15	1.88	0.20			
49				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top	10.26	
50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Bottom	10.47	
51				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.46	0.05	Vol Total	20.73	
52	5A	19	6	1.17	1.15	0.12				0.00	0.00	0.00	1.15	0.12	2.06	0.22			
53	5B	19.5	6	1.24	1.22	0.13				0.00	0.00	0.00	1.22	0.13	1.22	0.13	Ea Top	1.10	
54	5A	14	4	0.63	0.39	0.04				0.00	0.00	0.00	0.39	0.04	0.68	0.07	Ea Bottom	1.12	
55	5A	13	4	0.54	0.34	0.04				0.00	0.00	0.00	0.34	0.04	1.09	0.12	Ea Total	2.23	
56				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 3		
57	5A	15.5	7	0.79	0.93	0.10				0.00	0.00	0.00	0.93	0.10	2.90	0.31	Top Br	16	
58	5B	16	4	0.82	0.52	0.06				0.00	0.00	0.00	0.52	0.06	1.42	0.15	Bottom Br	14	
59	5A	17.5	7	0.99	1.17	0.13				0.00	0.00	0.00	1.17	0.13	1.81	0.19	Br Fruit	17	
60				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.61	0.07	Tray 4		
61	5A	17.5	7	0.96	1.16	0.12				0.00	0.00	0.00	1.16	0.12	1.53	0.16	Top Br	1	
62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Bottom Br	9	
63				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.30	0.03	Br Fruit	9	
64	5A	13	4.5	0.57	0.39	0.04				0.00	0.00	0.00	0.39	0.04	2.16	0.23	Carton		
65	5A	14.5	5	0.66	0.54	0.06				0.00	0.00	0.00	0.54	0.06	1.28	0.14	Top Br	55	
66	5A	16	4	0.83	0.53	0.06				0.00	0.00	0.00	0.53	0.06	0.53	0.06	Bottom Br	38	
Total					10.5	1.12						0	0	10.5	1.12	20.735	2.2271	Br Fruit	57

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Reinforced trays treated with an additional 25mm strip of tray material underneath pockets 6.10.93

88:23/6

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 23

Apple	Wt	D 1	D 2	D Av	R	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Top	E Top
67	220	78	83	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
68	212	81	78	79.5	39.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
69	219	74.5	79	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
70	214	79	79.5	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
71	210	77	79	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
72	220	76	79.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
73	209	80.5	79	79.8	39.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
74	220	78	80	79.0	39.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
75	214	79.5	76.5	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
76	221	76	79.5	77.8	38.88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
77	213	80.5	79	79.8	39.88	2A	8	2	0.20	0.06	0.01				0.00	0.00	0.00	0.06	0.01
78	220	79.5	79	79.2	39.62				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
79	206	78	77	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
80	213	77	79.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
81	209	75.5	78	76.8	38.38				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
82	212	77	80	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
83	219	78	78	78.0	39.00				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
84	206	78	79	78.5	39.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
85	203	79	76	77.5	38.75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
86	218	80	76.5	78.2	39.12				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
87	212	81	80	80.5	40.25				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
88	220	78.5	83.5	81.0	40.50				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00
Total	4710									0.06	0.01					0	0	0.0599	0.0064

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), Vol-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Reinforced trays treated with an additional 25mm strip of tray material underneath pockets 6.10.93

88:23/7

Apple Data, Bruise Analysis and Energy Absorbed in Bruising Count 88 Carton 23

Apple	P	d	h	X	Vol	E	P	d	h	X	Vol	E	V Bot	E Bot	Apple V	Apple E	Summary
67				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
68				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Tray 4
69				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Weight(kg) 4.71
70	5B	15	4	0.72	0.46	0.05				0.00	0.00	0.00	0.46	0.05	0.46	0.05	Vol Top 0.06
71	5A	15	4	0.73	0.46	0.05				0.00	0.00	0.00	0.46	0.05	0.46	0.05	Vol Bottom 2.56
72				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 2.52
73				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
74	5A	12.5	3	0.50	0.23	0.02				0.00	0.00	0.00	0.23	0.02	0.23	0.02	Ea Top 0.01
75				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 0.28
76	5A	13.5	4	0.59	0.37	0.04				0.00	0.00	0.00	0.37	0.04	0.37	0.04	Ea Total 0.28
77	5A	10.5	5	0.35	0.30	0.03				0.00	0.00	0.00	0.30	0.03	0.36	0.04	
78				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
79	5A	9	1.5	0.26	0.06	0.01				0.00	0.00	0.00	0.06	0.01	0.06	0.01	Carton
80	5B	13.5	3	0.59	0.27	0.03				0.00	0.00	0.00	0.27	0.03	0.27	0.03	Weight(kg) 18.71
81				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
82				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Top 38.97
83	5B	8.5	3	0.23	0.11	0.01				0.00	0.00	0.00	0.11	0.01	0.11	0.01	Vol Bottom 21.72
84				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Vol Total 60.69
85	5B	12.5	4	0.51	0.31	0.03				0.00	0.00	0.00	0.31	0.03	0.31	0.03	
86				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Top 4.19
87				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Bottom 2.33
88				0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ea Total 6.52
Total					2.56	0.28					0	0	2.56	0.28	2.6248	0.2819	Ek Carton 110.12

Wt-Weight grams, D 1-Diameter mm (height in tray), D2-Diameter mm (width in tray), D Av-Average Diameter mm, R-Radius mm, P-Position of Bruise (refer chart) d-Depth of Bruise mm, h-Height of Bruise mm, X-derived (refer Bruise Volume equation), h-Bruise Volume in mls, E-Energy Absorbed by Bruise joules, V Top-Bruise Volume top of apple mls, E Top-Energy Absorbed top of apple joules, V Bot-Bruise Volume Bottom of Apple mls, E Bot-Energy Absorbed Bottom of Apple joules, Apple V-Total Bruise Volume on Apple mls, Apple E-Total Energy Absorbed in Bruising Apple joules, Ea-Energy Absorbed joules, Ek Carton-Kinetic Energy (mgh) joules, Top Br- Number of individual bruises on top of apple, Bottom Br- Number of individual bruises on bottom of apple, Br Fruit-Number of fruit with one or more bruises. Reinforced trays treated with an additional 25mm strip of tray material underneath pockets 6.10.93

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Appendix 7

SUMMARIES OF DROP TEST DATA

Summary of Drop Test Data Count 88 at 15 % MC

Means	Ctn 1	Ctn 2	Ctn 3	Ctn 4	Ctn 5	Ctn 6	Ctn 7	Ctn 8	Ctn 9	Ctn 10
Carton										
Weight(kg)	18.66	18.65	18.71	18.69	18.66	18.64	18.75	18.71	18.59	18.77
Vol Top	63.14	65.07	44.44	59.7	57.15	57.79	106.38	62.93	71.88	38.41
Vol Bottom	83.93	77.12	64.84	54.11	63.05	77.56	59.58	73.13	64.64	50.98
Vol Total	147.07	142.19	109.28	113.81	120.20	135.35	165.96	136.06	136.52	89.39
No Bruises	142	141	119	120	104	94	121	111	103	104
No Br Fruit	69	77	72	74	66	65	70	70	69	62
Ea Top	6.97	7.18	4.9	6.59	6.31	6.38	12.18	7.13	8.14	4.24
Ea Bottom	9.26	8.51	7.16	5.97	6.96	8.56	6.58	8.07	7.13	5.63
Ea Total	16.23	15.69	12.06	12.56	13.27	14.94	18.76	15.20	15.27	9.87
Ek Carton	109.83	109.77	110.13	110.01	109.83	109.72	110.36	110.13	109.42	110.48
10 Ctns	Wt	#BF	#Ind.B	Vol T	Vol B	VolTot	EaT	EaB	EaTot	Ek
Std Dev	0.0540	4.3767	16.045	18.213	10.758	21.797	2.1406	1.1859	2.5026	0.3176
Var	0.0029	19.156	257.43	331.71	115.74	475.10	4.5820	1.4064	6.2631	0.1009
Mean	18.683	69.4	115.9	62.689	66.894	129.58	7.002	7.383	14.385	109.97
CV	0.2888	6.3065	13.844	29.053	16.083	16.821	30.571	16.063	17.397	0.2888
Se	0.0171	1.3840	5.0738	5.7595	3.4021	6.8927	0.6769	0.3750	0.7914	0.1004
Min	18.59	62	94	38.41	50.98	89.39	4.24	5.63	9.87	109.42
Max	18.77	77	142	106.38	83.93	165.96	12.18	9.26	18.76	110.48
n	10	10	10	10	10	10	10	10	10	10

Table 7.1 Summary of Drop Test Data Count 88 Cartons at 15% MC

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.

Std Dev - standard deviation, Var - variance, Mean - average, CV - coefficient of variation, se - standard error, min - minimum value, max - maximum value, n - number of cartons.

Wt - weight, #BF - Number of bruised fruit, # Ind B - number of individual bruises, Vol T - volume of bruising on top of apple, Vol B - volume of bruising on bottom of apple, Vol Tot - total volume of bruising on apple, EaT - energy absorbed by bruising on the top of the apple, EaB - energy absorbed by bruising on the bottom of the apple, EaTot - energy absorbed by bruising on the apple.

Summary of Drop Test Data Count 88 at 15 % MC

	Ctn 1	Ctn 2	Ctn 3	Ctn 4	Ctn 5	Ctn 6	Ctn 7	Ctn 8	Ctn 9	Ctn 10
Tray 1										
Weight(kg)	4.71	4.65	4.70	4.68	4.68	4.65	4.72	4.69	4.64	4.73
Vol Top	32.12	29.85	15.94	23.88	21.06	27.92	48.61	30.96	30.09	15.63
% of Vol Tot	50.87	45.87	35.87	40.00	36.85	48.31	45.69	49.20	41.86	40.69
No Bruises	26	29	23	27	22	19	27	24	24	23
Vol Bottom	20.73	2.51	6.99	0	5.95	7.35	17.72	5.12	0.72	3.64
% of Vol Tot	24.70	3.25	10.78	0.00	9.44	9.48	29.74	7.00	1.11	7.14
No Bruises	13	4	3	0	5	3	10	7	1	6
Vol Total	52.85	32.36	22.93	23.88	27.02	35.27	66.33	36.08	30.81	19.27
% of Vol Tot	35.94	22.76	20.98	20.98	22.48	26.06	39.97	26.52	22.57	21.56
No Br Fruit	18	18	19	19	17	17	21	19	19	17
Ea Top	3.55	3.29	1.76	2.64	2.33	3.08	5.37	3.42	3.32	1.73
Ea Bottom	2.29	0.28	0.77	0	0.66	0.81	1.96	0.57	0.08	0.4
Ea Total	5.84	3.57	2.53	2.64	2.99	3.89	7.33	3.99	3.4	2.13
Tray 2										
Weight(kg)	4.67	4.65	4.66	4.65	4.61	4.70	4.65	4.68	4.66	4.70
Vol Top	17.02	19.85	18.81	20.12	15.59	17.69	37.33	22.30	29.20	17.07
% of Vol Tot	26.96	30.51	42.33	33.70	27.28	30.61	35.09	35.44	40.62	44.44
No Bruises	21	23	27	21	18	15	24	18	20	21
Vol Bottom	19.34	32.32	24.81	21.15	16.17	27.04	18.67	32.71	28.35	24.46
% of Vol Tot	23.04	41.91	38.26	39.09	25.65	34.86	31.34	44.73	43.86	47.98
No Bruises	18	21	18	17	14	16	17	18	14	20
Vol Total	36.36	52.17	43.62	41.27	31.76	44.73	56.00	55.01	57.55	41.53
% of Vol Tot	24.72	36.69	39.92	36.26	26.42	33.05	33.74	40.43	42.15	46.46
No Br Fruit	18	20	20	19	17	20	20	19	19	20
Ea Top	1.88	2.19	2.08	2.22	1.72	1.95	4.12	2.46	3.26	1.88
Ea Bottom	2.13	3.57	2.74	2.33	1.78	2.98	2.06	3.61	3.13	2.7
Ea Total	4.01	5.76	4.82	4.55	3.5	4.93	6.18	6.07	6.39	4.58

Table 7.1 Summary of Drop Test Data Count 88 Cartons at 15% MC

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.

Std Dev - standard deviation, Var - variance, Mean - average, CV - coefficient of variation, se - standard error, min - minimum value, max - maximum value, n - number of cartons.

Wt - weight, #BF - Number of bruised fruit, # Ind B - number of individual bruises, Vol T - volume of bruising on top of apple, Vol B - volume of bruising on bottom of apple, Vol Tot - total volume of bruising on apple, EaT - energy absorbed by bruising on the top of the apple, EaB - energy absorbed by bruising on the bottom of the apple, EaTot - energy absorbed by bruising on the apple.

Summary of Drop Test Data Count 88 at 15 % MC

	Ctn 1	Ctn 2	Ctn 3	Ctn 4	Ctn 5	Ctn 6	Ctn 7	Ctn 8	Ctn 9	Ctn 10
Tray 3										
Weight(kg)	4.67	4.64	4.69	4.69	4.67	4.64	4.67	4.69	4.64	4.7
Vol Top	11.99	15.27	9.69	14.06	19.95	12.02	24.12	11.32	13.52	5.71
% of Vol Tot	18.99	23.47	21.80	23.55	34.91	20.80	22.67	17.99	18.81	14.87
No Bruises	20	20	15	18	14	13	18	11	15	10
Vol Bottom	25.91	26.42	17.45	18.94	24.32	26.29	16.09	17.45	24.24	16.51
% of Vol Tot	30.87	34.26	26.91	35.00	38.57	33.90	27.01	23.86	37.50	32.39
No Bruises	22	23	16	18	16	17	16	15	17	16
Vol Total	37.90	41.69	27.13	33.01	44.27	38.31	40.21	28.77	37.76	22.22
% of Vol Tot	25.77	29.32	24.83	29.00	36.83	28.30	24.23	21.15	27.66	24.86
No Br Fruit	18	22	18	20	19	19	20	14	19	17
Ea Top	1.32	1.69	1.07	1.55	2.20	1.33	2.66	1.25	1.49	0.63
Ea Bottom	2.86	2.92	1.93	2.09	2.68	2.90	1.78	1.93	2.67	1.82
Ea Total	4.18	4.61	3.00	3.64	4.88	4.23	4.44	3.18	4.16	2.45
Tray 4										
Weight(kg)	4.62	4.7	4.66	4.67	4.7	4.65	4.71	4.66	4.65	4.64
Vol Top	2.04	0.14	0.00	1.64	0.55	0.16	0.32	0.00	0.61	0.00
% of Vol Tot	3.23	0.22	0.00	2.75	0.96	0.28	0.30	0.00	0.85	0.00
No Bruises	4	2	0	2	2	1	1	0	1	0
Vol Bottom	18.01	15.87	15.59	14.02	16.61	16.87	7.09	17.84	11.34	6.37
% of Vol Tot	21.46	20.58	24.04	25.91	26.34	21.75	11.90	24.39	17.54	12.50
No Bruises	18	19	17	17	13	10	8	18	11	8
Vol Total	20.04	16.00	15.59	15.66	17.16	17.03	7.41	17.84	11.95	6.37
% of Vol Tot	13.63	11.25	14.27	13.76	14.28	12.58	4.46	13.11	8.75	7.13
No Br Fruit	15	17	15	16	13	9	9	18	12	8
Ea Top	0.22	0.01	0.00	0.18	0.06	0.02	0.04	0.00	0.07	0.00
Ea Bottom	1.99	1.75	1.72	1.55	1.83	1.86	0.78	1.97	1.25	0.70
Ea Total	2.21	1.76	1.72	1.73	1.89	1.88	0.82	1.97	1.32	0.70

Table 7.1 Summary of Drop Test Data Count 88 Cartons at 15% MC

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.

Std Dev - standard deviation, Var - variance, Mean - average, CV - coefficient of variation, se - standard error, min - minimum value, max - maximum value, n - number of cartons.

Wt - weight, #BF - Number of bruised fruit, # Ind B - number of individual bruises, Vol T - volume of bruising on top of apple, Vol B - volume of bruising on bottom of apple, Vol Tot - total volume of bruising on apple, EaT - energy absorbed by bruising on the top of the apple, EaB - energy absorbed by bruising on the bottom of the apple, EaTot - energy absorbed by bruising on the apple.

Summary of Drop Test Data Count 88 at 15 % MC

Tray 1	Wt	#BF	Vol top	#ind Bt	t%VTot	Vol bot	#ind Bb	b%VTot	Vol TOT	% V Tot
Std Dev	0.0310	1.2649	9.5473	2.9136	5.2247	6.8963	3.9944	9.7064	14.550	6.6570
Var	0.0010	1.6	91.150	8.4889	27.297	47.558	15.956	94.214	211.71	44.315
Mean	4.685	18.4	27.606	24.4	43.522	7.073	5.2	10.264	34.68	25.981
CV	0.66	6.87	34.58	11.94	12.00	97.50	76.82	94.56	41.96	25.62
SEM	0.0098	0.4	3.0191	0.9214	1.6522	2.1808	1.2632	3.0694	4.6012	2.1051
Min	4.64	17	15.63	19	35.869	0	0	0	19.27	20.982
Max	4.73	21	48.61	29	50.871	20.73	13	29.742	66.33	39.967
n	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Tray 2	Wt	#BF	Vol top	#ind Bt	t%VTot	Vol bot	#ind Bb	b%VTot	Vol TOT	% V Tot
Std Dev	0.03	1.03	6.76	3.39	6.14	5.69	2.26	8.28	8.81	6.79
Var	0.0007	1.0667	45.725	11.511	37.688	32.350	5.1222	68.629	77.554	46.166
Mean	4.66	19.20	21.50	20.80	34.70	24.50	17.30	37.07	46.00	35.98
CV	0.57	5.38	31.45	16.31	17.69	23.21	13.08	22.35	19.14	18.88
SEM	0.0084	0.3266	2.1383	1.0729	1.9413	1.7986	0.7157	2.6197	2.7849	2.1486
Min	4.61	17	15.59	15	26.956	16.17	14	23.043	31.76	24.723
Max	4.7	20	37.33	27	44.442	32.71	21	47.980	57.55	46.459
n	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Tray 3	Wt	#BF	Vol top	#ind Bt	t%VTot	Vol bot	#ind Bb	b%VTot	Vol TOT	% V Tot
Std Dev	0.0231	2.1187	5.1807	3.5340	5.3633	4.4146	2.7162	4.8263	7.0922	4.2240
Var	0.0005	4.4889	26.839	12.489	28.765	19.488	7.3778	23.293	50.299	17.842
Mean	4.67	18.6	13.765	15.4	21.786	21.362	17.6	32.027	35.127	27.195
CV	0.49	11.39	37.64	22.95	24.62	20.67	15.43	15.07	20.19	15.53
SEM	0.0073	0.6700	1.6383	1.1175	1.6960	1.3960	0.8589	1.5262	2.2428	1.3358
Min	4.64	14	5.71	10	14.866	16.09	15	23.862	22.22	21.145
Max	4.7	22	24.12	20	34.908	26.42	23	38.573	44.27	36.830
n	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Tray 4	Wt	#BF	Vol top	#ind Bt	t%VTot	Vol bot	#ind Bb	b%VTot	Vol TOT	% V Tot
Std Dev	0.0291	3.5839	0.7221	1.2517	1.1776	4.2808	4.3830	5.1664	4.5089	3.4102
Var	0.0008	12.844	0.5214	1.5667	1.3867	18.325	19.211	26.691	20.331	11.630
Mean	4.67	13.20	0.55	1.30	0.86	13.96	13.90	20.64	14.50	11.32
CV	0.62	27.15	132.24	96.28	137.22	30.66	31.53	25.03	31.09	30.12
SEM	0.0092	1.1333	0.2283	0.3958	0.3724	1.3537	1.3860	1.6337	1.4259	1.0784
Min	4.62	8	0	0	0	6.37	8	11.900	6.37	4.4649
Max	4.71	18	2.04	4	3.2309	18.01	19	26.344	20.04	14.276
n	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Table 7.1 Summary of Drop Test Data Count 88 Cartons at 15% MC

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.

Std Dev - standard deviation, Var - variance, Mean - average, CV - coefficient of variation, se - standard error, min - minimum value, max - maximum value, n - number of cartons.

Wt - weight, #BF - Number of bruised fruit, # Ind B - number of individual bruises, Vol T - volume of bruising on top of apple, Vol B - volume of bruising on bottom of apple, Vol Tot - total volume of bruising on apple, EaT - energy absorbed by bruising on the top of the apple, EaB - energy absorbed by bruising on the bottom of the apple, EaTot - energy absorbed by bruising on the apple.

Summary of Drop Test Data Count 88 Cartons 11-20 at 8 % MC

Means	Ctn 11	Ctn 12	Ctn 13	Ctn 14	Ctn 15	Ctn 16	Ctn 17	Ctn 18	Ctn 19	Ctn 20
Carton										
Weight(kg)	18.75	18.55	18.63	18.67	18.6	18.67	18.66	18.69	18.56	18.66
Vol Top	70.94	71.01	78.22	64.82	72.42	68.96	91.81	92.12	108.71	81.65
Vol Bottom	42.75	55.16	43.19	37.25	36.04	45.61	43.85	82.22	56.04	81.01
Vol Total	113.69	126.17	121.41	102.07	108.46	114.57	135.66	174.34	164.75	162.66
No. Bruises	107	120	102	99	127	124	123	136	133	126
No. Br Fruit	68	73	67	67	66	72	70	67	73	69
Ea Top	7.83	7.84	8.63	6.26	6.99	6.66	8.86	8.89	10.49	7.88
Ea Bottom	4.72	6.09	4.77	3.60	3.48	4.40	4.23	7.94	5.41	7.82
Ea Total	12.55	13.93	13.40	9.86	10.47	11.06	13.09	16.83	15.90	15.70
Ek Carton	110.36	109.19	109.66	109.89	109.48	109.89	109.83	110.01	109.24	109.83
10 Ctns	Wt	#BF	#Ind.B	Vol T	Vol B	VolTot	EaT	EaB	EaTot	Ek
Std Dev	0.0608	2.6583	12.772	13.700	16.743	25.932	1.2486	1.5882	2.3770	0.3577
Var	0.0037	7.0667	163.12	187.68	280.32	672.49	1.5589	2.5224	5.6500	0.1280
Mean	18.644	69.2	119.7	80.066	52.312	132.38	8.033	5.246	13.279	109.74
CV	0.3260	3.8415	10.670	17.111	32.006	19.590	15.543	30.275	17.900	0.3260
se	0.0192	0.8406	4.0388	4.3323	5.2945	8.2005	0.3948	0.5022	0.7517	0.1131
Min	18.55	66	99	64.82	36.04	102.07	6.26	3.48	9.86	109.19
Max	18.75	73	136	108.71	82.22	174.34	10.49	7.94	16.83	110.36
n	10	10	10	10	10	10	10	10	10	10

Table 7.2 Summary of Drop Test Data Count 88 Cartons at 8% MC

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.

Std Dev - standard deviation, Var - variance, Mean - average, CV - coefficient of variation, se - standard error, min - minimum value, max - maximum value, n - number of cartons.

Wt - weight, #BF - Number of bruised fruit, # Ind B - number of individual bruises, Vol T - volume of bruising on top of apple, Vol B - volume of bruising on bottom of apple, Vol Tot - total volume of bruising on apple, EaT - energy absorbed by bruising on the top of the apple, EaB - energy absorbed by bruising on the bottom of the apple, EaTot - energy absorbed by bruising on the apple.

Summary of Drop Test Data Count 88 Cartons 11-20 at 8 % MC

	Ctn 11	Ctn 12	Ctn 13	Ctn 14	Ctn 15	Ctn 16	Ctn 17	Ctn 18	Ctn 19	Ctn 20
Tray 1										
Weight(kg)	4.72	4.64	4.63	4.64	4.64	4.69	4.69	4.65	4.64	4.61
Vol Top	40.15	29.71	39.35	30.62	27.19	28.92	37.33	43.47	46.3	33.48
% of Vol Tot	56.60	41.84	50.31	47.24	37.54	41.94	40.66	47.19	42.59	41.00
No. Bruises	29	25	24	24	26	31	26	30	28	27
Vol Bottom	6.42	5.07	9.29	2.28	1.59	4.38	2.38	23.75	8.96	12.83
% of Vol Tot	15.02	9.19	21.51	6.12	4.41	9.60	5.43	28.89	15.99	15.84
No. Bruises	4	7	8	3	6	7	2	16	8	9
Vol Total	46.57	34.78	48.64	32.9	28.78	33.3	39.71	67.22	55.26	46.31
% of Vol Tot	40.96	27.57	40.06	32.23	26.54	29.07	29.27	38.56	33.54	28.47
No. Br Fruit	21	21	21	19	19	20	21	22	21	19
Ea Top	4.43	3.28	4.34	2.96	2.62	2.79	3.60	4.20	4.47	3.23
Ea Bottom	0.71	0.56	1.03	0.22	0.15	0.42	0.23	2.29	0.87	1.24
Ea Total	5.14	3.84	5.37	3.18	2.77	3.21	3.83	6.49	5.34	4.47
Tray 2										
Weight(kg)	4.67	4.65	4.65	4.68	4.7	4.64	4.68	4.66	4.61	4.73
Vol Top	18.85	24.10	23.65	19.33	23.57	21.22	31.21	29.46	43.71	22.40
% of Vol Tot	26.57	33.94	30.24	29.82	32.55	30.77	33.99	31.98	40.21	27.43
No. Bruises	20	19	18	18	22	23	27	24	30	21
Vol Bottom	12.07	17.07	12.27	10.54	12.27	14.22	13.43	21.29	20.16	22.72
% of Vol Tot	28.23	30.95	28.41	28.30	34.05	31.18	30.63	25.89	35.97	28.05
No. Bruises	13	15	11	12	15	16	16	20	19	20
Vol Total	30.92	41.17	35.92	29.87	35.84	35.44	44.64	50.75	63.87	45.12
% of Vol Tot	27.20	32.63	29.59	29.26	33.04	30.93	32.91	29.11	38.77	27.74
No. Br Fruit	19	18	18	19	17	19	20	18	21	20
Ea Top	2.08	2.66	2.61	1.87	2.28	2.05	3.01	2.84	4.22	2.16
Ea Bottom	1.33	1.88	1.35	1.02	1.18	1.37	1.30	2.05	1.95	2.19
Ea Total	3.41	4.54	3.96	2.89	3.46	3.42	4.31	4.89	6.17	4.35

Table 7.2 Summary of Drop Test Data Count 88 Cartons at 8% MC

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.

Std Dev - standard deviation, Var - variance, Mean - average, CV - coefficient of variation, se - standard error, min - minimum value, max - maximum value, n - number of cartons.

Wt - weight, #BF - Number of bruised fruit, # Ind B - number of individual bruises, Vol T - volume of bruising on top of apple, Vol B - volume of bruising on bottom of apple, Vol Tot - total volume of bruising on apple, EaT - energy absorbed by bruising on the top of the apple, EaB - energy absorbed by bruising on the bottom of the apple, EaTot - energy absorbed by bruising on the apple.

Summary of Drop Test Data Count 88 Cartons 11-20 at 8 % MC

	Ctn 11	Ctn 12	Ctn 13	Ctn 14	Ctn 15	Ctn 16	Ctn 17	Ctn 18	Ctn 19	Ctn 20
Tray 3										
Weight(kg)	4.66	4.64	4.67	4.67	4.64	4.69	4.64	4.7	4.65	4.64
Vol Top	11.07	16.10	13.87	13.37	17.50	18.28	23.28	19.19	18.70	25.76
% of Vol Tot	15.60	22.67	17.73	20.63	24.16	26.51	25.36	20.83	17.20	31.55
No. Bruises	14	17	16	15	19	15	19	21	17	20
Vol Bottom	16.78	16.41	15.48	16.72	14.39	18.83	14.49	20.51	17.81	27.69
% of Vol Tot	39.25	29.75	35.84	44.89	39.93	41.28	33.04	24.95	31.78	34.18
No. Bruises	14	20	14	15	17	18	20	15	18	19
Vol Total	27.85	32.51	29.35	30.09	31.89	37.11	37.77	39.7	36.51	53.45
% of Vol Tot	24.50	25.77	24.17	29.48	29.40	32.39	27.84	22.77	22.16	32.86
No. Br Fruit	18	20	17	17	18	20	19	18	18	20
Ea Top	1.22	1.78	1.53	1.29	1.69	1.76	2.25	1.85	1.81	2.49
Ea Bottom	1.85	1.81	1.71	1.61	1.39	1.82	1.40	1.98	1.72	2.67
Ea Total	3.07	3.59	3.24	2.9	3.08	3.58	3.65	3.83	3.52	5.16
Tray 4										
Weight(kg)	4.7	4.62	4.68	4.68	4.63	4.66	4.65	4.68	4.66	4.67
Vol Top	0.87	1.10	1.34	1.49	4.16	0.54	0.00	0.00	0.00	0.00
% of Vol Tot	1.23	1.55	1.71	2.30	5.74	0.78	0.00	0.00	0.00	0.00
No. Bruises	2	2	4	4	9	1	0	0	0	0
Vol Bottom	7.48	16.61	6.14	7.70	7.79	8.18	13.55	16.66	9.11	17.77
% of Vol Tot	17.50	30.11	14.22	20.67	21.61	17.93	30.90	20.26	16.26	21.94
No. Bruises	11	15	7	8	13	13	13	10	13	10
Vol Total	8.35	17.71	7.48	9.19	11.95	8.72	13.55	16.66	9.11	17.77
% of Vol Tot	7.34	14.04	6.16	9.00	11.02	7.61	9.99	9.56	5.53	10.92
No. Br Fruit	10	14	11	12	12	13	10	9	13	10
Ea Top	0.10	0.12	0.15	0.14	0.40	0.05	0.00	0.00	0.00	0.00
Ea Bottom	0.83	1.83	0.68	0.74	0.75	0.79	1.31	1.61	0.88	1.72
Ea Total	0.93	1.95	0.83	0.88	1.15	0.84	1.31	1.61	0.88	1.72

Table 7.2 Summary of Drop Test Data Count 88 Cartons at 8% MC

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.

Std Dev - standard deviation, Var - variance, Mean - average, CV - coefficient of variation, se - standard error, min - minimum value, max - maximum value, n - number of cartons.

Wt - weight, #BF - Number of bruised fruit, # Ind B - number of individual bruises, Vol T - volume of bruising on top of apple, Vol B - volume of bruising on bottom of apple, Vol Tot - total volume of bruising on apple, EaT - energy absorbed by bruising on the top of the apple, EaB - energy absorbed by bruising on the bottom of the apple, EaTot - energy absorbed by bruising on the apple.

Summary of Drop Test Data Count 88 Cartons 11-20 at 8 % MC

Tray 1	Wt	#BF	Vol top	#ind Bt	t%VTot	Vol bot	#ind Bb	b%VTot	Vol TOT	% V Tot
Std Dev	0.0337	1.0750	6.6122	2.4495	5.6476	6.6885	3.9158	7.8166	11.869	5.4249
Var	0.0011	1.1556	43.722	6	31.895	44.736	15.333	61.100	140.88	29.430
Mean	4.655	20.4	35.652	27	44.691	7.695	7	13.199	43.347	32.626
CV	0.72	5.27	18.55	9.07	12.64	86.92	55.94	59.22	27.38	16.63
se	0.0107	0.3399	2.0910	0.7746	1.7859	2.1151	1.2383	2.4718	3.7534	1.7155
Min	4.61	19	27.19	24	37.545	1.59	2	4.4118	28.78	26.535
Max	4.72	22	46.3	31	56.597	23.75	16	28.886	67.22	40.962
n	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Tray 2	Wt	#BF	Vol top	#ind Bt	t%VTot	Vol bot	#ind Bb	b%VTot	Vol TOT	% V Tot
Std Dev	0.0333	1.1972	7.4431	3.9384	3.8653	4.3828	3.1990	3.0495	10.306	3.4052
Var	0.0011	1.4333	55.399	15.511	14.940	19.209	10.233	9.2994	106.21	11.596
Mean	4.67	18.90	25.75	22.20	31.75	15.60	15.70	30.16	41.35	31.12
CV	0.71	6.33	28.91	17.74	12.17	28.09	20.38	10.11	24.92	10.94
se	0.0105	0.3786	2.3537	1.2454	1.2223	1.3860	1.0116	0.9643	3.2591	1.0768
Min	4.61	17	18.85	18	26.572	10.54	11	25.894	29.87	27.197
Max	4.73	21	43.71	30	40.208	22.72	20	35.974	63.87	38.768
n	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Tray 3	Wt	#BF	Vol top	#ind Bt	t%VTot	Vol bot	#ind Bb	b%VTot	Vol TOT	% V Tot
Std Dev	0.0221	1.1785	4.4675	2.3594	4.8626	3.9186	2.3570	5.9761	7.4240	3.8430
Var	0.0005	1.3889	19.959	5.5667	23.645	15.355	5.5556	35.714	55.116	14.769
Mean	4.66	18.50	17.71	17.30	22.22	17.91	17.00	35.49	35.62	27.13
CV	0.47	6.37	25.22	13.64	21.88	21.88	13.86	16.84	20.84	14.16
se	0.0070	0.3727	1.4128	0.7461	1.5377	1.2392	0.7454	1.8898	2.3477	1.2153
Min	4.64	17	11.07	14	15.605	14.39	14	24.945	27.85	22.161
Max	4.7	20	25.76	21	31.549	27.69	20	44.886	53.45	32.860
n	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Tray 4	Wt	#BF	Vol top	#ind Bt	t%VTot	Vol bot	#ind Bb	b%VTot	Vol TOT	% V Tot
Std Dev	0.0245	1.6465	1.2717	2.8597	1.7640	4.5274	2.5408	5.5072	4.0927	2.5618
Var	0.0006	2.7111	1.6172	8.1778	3.1116	20.497	6.4556	30.329	16.750	6.5628
Mean	4.66	11.40	0.95	2.20	1.33	11.10	11.30	21.14	12.05	9.12
CV	0.53	14.44	133.86	129.99	132.48	40.79	22.48	26.05	33.97	28.10
se	0.0078	0.5207	0.4021	0.9043	0.5578	1.4317	0.8035	1.7415	1.2942	0.8101
Min	4.62	9	0	0	0	6.14	7	14.216	7.48	5.5296
Max	4.70	14.00	4.16	9.00	5.74	17.77	15.00	30.90	17.77	14.04
n	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Table 7.2 Summary of Drop Test Data Count 88 Cartons at 8% MC

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.

Std Dev - standard deviation, Var - variance, Mean - average, CV - coefficient of variation, se - standard error, min - minimum value, max - maximum value, n - number of cartons.

Wt - weight, #BF - Number of bruised fruit, # Ind B - number of individual bruises, Vol T - volume of bruising on top of apple, Vol B - volume of bruising on bottom of apple, Vol Tot - total volume of bruising on apple, EaT - energy absorbed by bruising on the top of the apple, EaB - energy absorbed by bruising on the bottom of the apple, EaTot - energy absorbed by bruising on the apple.

Summary of Drop Test Data Count 100 at 8 % MC

Mean	Ctn 1	Ctn 2	Ctn 3	Ctn 4	Ctn 5	Ctn 6	Ctn 7	Ctn 8	Ctn 9	Ctn 10
Carton										
Weight(kg)	18.59		18.61	18.64	18.72	18.52	18.57	18.62	18.62	18.63
Vol Top	17.33		13.58	11.84	14.05	11.88	14.29	12.57	16.88	13.61
Vol Bottom	8.74		13.43	14.54	6.9	10.95	6.92	12.27	11.84	12.43
Vol Total	26.07		27.01	26.38	20.95	22.83	21.21	24.84	28.72	26.04
No Bruises	36		34	31	39	38	32	36	35	36
No Br Fruit	28		26	25	27	27	27	28	31	29
Ea Top	1.92		1.51	1.32	1.55	1.32	1.38	1.39	1.86	1.51
Ea Bottom	0.97		1.49	1.61	0.77	1.21	0.67	1.36	1.32	1.38
Ea Total	2.89		3.00	2.93	2.32	2.53	2.05	2.75	3.18	2.89
Ek Carton	109.42		109.54	109.72	110.19	109.01	109.30	109.60	109.60	109.66
9 Ctns	Wt	#BF	#Ind.B	Vol T	Vol B	VolTot	EaT	EaB	EaTot	Ek
Std Dev	0.0543	1.7401	2.5874	1.9686	2.7672	2.6789	0.2215	0.3247	0.3601	0.3197
Var	0.0029	3.0278	6.6944	3.8754	7.6575	7.1763	0.0491	0.1054	0.1297	0.1022
Mean	18.613	27.556	35.222	14.003	10.891	24.894	1.5289	1.1978	2.7267	109.56
CV	0.2918	6.3147	7.3458	14.058	25.408	10.761	14.487	27.107	13.207	0.2918
se	0.0181	0.5800	0.8625	0.6562	0.9224	0.8930	0.0738	0.1082	0.1200	0.1066
Min	18.52	25	31	11.84	6.9	20.95	1.32	0.67	2.05	109.01
Max	18.72	31	39	17.33	14.54	28.72	1.92	1.61	3.18	110.19
n	9	9	9	9	9	9	9	9	9	9

Table 7.3 Summary of Drop Test Data Count 100 Cartons at 8% MC

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.

Std Dev - standard deviation, Var - variance, Mean - average, CV - coefficient of variation, se - standard error, min - minimum value, max - maximum value, n - number of cartons.

Wt - weight, #BF - Number of bruised fruit, # Ind B - number of individual bruises, Vol T - volume of bruising on top of apple, Vol B - volume of bruising on bottom of apple, Vol Tot - total volume of bruising on apple, EaT - energy absorbed by bruising on the top of the apple, EaB - energy absorbed by bruising on the bottom of the apple, EaTot - energy absorbed by bruising on the apple.

Summary of Drop Test Data Count 100 at 8 % MC

	Ctn 1	Ctn 2	Ctn 3	Ctn 4	Ctn 5	Ctn 6	Ctn 7	Ctn 8	Ctn 9	Ctn 10
Tray 1										
Weight(kg)	3.63		3.71	3.74	3.73	3.66	3.67	3.71	3.75	3.72
Vol Top	6.90		5.93	7.01	5.47	6.86	5.96	5.94	8.97	6.10
% of Vol Tot	39.82		43.67	59.21	38.93	57.74	41.71	47.26	53.14	44.82
No Bruises	12		9	7	11	15	10	11	11	10
Vol Bottom	6.09		11.65	12.84	6.11	9.31	5.83	10.10	7.83	10.71
% of Vol Tot	69.68		86.75	88.31	88.55	85.02	84.25	82.31	66.13	86.16
No Bruises	9		11	10	11	10	8	8	7	10
Vol Total	12.99		17.58	19.85	11.58	16.17	11.79	16.04	16.80	16.81
% of Vol Tot	49.83		65.09	75.25	55.27	70.83	55.59	64.57	58.50	64.55
No Br Fruit	15		13	14	15	15	15	14	16	14
Ea Top	0.77		0.66	0.78	0.61	0.76	0.57	0.66	0.99	0.68
Ea Bottom	0.68		1.29	1.42	0.68	1.03	0.56	1.12	0.87	1.19
Ea Total	1.45		1.95	2.2	1.29	1.79	1.13	1.78	1.86	1.87
Tray 2										
Weight(kg)	3.75		3.75	3.78	3.76	3.67	3.70	3.65	3.71	3.72
Vol Top	5.99		5.50	3.66	5.18	1.61	4.74	4.70	4.72	3.86
% of Vol Tot	34.56		40.50	30.91	36.87	13.55	33.17	37.39	27.96	28.36
No Bruises	5		8	5	7	4	5	7	6	7
Vol Bottom	1.58		1.47	0.69	0.47	1.05	1.09	0.39	3.23	0.81
% of Vol Tot	18.08		10.95	4.75	6.81	9.59	15.75	3.18	27.28	6.52
No Bruises	3		0	2	2	2	2	1	4	2
Vol Total	7.57		6.97	4.35	5.65	2.66	4.74	5.09	7.95	4.67
% of Vol Tot	29.04		25.81	16.49	26.97	11.65	22.35	20.49	27.68	17.93
No Br Fruit	6		7	6	6	5	5	7	8	8
Ea Top	0.66		0.61	0.41	0.57	0.18	0.46	0.52	0.52	0.43
Ea Bottom	0.18		0.16	0.08	0.05	0.12	0.11	0.04	0.36	0.09
Ea Total	0.84		0.77	0.49	0.62	0.3	0.57	0.56	0.88	0.52

Table 7.3 Summary of Drop Test Data Count 100 Cartons at 8% MC

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.

Std Dev - standard deviation, Var - variance, Mean - average, CV - coefficient of variation, se - standard error, min - minimum value, max - maximum value, n - number of cartons.

Wt - weight, #BF - Number of bruised fruit, # Ind B - number of individual bruises, Vol T - volume of bruising on top of apple, Vol B - volume of bruising on bottom of apple, Vol Tot - total volume of bruising on apple, EaT - energy absorbed by bruising on the top of the apple, EaB - energy absorbed by bruising on the bottom of the apple, EaTot - energy absorbed by bruising on the apple.

Summary of Drop Test Data Count 100 at 8 % MC

	Ctn 1	Ctn 2	Ctn 3	Ctn 4	Ctn 5	Ctn 6	Ctn 7	Ctn 8	Ctn 9	Ctn 10
Tray 3										
Weight(kg)	3.78		3.74	3.76	3.75	3.73	3.71	3.76	3.74	3.73
Vol Top	3.24		0.75	1.05	1.66	0.10	2.05	1.19	3.19	1.03
% of Vol Tot	18.70		5.52	8.87	11.81	0.84	14.35	9.47	18.90	7.57
No Bruises	3		3	4	4	2	4	3	5	3
Vol Bottom	0.76		0.23	0.89	0.32	0.39	0.00	1.78	0.00	0.91
% of Vol Tot	8.70		1.71	6.12	4.64	3.56	0.00	14.51	0.00	7.32
No Bruises	1		1	1	2	1	0	4	0	1
Vol Total	4.00		0.98	1.94	1.98	0.49	2.05	2.97	3.19	1.94
% of Vol Tot	15.34		3.63	7.35	9.45	2.15	9.67	11.96	11.11	7.45
No Br Fruit	4		4	3	4	3	4	5	5	4
Ea Top	0.36		0.08	0.12	0.18	0.01	0.20	0.13	0.35	0.11
Ea Bottom	0.08		0.03	0.10	0.04	0.04	0.00	0.20	0.00	0.10
Ea Total	0.44		0.11	0.22	0.22	0.05	0.20	0.33	0.35	0.21
Tray 4										
Weight(kg)	3.68		3.74	3.68	3.76	3.71	3.74	3.73	3.70	3.76
Vol Top	1.20		1.40	0.12	1.74	3.31	1.54	0.74	0.00	2.62
% of Vol Tot	6.92		10.31	1.01	12.38	27.86	10.78	5.89	0.00	19.25
No Bruises	1		1	1	2	3	3	2	0	3
Vol Bottom	0.31		0.08	0.12	0.00	0.20	0.00	0.00	0.78	0.00
% of Vol Tot	3.55		0.60	0.83	0.00	1.83	0.00	0.00	6.59	0.00
No Bruises	2		1	1	0	1	0	0	2	0
Vol Total	1.51		1.48	0.24	1.74	3.51	1.54	0.74	0.78	2.62
% of Vol Tot	5.79		5.48	0.91	8.31	15.37	7.26	2.98	2.72	10.06
No Br Fruit	3		2	2	2	4	3	2	2	3
Ea Top	0.13		0.16	0.01	0.19	0.37	0.15	0.08	0.00	0.29
Ea Bottom	0.03		0.01	0.01	0.00	0.02	0.00	0.00	0.09	0.00
Ea Total	0.16		0.17	0.02	0.19	0.39	0.15	0.08	0.09	0.29

Table 7.3 Summary of Drop Test Data Count 100 Cartons at 8% MC

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.

Std Dev - standard deviation, Var - variance, Mean - average, CV - coefficient of variation, se - standard error, min - minimum value, max - maximum value, n - number of cartons.

Wt - weight, #BF - Number of bruised fruit, # Ind B - number of individual bruises, Vol T - volume of bruising on top of apple, Vol B - volume of bruising on bottom of apple, Vol Tot - total volume of bruising on apple, EaT - energy absorbed by bruising on the top of the apple, EaB - energy absorbed by bruising on the bottom of the apple, EaTot - energy absorbed by bruising on the apple.

Summary of Drop Test Data Count 100 at 8 % MC

	Ctn 1	Ctn 2	Ctn 3	Ctn 4	Ctn 5	Ctn 6	Ctn 7	Ctn 8	Ctn 9	Ctn 10
Tray 5										
Weight(kg)	3.75		3.67	3.68	3.72	3.75	3.75	3.77	3.72	3.70
Vol Top	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
% of Vol Tot	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No Bruises	0		0	0	0	0	0	0	0	
Vol Bottom	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
% of Vol Tot	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No Bruises	0		0	0	0	0	0	0	0	
Vol Total	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
% of Vol Tot	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No Br Fruit	0		0	0	0	0	0	0	0	
Ea Top	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ea Bottom	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ea Total	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tray 1										
Wt		#BF	Vol top	#ind Bt	t%VTot	Vol bot	#ind Bb	b%VTot	Vol TOT	% V Tot
Std Dev	0.0402	0.8819	1.0462	2.1794	7.5957	2.6030	1.4142	8.2186	2.8023	8.0827
Var	0.0016	0.7778	1.0945	4.75	57.695	6.7756	2	67.545	7.8531	65.331
Mean	3.70	14.56	6.57	10.67	47.37	8.94	9.33	81.91	15.51	62.16
CV	1.09	6.06	15.92	20.43	16.04	29.11	15.15	10.03	18.07	13.00
se	0.0134	0.2940	0.3487	0.7265	2.5319	0.8677	0.4714	2.7395	0.9341	2.6942
Min	3.63	13	5.47	7	38.932	5.83	7	66.132	11.58	49.827
Max	3.75	16.00	8.97	15.00	59.21	12.84	11.00	88.55	19.85	75.25
n	9	9	9	9	9	9	9	9	9	9
Tray 2										
Wt		#BF	Vol top	#ind Bt	t%VTot	Vol bot	#ind Bb	b%VTot	Vol TOT	% V Tot
Std Dev	0.0431	1.1304	1.2876	1.3229	7.9179	0.8641	1.1180	7.7134	1.7063	5.8879
Var	0.0019	1.2778	1.6579	1.75	62.693	0.7467	1.25	59.496	2.9114	34.667
Mean	3.72	6.44	4.44	6.00	31.48	1.20	2.00	11.43	5.52	22.05
CV	1.16	17.54	29.00	22.05	25.16	72.15	55.90	67.47	30.93	26.71
se	0.0144	0.3768	0.4292	0.4410	2.6393	0.2880	0.3727	2.5711	0.5688	1.9626
Min	3.65	5	1.61	4	13.552	0.39	0	3.1785	2.66	11.651
Max	3.78	8	5.99	8	40.501	3.23	4	27.280	7.95	29.037
n	9	9	9	9	9	9	9	9	9	9

Table 7.3 Summary of Drop Test Data Count 100 Cartons at 8% MC

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.

Std Dev - standard deviation, Var - variance, Mean - average, CV - coefficient of variation, se - standard error, min - minimum value, max - maximum value, n - number of cartons.

Wt - weight, #BF - Number of bruised fruit, # Ind B - number of individual bruises, Vol T - volume of bruising on top of apple, Vol B - volume of bruising on bottom of apple, Vol Tot - total volume of bruising on apple, EaT - energy absorbed by bruising on the top of the apple, EaB - energy absorbed by bruising on the bottom of the apple, EaTot - energy absorbed by bruising on the apple.

Summary of Drop Test Data Count 100 at 8 % MC

Tray 3	Wt	#BF	Vol top	#ind Bt	t%VTot	Vol bot	#ind Bb	b%VTot	Vol TOT	% V Tot
Std Dev	0.0207	0.7071	1.0718	0.8819	5.9618	0.5675	1.2019	4.6559	1.0854	4.0938
Var	0.0004	0.5	1.1487	0.7778	35.543	0.322	1.4444	21.678	1.1780	16.759
Mean	3.74	4.00	1.58	3.44	10.67	0.59	1.22	5.17	2.17	8.68
CV	0.55	17.68	67.64	25.60	55.88	96.72	98.33	90.01	49.99	47.17
se	0.0069	0.2357	0.3573	0.2940	1.9873	0.1892	0.4006	1.5520	0.3618	1.3646
Min	3.71	3	0.1	2	0.8418	0	0	0	0.49	2.1463
Max	3.78	5.00	3.24	5.00	18.90	1.78	4.00	14.51	4.00	15.34
n	9	9	9	9	9	9	9	9	9	9
Tray 4	Wt	#BF	Vol top	#ind Bt	t%VTot	Vol bot	#ind Bb	b%VTot	Vol TOT	% V Tot
Std Dev	0.0311	0.7265	1.0808	1.0929	8.7748	0.2546	0.8333	2.2487	0.9993	4.3985
Var	0.0010	0.5278	1.1681	1.1944	76.998	0.0648	0.6944	5.0567	0.9987	19.347
Mean	3.72	2.56	1.41	1.78	10.49	0.17	0.78	1.49	1.57	6.54
CV	0.84	28.43	76.77	61.48	83.65	153.79	107.14	151.23	63.52	67.23
se	0.0104	0.2422	0.3603	0.3643	2.9249	0.0849	0.2778	0.7496	0.3331	1.4662
Min	3.68	2	0	0	0	0	0	0	0.24	0.9098
Max	3.76	4.00	3.31	3.00	27.86	0.78	2.00	6.59	3.51	15.37
n	9	9	9	9	9	9	9	9	9	9
Tray 5	Wt	#BF	Vol top	#ind Bt	t%VTot	Vol bot	#ind Bb	b%VTot	Vol TOT	% V Tot
Std Dev	0.0346	0	0	0	0	0	0	0	0	0
Var	0.0012	0	0	0	0	0	0	0	0	0
Mean	3.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CV	0.93	-	-	-	-	-	-	-	-	-
se	0.0115	0	0	0	0	0	0	0	0	0
Min	3.67	0	0	0	0	0	0	0	0	0
Max	3.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
n	9	9	9	9	9	9	9	9	9	9

Table 7.3 Summary of Drop Test Data Count 100 Cartons at 8% MC

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.

Std Dev - standard deviation, Var - variance, Mean - average, CV - coefficient of variation, se - standard error, min - minimum value, max - maximum value, n - number of cartons.

Wt - weight, #BF - Number of bruised fruit, # Ind B - number of individual bruises, Vol T - volume of bruising on top of apple, Vol B - volume of bruising on bottom of apple, Vol Tot - total volume of bruising on apple, EaT - energy absorbed by bruising on the top of the apple, EaB - energy absorbed by bruising on the bottom of the apple, EaTot - energy absorbed by bruising on the apple.

Summary of Count 88 Cartons One Off Tests

	Doubles	Rigid	Thickened
Carton			
Weight(kg)	18.55	18.53	18.71
Vol Top	43.23	132.24	38.97
Vol Bottom	5.51	19.93	21.72
Vol Total	48.74	152.17	60.69
No Bruises	58	98	93
No Br Fruit	46	70	58
Ea Top	4.64	14.2	4.19
Ea Bottom	0.59	2.14	2.33
Ea Total	5.23	16.34	6.52
Ek Carton	109.185	109.068	110.127
Tray 1			
Weight(kg)	4.62	4.63	4.68
Vol Top	17.18	64.42	13.44
% of Vol Tot	39.74	48.71	34.49
No Bruises	15	28	20
Vol Bottom	1.32	9.95	0.27
% of Vol Tot	23.96	49.92	1.24
No Bruises	4	3	1
Vol Total	18.5	74.37	13.71
% of Vol Tot	37.96	48.87	22.59
No Br Fruit	15	21	14
Ea Top	1.85	6.92	1.44
Ea Bottom	0.14	1.07	0.03
Ea Total	1.99	7.99	1.47

Table 7.4 Summary of Drop Test Data Count 88 Cartons One Off Tests

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.

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Summary of Count 88 Cartons One Off Tests

Tray 2	Doubles	Rigid	Thickened
Weight(kg)	4.68	4.63	4.68
Vol Top	18.88	34.37	15.21
% of Vol Tot	43.67	25.99	39.03
No Bruises	15	21	19
Vol Bottom	1.1	2.89	8.41
% of Vol Tot	19.96	14.50	38.72
No Bruises	3	6	13
Vol Total	19.98	37.26	23.62
% of Vol Tot	40.99	24.49	38.92
No Br Fruit	14	19	18
Ea Top	2.03	3.69	1.63
Ea Bottom	0.12	0.31	0.9
Ea Total	2.15	4	2.53
Tray 3			
Weight(kg)	4.63	4.63	4.64
Vol Top	6.17	32.29	10.26
% of Vol Tot	14.27	24.42	26.33
No Bruises	9	23	16
Vol Bottom	2.48	3.16	10.47
% of Vol Tot	45.01	15.86	48.20
No Bruises	6	5	14
Vol Total	8.65	35.45	20.73
% of Vol Tot	17.75	23.30	34.16
No Br Fruit	12	19	17
Ea Top	0.66	3.47	1.1
Ea Bottom	0.27	0.34	1.12
Ea Total	0.93	3.81	2.22

Table 7.4 Summary of Drop Test Data Count 88 Cartons One Off Tests

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.

7.4/2

Summary of Count 88 Cartons One Off Tests

Tray 4	Doubles	Rigid	Thickened
Weight(kg)	4.62	4.64	4.71
Vol Top	1	1.16	0.06
% of Vol Tot	2.31	0.88	0.15
No Bruises	4	5	1
Vol Bottom	0.61	3.92	2.56
% of Vol Tot	11.07	19.67	11.79
No Bruises	2	7	9
Vol Total	1.61	5.08	2.62
% of Vol Tot	3.30	3.34	4.32
No Br Fruit	5	11	9
Ea Top	0.11	0.12	0.01
Ea Bottom	0.06	0.42	0.28
Ea Total	0.17	0.54	0.29

Table 7.4 Summary of Drop Test Data Count 88 Cartons One Off Tests

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.

7.4/3

Appendix 8

SUMMARY OF DROP TEST DATA FOR COUNT 100 FRUIT INCLUDING CARTON No 2.

Summary of Drop Test Data Count 100 at 8 % MC Including Carton No 2

Mean	Ctn 1	Ctn 2	Ctn 3	Ctn 4	Ctn 5	Ctn 6	Ctn 7	Ctn 8	Ctn 9	Ctn 10
Carton										
Weight(kg)	18.59	18.64	18.61	18.64	18.72	18.52	18.57	18.62	18.62	18.63
Vol Top	17.33	25.81	13.58	11.84	14.05	11.88	14.29	12.57	16.88	13.61
Vol Bottom	8.74	19.76	13.43	14.54	6.9	10.95	6.92	12.27	11.84	12.43
Vol Total	26.07	45.57	27.01	26.38	20.95	22.83	21.21	24.84	28.72	26.04
No Bruises	36	54	34	31	39	38	32	36	35	36
No Br Fruit	28	37	26	25	27	27	27	28	31	29
Ea Top	1.92	2.86	1.51	1.32	1.55	1.32	1.38	1.39	1.86	1.51
Ea Bottom	0.97	2.19	1.49	1.61	0.77	1.21	0.67	1.36	1.32	1.38
Ea Total	2.89	5.05	3.00	2.93	2.32	2.53	2.05	2.75	3.18	2.89
Ek Carton	109.42	109.72	109.54	109.72	110.19	109.01	109.30	109.60	109.60	109.66
10 Ctns	Wt	#BF	#Ind.B	Vol T	Vol B	VolTot	EaT	EaB	EaTot	Ek
Std Dev	0.0519	3.4075	6.4196	4.1695	3.8305	7.0090	0.4699	0.4384	0.8094	0.3055
Var	0.0027	11.611	41.211	17.385	14.672	49.127	0.2208	0.1922	0.6551	0.0933
Mean	18.616	28.5	37.1	15.184	11.778	26.962	1.662	1.297	2.959	109.57
CV	0.2788	11.956	17.303	27.460	32.522	25.996	28.272	33.798	27.352	0.2788
se	0.0164	1.0775	2.0301	1.3185	1.2113	2.2165	0.1486	0.1386	0.2559	0.0966
Min	18.52	25	31	11.84	6.9	20.95	1.32	0.67	2.05	109.01
Max	18.72	37	54	25.81	19.76	45.57	2.86	2.19	5.05	110.19
n	10	10	10	10	10	10	10	10	10	10

Table 8.1 Summary of Drop Test Data Count 100 Cartons at 8% MC Including Carton No 2

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.

Std Dev - standard deviation, Var - variance, Mean - average, CV - coefficient of variation, se - standard error, min - minimum value, max - maximum value, n - number of cartons.

Wt - weight, #BF - Number of bruised fruit, # Ind B - number of individual bruises, Vol T - volume of bruising on top of apple, Vol B - volume of bruising on bottom of apple, Vol Tot - total volume of bruising on apple, EaT - energy absorbed by bruising on the top of the apple, EaB - energy absorbed by bruising on the bottom of the apple, EaTot - energy absorbed by bruising on the apple.

Summary of Drop Test Data Count 100 at 8 % MC Including Carton No 2

	Ctn 1	Ctn 2	Ctn 3	Ctn 4	Ctn 5	Ctn 6	Ctn 7	Ctn 8	Ctn 9	Ctn 10
Tray 1										
Weight(kg)	3.63	3.73	3.71	3.74	3.73	3.66	3.67	3.71	3.75	3.72
Vol Top	6.90	7.63	5.93	7.01	5.47	6.86	5.96	5.94	8.97	6.10
% of Vol Tot	39.82	29.56	43.67	59.21	38.93	57.74	41.71	47.26	53.14	44.82
No Bruises	12	9	9	7	11	15	10	11	11	10
Vol Bottom	6.09	10.57	11.65	12.84	6.11	9.31	5.83	10.10	7.83	10.71
% of Vol Tot	69.68	53.49	86.75	88.31	88.55	85.02	84.25	82.31	66.13	86.16
No Bruises	9	9	11	10	11	10	8	8	7	10
Vol Total	12.99	18.20	17.58	19.85	11.58	16.17	11.79	16.04	16.80	16.81
% of Vol Tot	49.83	39.94	65.09	75.25	55.27	70.83	55.59	64.57	58.50	64.55
No Br Fruit	15	14	13	14	15	15	15	14	16	14
Ea Top	0.77	0.85	0.66	0.78	0.61	0.76	0.57	0.66	0.99	0.68
Ea Bottom	0.68	1.17	1.29	1.42	0.68	1.03	0.56	1.12	0.87	1.19
Ea Total	1.45	2.02	1.95	2.2	1.29	1.79	1.13	1.78	1.86	1.87
Tray 2										
Weight(kg)	3.75	3.7	3.75	3.78	3.76	3.67	3.70	3.65	3.71	3.72
Vol Top	5.99	9.95	5.50	3.66	5.18	1.61	4.74	4.70	4.72	3.86
% of Vol Tot	34.56	38.55	40.50	30.91	36.87	13.55	33.17	37.39	27.96	28.36
No Bruises	5	10	8	5	7	4	5	7	6	7
Vol Bottom	1.58	6.41	1.47	0.69	0.47	1.05	1.09	0.39	3.23	0.81
% of Vol Tot	18.08	32.44	10.95	4.75	6.81	9.59	15.75	3.18	27.28	6.52
No Bruises	3	9	0	2	2	2	2	1	4	2
Vol Total	7.57	16.36	6.97	4.35	5.65	2.66	4.74	5.09	7.95	4.67
% of Vol Tot	29.04	35.90	25.81	16.49	26.97	11.65	22.35	20.49	27.68	17.93
No Br Fruit	6	11	7	6	6	5	5	7	8	8
Ea Top	0.66	1.10	0.61	0.41	0.57	0.18	0.46	0.52	0.52	0.43
Ea Bottom	0.18	0.71	0.16	0.08	0.05	0.12	0.11	0.04	0.36	0.09
Ea Total	0.84	1.81	0.77	0.49	0.62	0.3	0.57	0.56	0.88	0.52

Table 8.1 Summary of Drop Test Data Count 100 Cartons at 8% MC Including Carton No 2

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.

Std Dev - standard deviation, Var - variance, Mean - average, CV - coefficient of variation, se - standard error, min - minimum value, max - maximum value, n - number of cartons.

Wt - weight, #BF - Number of bruised fruit, # Ind B - number of individual bruises, Vol T - volume of bruising on top of apple, Vol B - volume of bruising on bottom of apple, Vol Tot - total volume of bruising on apple, EaT - energy absorbed by bruising on the top of the apple, EaB - energy absorbed by bruising on the bottom of the apple, EaTot - energy absorbed by bruising on the apple.

Summary of Drop Test Data Count 100 at 8 % MC Including Carton No 2

	Ctn 1	Ctn 2	Ctn 3	Ctn 4	Ctn 5	Ctn 6	Ctn 7	Ctn 8	Ctn 9	Ctn 10
Tray 3										
Weight(kg)	3.78	3.74	3.74	3.76	3.75	3.73	3.71	3.76	3.74	3.73
Vol Top	3.24	7.51	0.75	1.05	1.66	0.10	2.05	1.19	3.19	1.03
% of Vol Tot	18.70	29.10	5.52	8.87	11.81	0.84	14.35	9.47	18.90	7.57
No Bruises	3	8	3	4	4	2	4	3	5	3
Vol Bottom	0.76	2.78	0.23	0.89	0.32	0.39	0.00	1.78	0.00	0.91
% of Vol Tot	8.70	14.07	1.71	6.12	4.64	3.56	0.00	14.51	0.00	7.32
No Bruises	1	6	1	1	2	1	0	4	0	1
Vol Total	4.00	10.29	0.98	1.94	1.98	0.49	2.05	2.97	3.19	1.94
% of Vol Tot	15.34	22.58	3.63	7.35	9.45	2.15	9.67	11.96	11.11	7.45
No Br Fruit	4	9	4	3	4	3	4	5	5	4
Ea Top	0.36	0.83	0.08	0.12	0.18	0.01	0.20	0.13	0.35	0.11
Ea Bottom	0.08	0.31	0.03	0.10	0.04	0.04	0.00	0.20	0.00	0.10
Ea Total	0.44	1.14	0.11	0.22	0.22	0.05	0.20	0.33	0.35	0.21
Tray 4										
Weight(kg)	3.68	3.74	3.74	3.68	3.76	3.71	3.74	3.73	3.70	3.76
Vol Top	1.20	0.72	1.40	0.12	1.74	3.31	1.54	0.74	0.00	2.62
% of Vol Tot	6.92	2.79	10.31	1.01	12.38	27.86	10.78	5.89	0.00	19.25
No Bruises	1	3	1	1	2	3	3	2	0	3
Vol Bottom	0.31	0.00	0.08	0.12	0.00	0.20	0.00	0.00	0.78	0.00
% of Vol Tot	3.55	0.00	0.60	0.83	0.00	1.83	0.00	0.00	6.59	0.00
No Bruises	2	0	1	1	0	1	0	0	2	0
Vol Total	1.51	0.72	1.48	0.24	1.74	3.51	1.54	0.74	0.78	2.62
% of Vol Tot	5.79	1.58	5.48	0.91	8.31	15.37	7.26	2.98	2.72	10.06
No Br Fruit	3	3	2	2	2	4	3	2	2	3
Ea Top	0.13	0.08	0.16	0.01	0.19	0.37	0.15	0.08	0.00	0.29
Ea Bottom	0.03	0.00	0.01	0.01	0.00	0.02	0.00	0.00	0.09	0.00
Ea Total	0.16	0.08	0.17	0.02	0.19	0.39	0.15	0.08	0.09	0.29

Table 8.1 Summary of Drop Test Data Count 100 Cartons at 8% MC Including Carton No 2

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.

Std Dev - standard deviation, Var - variance, Mean - average, CV - coefficient of variation, se - standard error, min - minimum value, max - maximum value, n - number of cartons.

Wt - weight, #BF - Number of bruised fruit, # Ind B - number of individual bruises, Vol T - volume of bruising on top of apple, Vol B - volume of bruising on bottom of apple, Vol Tot - total volume of bruising on apple, EaT - energy absorbed by bruising on the top of the apple, EaB - energy absorbed by bruising on the bottom of the apple, EaTot - energy absorbed by bruising on the apple.

Summary of Drop Test Data Count 100 at 8 % MC Including Carton No 2

	Ctn 1	Ctn 2	Ctn 3	Ctn 4	Ctn 5	Ctn 6	Ctn 7	Ctn 8	Ctn 9	Ctn 10
Tray 5										
Weight(kg)	3.75	3.73	3.67	3.68	3.72	3.75	3.75	3.77	3.72	3.70
Vol Top	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
% of Vol Tot	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No Bruises	0	0	0	0	0	0	0	0	0	
Vol Bottom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
% of Vol Tot	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No Bruises	0	0	0	0	0	0	0	0	0	
Vol Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
% of Vol Tot	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No Br Fruit	0	0	0	0	0	0	0	0	0	
Ea Top	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ea Bottom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ea Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tray 1										
	Wt	#BF	Vol top	#ind Bt	t%VTot	Vol bot	#ind Bb	b%VTot	Vol TOT	% V Tot
Std Dev	0.0389	0.8498	1.0416	2.1213	9.1093	2.5076	1.3375	11.865	2.7754	10.367
Var	0.0015	0.7222	1.0850	4.5	82.980	6.2881	1.7889	140.78	7.7029	107.47
Mean	3.70	14.50	6.68	10.50	45.58	9.10	9.30	79.07	15.78	59.94
CV	1.05	5.86	15.60	20.20	19.98	27.54	14.38	15.01	17.59	17.29
se	0.0123	0.2687	0.3294	0.6708	2.8806	0.7930	0.4230	3.7521	0.8777	3.2782
Min	3.63	13	5.47	7	29.562	5.83	7	53.492	11.58	39.939
Max	3.75	16.00	8.97	15.00	59.21	12.84	11.00	88.55	19.85	75.25
n	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Tray 2										
	Wt	#BF	Vol top	#ind Bt	t%VTot	Vol bot	#ind Bb	b%VTot	Vol TOT	% V Tot
Std Dev	0.0412	1.7920	2.1236	1.7764	7.7931	1.8386	2.4518	9.8495	3.7876	7.0720
Var	0.0017	3.2111	4.5097	3.1556	60.733	3.3805	6.0111	97.012	14.346	50.013
Mean	3.72	6.90	4.99	6.40	32.18	1.72	2.70	13.53	6.60	23.43
CV	1.11	25.97	42.55	27.76	24.21	106.96	90.81	72.78	57.38	30.18
se	0.0130	0.5667	0.6715	0.5617	2.4644	0.5814	0.7753	3.1147	1.1977	2.2364
Min	3.65	5	1.61	4	13.552	0.39	0	3.1785	2.66	11.651
Max	3.78	11	9.95	10	40.501	6.41	9	32.439	16.36	35.901
n	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Table 8.1 Summary of Drop Test Data Count 100 Cartons at 8% MC Including Carton No 2

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.
 Std Dev - standard deviation, Var - variance, Mean - average, CV - coefficient of variation, se - standard error, min - minimum value, max - maximum value, n - number of cartons.
 Wt - weight, #BF - Number of bruised fruit, # Ind B - number of individual bruises, Vol T - volume of bruising on top of apple, Vol B - volume of bruising on bottom of apple, Vol Tot - total volume of bruising on apple, EaT - energy absorbed by bruising on the top of the apple, EaB - energy absorbed by bruising on the bottom of the apple, EaTot - energy absorbed by bruising on the apple.

Summary of Drop Test Data Count 100 at 8 % MC Including Carton No

Tray 3	Wt	#BF	Vol top	#ind Bt	t%VTot	Vol bot	#ind Bb	b%VTot	Vol TOT	% V To
Std Dev	0.0196	1.7159	2.1289	1.6633	8.0965	0.8760	1.8886	5.2137	2.7638	5.850
Var	0.0004	2.9444	4.5323	2.7667	65.553	0.7673	3.5667	27.183	7.6388	34.22
Mean	3.74	4.50	2.18	3.90	12.51	0.81	1.70	6.06	2.98	10.0
CV	0.52	38.13	97.79	42.65	64.71	108.68	111.09	86.00	92.65	58.1
se	0.0062	0.5426	0.6732	0.5260	2.5603	0.2770	0.5972	1.6487	0.8740	1.850
Min	3.71	3	0.1	2	0.8418	0	0	0	0.49	2.146
Max	3.78	9.00	7.51	8.00	29.10	2.78	6.00	14.51	10.29	22.5
n	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.0
Tray 4	Wt	#BF	Vol top	#ind Bt	t%VTot	Vol bot	#ind Bb	b%VTot	Vol TOT	% V To
Std Dev	0.0299	0.6992	1.0419	1.1005	8.6239	0.2457	0.8233	2.1716	0.9801	4.433
Var	0.0009	0.4889	1.0857	1.2111	74.371	0.0604	0.6778	4.7160	0.9605	19.65
Mean	3.72	2.60	1.34	1.90	9.72	0.15	0.70	1.34	1.49	6.0
CV	0.80	26.89	77.82	57.92	88.73	164.90	117.61	162.28	65.86	73.3
se	0.0095	0.2211	0.3295	0.3480	2.7271	0.0777	0.2603	0.6867	0.3099	1.402
Min	3.68	2	0	0	0	0	0	0	0.24	0.909
Max	3.76	4.00	3.31	3.00	27.86	0.78	2.00	6.59	3.51	15.3
n	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Tray 5	Wt	#BF	Vol top	#ind Bt	t%VTot	Vol bot	#ind Bb	b%VTot	Vol TOT	% V To
Std Dev	0.0327	0	0	0	0	0	0	0	0	0
Var	0.0011	0	0	0	0	0	0	0	0	0
Mean	3.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CV	0.88	-	-	-	-	-	-	-	-	-
se	0.0103	0	0	0	0	0	0	0	0	0
Min	3.67	0	0	0	0	0	0	0	0	0
Max	3.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
n	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Table 8.1 Summary of Drop Test Data Count 100 Cartons at 8% MC Including Carton No 2

Vol Top-Bruise Volume top of apple (mL), Vol Bottom-Bruise Volume Bottom of Apple (mL), Vol Total - total bruise volume (mL), No. Bruises - number of individual bruises, No. Br Fruit - number of bruised fruit, Ea Top - Energy Absorbed through bruising on top of Apple (J) Ea Bottom-Energy Absorbed through bruising on Bottom of Apple (J) , Ea Total-Energy Absorbed by bruising (J), Ek Carton-Kinetic Energy (mgh), % of Vol Tot - % of the total bruise volume in the whole carton.

Std Dev - standard deviation, Var - variance, Mean - average, CV - coefficient of variation, se - standard error, min - minimum value, max - maximum value, n - number of cartons.

Wt - weight, #BF - Number of bruised fruit, # Ind B - number of individual bruises, Vol T - volume of bruising on top of apple, Vol B - volume of bruising on bottom of apple, Vol Tot - total volume of bruising on apple, EaT - energy absorbed by bruising on the top of the apple, EaB - energy absorbed by bruising on the bottom of the apple, EaTot - energy absorbed by bruising on the apple.

Appendix 9

SPLIT POSITIONS AND SPLIT SITES

Potential split sites for Count 88 and Count 100 trays are given in Figures 9.1 and 9.2.

Photographs demonstrating typical tray splitting on trays 2 and 3 in a carton of Count 88 fruit at 8% MC are shown in Figure 9.3.

Tables 9.1 to 9.4 give details of the length of each split in mm and the position of the splits. Where two numbers are given, two splits occurred side by side in the same region. The data for Count 88 cartons at 8% MC was limited to 7 cartons.

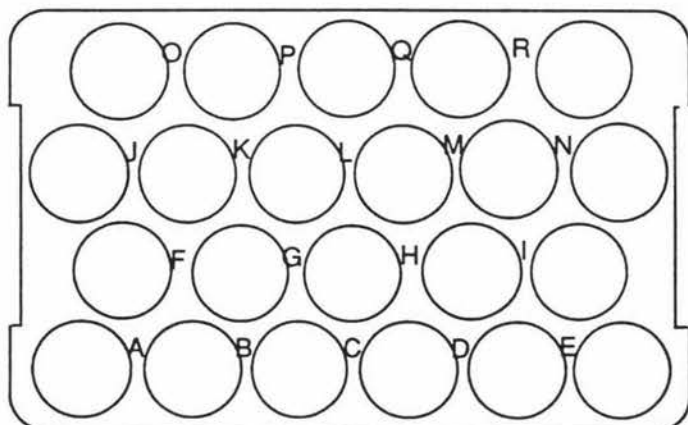


Figure 9.1 Split sites on Count 88 Trays

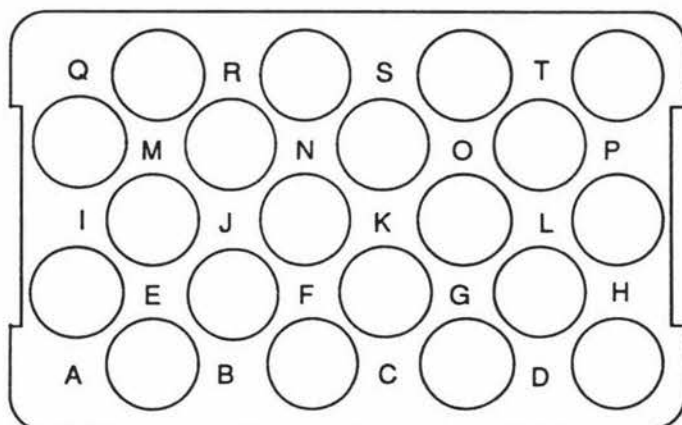


Figure 9.2 Split sites on Count 100 Tray

88 15%	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Carton 1																		
Carton 2																		
Tray 3									16	27								
Carton 3																		
Carton 4																		
Carton 5																		
Tray 2													20					
Carton 6																		
Carton 7																		
Carton 8																		
Tray 2													22					
Carton 9																		
Tray 2									20									
Carton 10																		

Table 9.1 Split Positions and Length (mm) in Count 88 Cartons with Trays at 15% MC

88 8%	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Carton 11																		
Tray 2			33				23					22	34			33		
Tray 3													16	20				33
Tray 4				30			21											
Carton 12																		
Tray 2			32				21											14
Tray 3								21		24					35			
Tray 4						28						22						
Carton 13																		
Tray 2						26		24	23	28						34		
Tray 3							23	24		20					33	24		
Carton 14																		
Tray 2							28						20	40	30	35		
Tray 4		33		28														
Carton 15																		
Tray 2			35				23			24	20	23			27	43		
Tray 3			43									26						
Tray 4			37	35				21										
Carton 16																		
Tray 2										15								
Tray 4		19		33														
Carton 17																		
Tray 2																	26	
Tray 3								25										

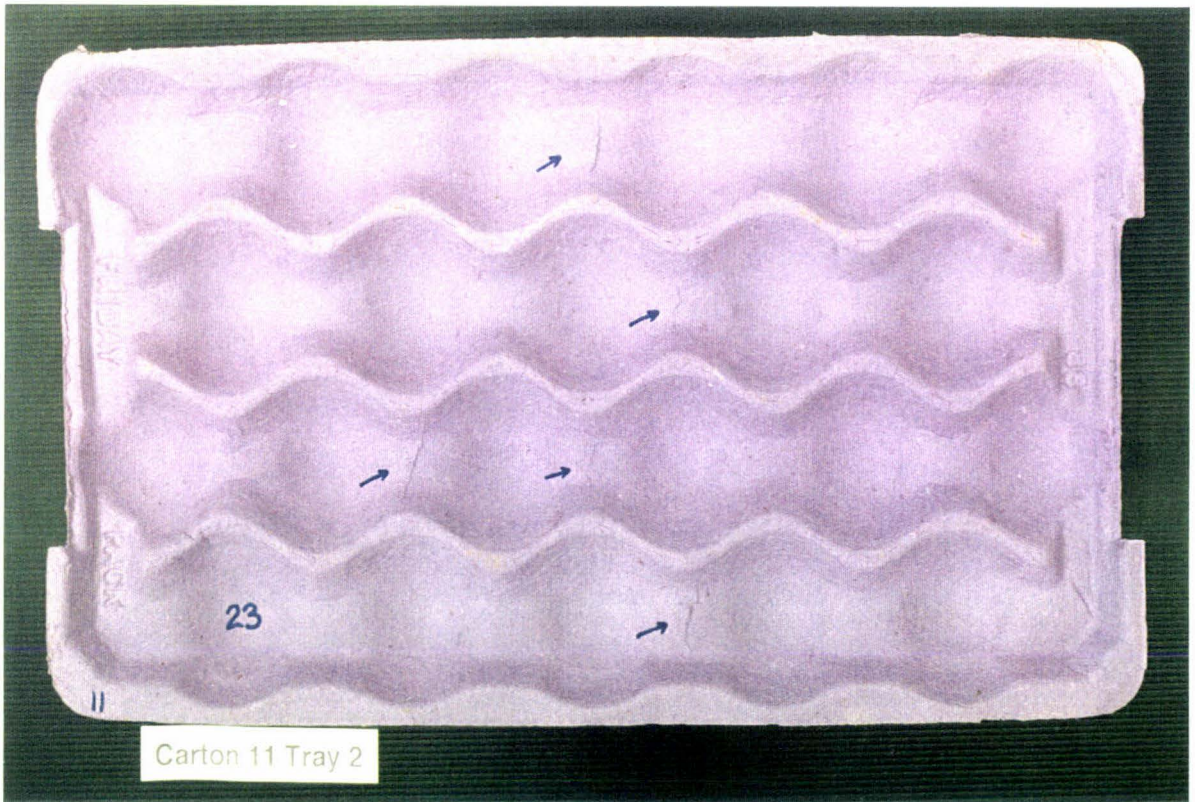
Table 9.2 Split Positions and Length (mm) in Count 88 Cartons with Trays at 8% MC

100 8%	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
Carton 1																				
Tray 2		27/50		58	24	23	19/29			24	25		22	9/10.				40		19
Tray 3								22		16	15				23			38	30	
Tray 4					22					22	18									
Carton 2																				
Tray 2		44	50		25	32	19				18		24	18						
Tray 3				38				12							16	13		50		
Tray 4						12														
Tray 5											16									
Carton 3																				
Tray 2	28	55		36	16	15			21	18	18			16				35/65		
Tray 3					23		13				17				23			36	25	
Tray 4													20		19					
Carton 4																				
Tray 2		54		30		20	27			22	22			25				67		
Tray 3		9				13	22								24					
Tray 4						18				29					24					
Tray 5							23			41								11		
Carton 5																				
Tray 2		51	36		22	21		25	28	24	20	15	16	25	14					
Tray 3		36								12					12	11				
Tray 4						15					23									

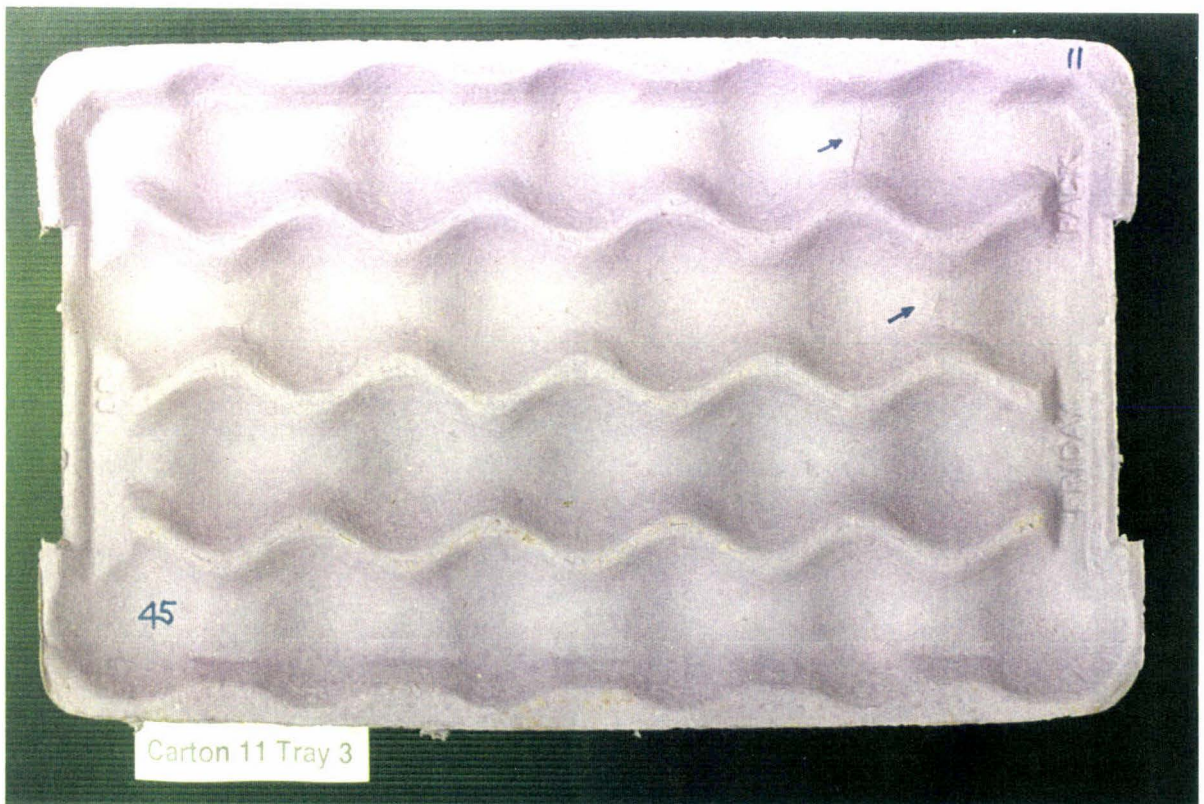
Table 9.3 Split Positions and Length (mm) in Count 100 Cartons 1-5 with Trays at 8% MC.

100 8%	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
Carton 6																				
Tray 2		38	17	27	37	30			42				19	25	34/23	10				
Tray 3					18	21									26					45
Tray 4							16				22		28							
Tray 5					22									30						
Carton 7																				
Tray 2		42	28			24								26		8		45		
Tray 4				43															18	
Carton 8																				
Tray 2				43	17	25			23	15				9					61	
Tray 3											15								17	
Tray 4					26										15					
Carton 9																				
Tray 2		52	32	40		27	18				27		23					48	30	
Tray 3														18						23
Tray 4		19	13			26								19						
Tray 5								22						28	34					
Carton 10																				
Tray 2			38	40		29				24	22		18/27	25						52
Tray 3							20									22				
Tray 4			15			32	28			15	25		23							

337 **Table 9.4** Split Positions and Length (mm) in Count 100 Cartons 6-10 with Trays at 8% MC



Photograph 1 Typical Splits in Count 88 Tray 2 at 8% MC



Photograph 2 Typical Splits in Count 88 Tray 3 at 8% MC

Figure 9.3 Typical Split Sites on Count 88 Trays 2 and 3 at 8% MC

Appendix 10

TENSILE STRENGTH TEST DATA

9	Thick	CS A	Ext	Force	Stress	Br		10	Thick	CS A	Ext	Force	Stress	Br
A	1.19	11.90	3.40	46.40	3.90	2		A	1.20	11.97	2.30	43.40	3.63	1
B	1.09	10.90	2.30	43.50	3.99	2		B	1.20	12.03	2.10	44.40	3.69	3
C	1.18	11.83	2.20	52.60	4.45	2		C	1.13	11.30	1.90	47.10	4.17	3
D	1.33	13.27	2.30	51.00	3.84	B		D	1.06	10.60	1.00	18.50	1.75	A
E	1.21	12.13	1.90	40.20	3.31	3		E	1.28	12.83	1.80	41.80	3.26	3
F	1.28	12.80	2.80	48.30	3.77	3		F	1.29	12.93	2.50	49.30	3.81	2
G	1.16	11.63	2.20	47.00	4.04	2		G	1.22	12.17	2.30	49.00	4.03	2
H	1.12	11.23	2.80	49.50	4.41	2		H	1.34	13.43	2.10	42.60	3.17	3
I	1.21	12.13	2.70	49.70	4.10	1		I	1.26	12.63	2.70	51.80	4.10	2
J	1.27	12.70	2.50	43.40	3.42	2		J	1.25	12.47	2.60	46.30	3.71	1
K	1.26	12.60	2.40	41.80	3.32	3		K	1.34	13.43	2.30	48.70	3.63	2
L	1.24	12.40	2.80	52.10	4.20	3		L	1.36	13.60	2.50	52.00	3.82	3
M	1.12	11.23	2.80	51.40	4.58	A		M	1.20	11.97	2.90	49.50	4.14	2
N	1.20	12.03	3.40	48.30	4.01	2		N	1.34	13.43	2.10	46.20	3.44	2
O	1.47	14.73	2.50	49.90	3.39	2		O	1.34	13.40	2.80	43.00	3.21	3
P	1.19	11.87	2.70	50.80	4.28	1		P	1.19	11.90	2.50	47.70	4.01	3
Q	1.16	11.57	2.70	49.30	4.26	1		Q	1.25	12.47	3.00	51.00	4.09	1
R	1.19	11.90	2.80	47.90	4.03	2		R	1.27	12.67	2.70	47.80	3.77	1
11	Thick	CS A	Ext	Force	Stress	Br		12	Thick	CS A	Ext	Force	Stress	Br
A	1.37	13.73	2.20	40.90	2.98	2		A	1.34	13.37	2.60	48.90	3.66	1
B	1.27	12.67	2.20	48.50	3.83	3		B	1.19	11.93	1.80	44.90	3.76	3
C	1.14	11.37	2.40	52.70	4.64	2		C	1.12	11.23	1.60	42.80	3.81	3
D	1.19	11.87	2.40	52.90	4.46	3		D	1.19	11.93	2.20	52.80	4.42	2
E	1.24	12.37	2.90	48.30	3.91	3		E	1.29	12.87	1.70	42.50	3.30	3
F	1.26	12.63	2.30	44.40	3.51	2		F	1.36	13.60	2.50	48.80	3.59	1
G	1.19	11.90	2.00	52.50	4.41	2		G	1.20	11.97	1.70	46.30	3.87	3
H	1.20	11.97	2.60	55.80	4.66	2		H	1.21	12.07	2.60	54.50	4.52	1
I	1.25	12.50	2.90	49.50	3.96	2		I	1.13	11.30	3.00	51.10	4.52	2
J	1.10	11.03	2.50	45.30	4.11	2		J	1.26	12.63	2.30	42.80	3.39	2
K	1.18	11.77	2.40	49.20	4.18	3		K	1.30	12.97	2.20	50.20	3.87	1
L	1.21	12.13	2.50	47.80	3.94	A		L	1.29	12.87	2.70	54.00	4.20	3
M	1.20	12.00	2.70	55.80	4.65	3		M	1.40	13.97	2.70	52.90	3.79	3
N	1.26	12.63	2.30	47.50	3.76	1		N	1.27	12.70	2.30	51.00	4.02	A
O	1.40	14.03	2.60	43.90	3.13	2		O	1.36	13.57	2.30	49.10	3.62	2
P	1.27	12.70	2.20	44.20	3.48	3		P	1.36	13.60	2.40	43.20	3.18	B
Q	1.16	11.60	2.50	52.00	4.48	3		Q	1.28	12.80	2.50	51.10	3.99	1
R	1.24	12.37	2.40	47.80	3.87	2		R	1.26	12.63	2.40	49.00	3.88	3

Tables 10.1 Tensile Test Data

Left Hand Column - top number = tray number, letters = position on tray (Figure 5.1 in text) Thick - Mean sample thickness (mm), CS A - Cross sectional Area, Ext - extension in (mm), Force - in Newtons, Stress - stress to break the sample, Br - Break, column figures = position of break, A and B indicate 'jaw breaks', (Figure 5.2 in text)

8% MC					15% MC				
DG		MEAN	N	TRAY	DG		MEAN	N	TRAY
A		4.718	18	5	A		4.001	17	11
A	B	4.657	14	6	A		3.930	16	9
A	B	4.525	15	4	A	B	3.887	16	12
	B	4.278	17	1	A	B	3.749	17	10
	B	4.264	16	2	A	B	3.705	15	8
	C	4.125	15	3	B		3.588	14	7
8% MC					15% MC				
DG		MEAN	N	POS'N	DG		MEAN	N	POS'N
A		4.960	6	H	A		4.530	2	P
A		4.857	6	M	A	B	4.312	5	H
A		4.758	6	G	A	B	4.264	5	C
A		4.735	4	Q	A	B	4.094	5	Q
A		4.672	6	O	B	C	4.038	5	G
A		4.572	5	P	B	C	4.037	6	I
A		4.560	6	R	B	C	3.996	5	M
A	B	4.440	4	J	E	B	3.834	5	P
A	B	4.422	5	I	E	B	3.824	5	L
A	B	4.358	6	C	E	C	3.775	6	R
A	B	4.324	5	L	E	D	3.744	5	N
A	B	4.320	5	F	E	D	3.712	6	B
A	B	4.320	6	A	E	D	3.690	6	K
A	B	4.292	6	B	E	D	3.683	6	F
A	B	4.278	4	N	E	D	3.675	6	J
A	B	4.232	4	K	E	D	3.622	6	A
	B	3.772	6	O	E		3.428	6	O
	B	3.724	5	E	E		3.358	5	E

Table 10.2 Duncans Multiple Range Tests

Letter = Duncan Groupings - means with same letters are not significantly different, MEAN = mean test value, N = number of samples tested, TRAY = tray number, POS'N = position on tray

Appendix 11

CHI SQUARED TESTS

The test statistic values for the Chi Squared Tests are given in tables 11.1 to 11.3

Data in the columns on these tables refer to the text as follows:-

Bruise Split: 7.5.1i
 Split Height: 7.5.2
 Bruise Height: 7.5.1iv
 Split Weight: 7.5.1ii
 Bruise Weight: 7.5.1iii

Bruise	Split	Split	Height	Bruise Height	Split	Wt	Bruise	Wt	
Tray 1	0.19	Tray 1	-	Tray 1	1.24	Tray 1	-	Tray 1	-
Tray 2	0.31	Tray 2	-	Tray 2	0.62	Tray 2	0.47	Tray 2	0.28
Tray 3	0.17	Tray 3	-	Tray 3	1.59	Tray 3	0.29	Tray 3	2.88
Tray 4	0.68	Tray 4	-	Tray 4	0.97	Tray 4	0.59	Tray 4	0.12

Table 11.1. Count 88 at 15% Moisture Content

Bruise	Split	Split	Height	Bruise Height	Split	Wt	Bruise	Wt	
Tray 1	2.33	Tray 1	-	Tray 1	2.49	Tray 1	-	Tray 1	-
Tray 2	0.72	Tray 2	-	Tray 2	1.02	Tray 2	0.52	Tray 2	2.32
Tray 3	2.18	Tray 3	-	Tray 3	0.1	Tray 3	5.32	Tray 3	3.2
Tray 4	2.18	Tray 4	-	Tray 4	1.14	Tray 4	1.39	Tray 4	3.81

Table 11.2. Count 88 at 8% Moisture Content

Bruise	Split	Split	Height	Bruise Height	Split	Wt	Bruise	Wt	
Tray 1	0.43	Tray 1	0.69	Tray 1	1.85	Tray 1	-	Tray 1	-
Tray 2	0.41	Tray 2	6.96	Tray 2	1.16	Tray 2	0.66	Tray 2	3.16
Tray 3	0.17	Tray 3	0.70	Tray 3	3.96	Tray 3	0.59	Tray 3	2.28
Tray 4	1.47	Tray 4	2.59	Tray 4	0.00	Tray 4	1.42	Tray 4	0.19
Tray 5		Tray 5	-	Tray 5	-	Tray 5	2.26	Tray 5	0.25

Table 11.3. Count 100 at 8% Moisture Content

Appendix 12

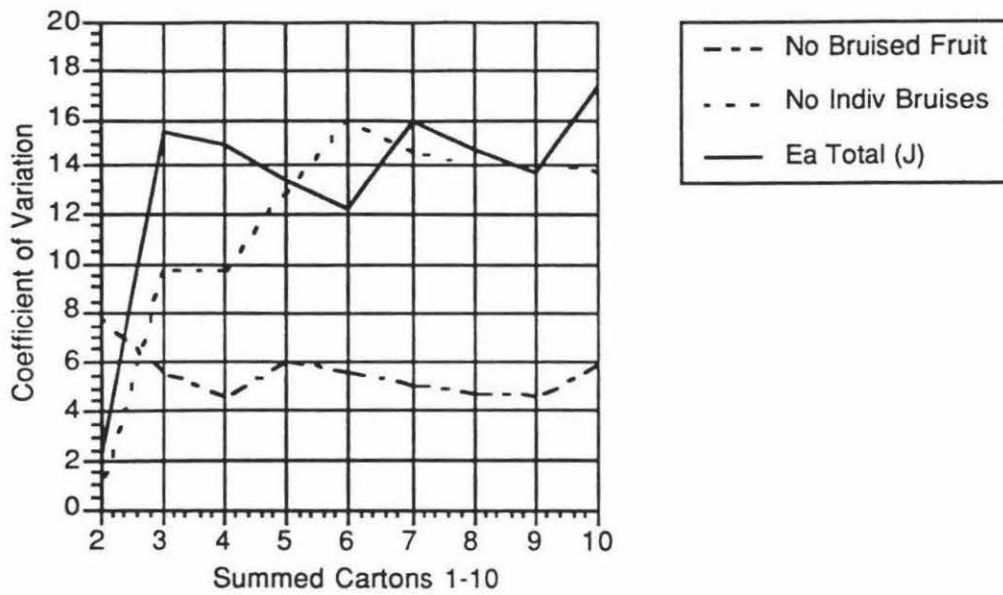
RECOMMENDATIONS ON SIZE OF FUTURE TRIALS

The size of the trials undertaken in this report were limited by time, and so it was decided to test 10 cartons as it was believed that this would provide at minimum a clear indication of trends. Using the data obtained in the three main experiments, the potential validity of future trials of this size was assessed to enable recommendations to be made regarding the scale further investigations.

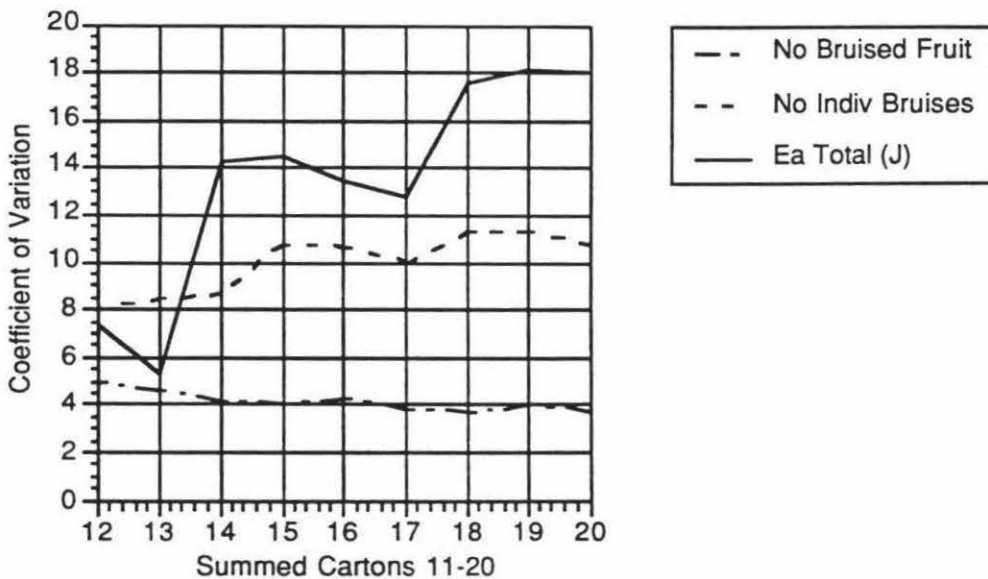
The validity of the quantity data collected in statistical terms was assessed by means of the coefficient of variation. The coefficient of variation describes the variability of the data and when plotted against the summed number of cartons dropped gives an indication of the point where enough cartons have been dropped to essentially eliminate errors resulting from a sample which is too small.

12.1 Graphs of Coefficient of Variation Data against Summed Cartons

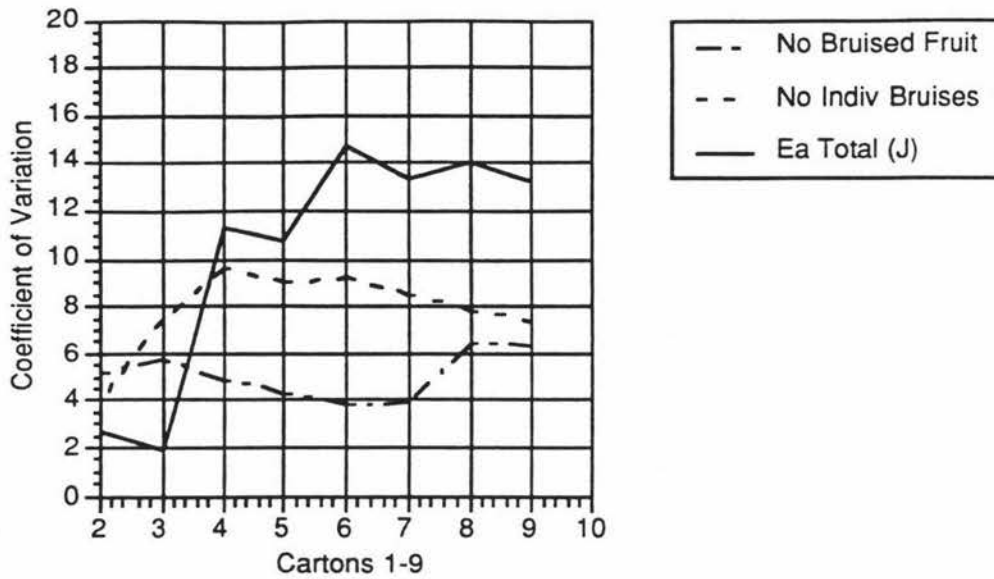
The coefficient of variation for each of the three main drop tests was calculated using a summation of cartons 1 and 2, then 1, 2 and 3 and so on until all 10 cartons were considered for Count 88 fruit and 9 cartons for Count 100 fruit. Figure 12.1, graphs 1, 2 and 3 showed the coefficient of variation against the summed cartons for the numbers of bruised fruit, individual bruises and total energy absorbed in bruising calculated from the bruise volumes and bruise resistance coefficient.



Graph 1 Coefficient of Variation Count 88 Fruit Cartons 1-10



Graph 2 Coefficient of Variation Count 88 Fruit Cartons 11-20



Graph 3 Coefficient of Variation Count 100 Fruit Cartons 1-9

Figure 12.1 Coefficient of Variation against Summed Cartons

12.2 Interpretation of Graphs

A plot of the coefficient of variation against the number of cartons should give a downwards sloping curve as the number of cartons increases, and will eventually reach a plateau where the value of the coefficient of variation does not change appreciably with each additional carton. The first 5 or 6 cartons will not give a very accurate assessment of the situation due to the small sample size but as more cartons are dropped trends will begin to emerge.

Count 88 fruit in Figure 12.1, 1 did not appear to follow any trends. Graph 12.1, 2 showed similar results although the variation in the number of bruised fruit remained fairly constant. Count 100 fruit in Graph 12.1, 3 showed a constant coefficient of variation for the number of bruised fruit but remained erratic for energy absorbed and numbers of actual bruises.

From this it can be concluded that a much larger sample of fruit would be needed to produce highly accurate data to determine the mean energy absorbed in bruising for a given carton configuration. Unfortunately due to

time constraints imposed on this programme it was not possible to extend the number of samples in the trials. However the results obtained did provide statistically sound results in order to distinguish between the two configurations. It is therefore recommended that further experimental work be undertaken using at least twenty cartons prior to assessing the coefficient of variation against the summed cartons, at which point an informed decision can be made to assess whether the scale of the programme needs to be increased. Ideally all the fruit should be obtained from one block in one orchard, graded and then immediately drop tested to maximise the consistency of the experiments.

Appendix 13

TECHNICAL PRODUCTION DETAILS

This thesis was prepared on an Apple Macintosh Powerbook 100 using Microsoft Works 3 for text, graphics and spreadsheet functions. The limitations of this program and the relatively low speed of the computer were more than offset by the portability that allowed all data to be directly entered (with the computer in a plastic bag) and the text added under a wide variety of circumstances. During the final stages of writing up the project I had the use of a Macintosh Quadra 700 with a 20" colour screen. I imported the text into Microsoft Word 5.1 and occasional pages into Pagemaker 3 for added formatting flexibility and printed the document on an Agfa 3400PS Laser printer at 400 dpi. The spreadsheets were printed using Microsoft Works 3, and the statistical tests were run on Stat View 512+.

Many of the original graphics were prepared in MacDraw Pro and imported into Word 5.1 in Pict format (eg Figure 4.1). Others were sketched, scanned in on an Agfa 800 dpi flat bed scanner and modified in McView (an Agfa scanner support program using a paint format). These images were saved in Pict and imported into MacDraw Pro for annotation. They were subject to error when subsequently saved in Pict format and so were saved in EPSF and printed in Pagemaker 3 (eg Figure 6.4).

The photograph of the Siemens Somatom CT Scanner (Figure 4.11) was scanned as a greytone image at 71 lpi, saved in Pict and then printed in Word 5.1 at 400 dpi. The CT Scan images were hung on a standard radiology lightbox and recorded using a Panasonic S-VHS video camera. They were digitised by a Macintosh Centris 660AV using the supplied Apple software. The image was saved in Pict format and placed in Pagemaker 3 to enable precise arrangement of captions and icons (Figures 4.14 to 4.17). The still-frame pictures of the apple cartons during fall were captured in a similar manner from a Panasonic semi-Professional video-recorder with digital image hold (Figures 6.18 and 6.19). Top copies of the halftones have been used in this report to preserve the quality.

The colour photographs were taken under natural lighting conditions with Kodak 200 ASA print film using a Nikon F301 with 35 -70 mm zoom lens. The camera was mounted on a tripod with cable release and apertures of F8 to F16 were used depending on the depth of field required. Photographs were reproduced on a Xerox A Color 635 photocopier.