AUTHOR ... VERSAVEL, Patrick Andre Ghislain ...

TITLE ... EXAMINATION OF THE INTERACTION OF BULK WHEAT WITH BIN WALL CONFIGURATION IN MODEL BINS ...

THESIS ... M.Sc., 1985 ...

EXAMINATION OF THE INTERACTION OF BULK WHEAT WITH BIN WALL CONFIGURATION IN MODEL BINS

by

Patrick Andre Ghislain Versavel

A thesis
presented to the University of Manitoba
in partial fulfillment of the
requirements for the degree of
Master of Science
in
Agricultural Engineering

Winnipeg, Manitoba

THE UNIVERSITY OF MANITOBA

FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a Master's thesis entitled: Examination of the interaction of bulk wheat with bin wall configuration in model bins

submitted by Patrick Andre Ghislain Versavel

in partial fulfilment of the requirements for the degree of Master of Science in Agricultural Engineering

M.G. Britton .... Advisor

W.E. Muir ....

A. Bararos ....

....

.... External Examiner

Date 22 March 1985 ....

Oral Examination is:

Satisfactory /✓/ Not Required /_/

[Unless otherwise specified by the major Department, thesis students must pass an oral examination on the subject of the thesis and matters relating thereto.]

EXAMINATION OF THE INTERACTION OF BULK WHEAT

WITH BIN WALL CONFIGURATION IN MODEL BINS

BY

PATRICK ANDRE GHISLAIN VERSAVEL

A thesis submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements of the degree of

MASTER OF SCIENCE

I hereby declare that I am the sole author of this thesis.

I authorize the University of Manitoba to lend this thesis to other institutions or individuals for the purpose of scholarly research.

Patrick Versavel

Patrick Andre Ghislain Versavel

I further authorize the University of Manitoba to reproduce this thesis by photocopying or by other means, in total or in part, at the request of other institutions or individuals for the purpose of scholarly research.

Patrick Versavel

Patrick Andre Ghislain Versavel

ABSTRACT

The product of the coefficient of friction and lateral-to-vertical grain pressure ratio was indirectly obtained for wheat in model bins. Model bins with both smooth and corrugated walls and with diameters of approximately 307 mm, 270 mm, and 220 mm were studied. Results were determined at overpressures of 40, 50 and 70 kPa and at grain depth to bin diameter ratios of approximately 1.0 and 2.0.

The static coefficient of friction of the wheat used was determined on smooth steel, corrugated steel and on wheat. Values of 0.30, 0.48, and 0.55 were obtained on the respective surfaces.

Average pressure ratio for the smooth-wall model was found to be 0.31 while the corrugated-wall model had a value of 0.67. This indicates that the pressure ratio may be a function of the grain-wall interface. The product of friction coefficient and pressure ratio was studied at two ratios of grain depth to bin diameter. Effect of grain depth was significant at alpha=0.05.

Bin diameter affected the product and indications are that model bins for tests of this nature should have diameters no smaller than 307 mm. Trends in results from the smaller bins were visibly different than the largest bins tested under the same conditions. Overpressure levels were found to affect results in the largest model bins with no significant effect on the results of the smaller model bins.

ACKNOWLEDGEMENTS

A large number of people had input into this thesis and to thank them all individually is impossible. To these people who include family, friends and associates I extend my gratitude for their contributions.

I am extremely grateful to the Natural Sciences and Engineering Research Council for their financial assistance in the form of a scholarship. As well I am grateful to the Manitoba Department of Agriculture and Westeel for their assistance.

A special thanks to Dr. Britton for the guidance and inspiration provided as my major professor. He made all the work worthwhile. Thanks to the technicians and staff of the department for they all contributed in their own way.

Thanks also to Dr. Muir and Professor Baracos for serving as members on my committee.

Finally I would like to acknowledge the inspiration given to me by my parents to keep going even when things got tough and for support during my work. I am forever indebted to them.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS

A = cross-sectional area, m^2
C = circumference of bin, m
D = bin diameter, m
E = modulus of elasticity, MPa
Ea = axial shear modulus, MPa
Er = modulus of elasticity in radial direction, MPa
Et = transverse shear modulus, MPa
Ez = modulus of elasticity in vertical direction, MPa
F = friction force per unit wall length, N/m
H = depth of bin, m
K = p/q = ratio of lateral to vertical grain pressure or pressure ratio
Ka = active pressure coefficient
Kp = passive pressure coefficient
Kpl = plastic pressure ratio
N = normal force at contact surface, newtons
Q = difference between total horizontal normal stress and cross-sectional average, averaged over perimeter of the cross section, kPa
R = hydraulic radius, m
S = stress, kPa
Sh = horizontal stress, kPa
St = tangential stress, MPa
Sv = vertical stress, kPa
S_1 = minor plastic stress, kPa
S_2 = major plastic stress, kPa
V = vertical pressure averaged over the cross-section, kPa
Va = axial poisson's ratio
Vro = ratio of radial to circumferential strain due to a radial stress
Vrz = ratio of radial to vertical strain due to a vertical stress
Vt = transverse poisson's ratio
X = load transducer strain output, microstrain
Y = applied load, newtons
a = radius of transducer base ring, mm
e = natural log base
f = wall friction force, N/m^2
g = acceleration due to gravity, 9.81 m/s^2
ho = surcharge height, m
p = lateral pressure, Pa
pi = 3.14159
q = vertical pressure, Pa
q_0 = applied grain overpressure, Pa
r = bin radius, m
r_0 = radius of concentric ring on load transducer, mm
t = thickness of diaphragm of load transducers, mm
u = coefficient of friction
u_0 = wall friction coefficient
v = poisson's ratio
w = bulk density, kg/m^3
y = depth below grain surface, m
α = angle between the direction of the major pressure S_1 and the vertical axis, degrees
β = uK/R
Ø = internal angle of friction, degrees
Ø' = wall friction angle, degrees

Chapter I

INTRODUCTION

Modern farming practices and increased farm land under cultivation have increased production of cereal grains and other field crops. The Canadian Wheat Board (1983) indicated that total production of principal grains, which includes wheat, oats and barley, in the Western Canadian Provinces for 1983 was 41.7 Mt while 1959 production was only 20.0 Mt. Production first exceeded 40.0 Mt in 1981 and has since not dropped below this figure. Figure 1.1 gives a summary of grain production from 1959 to 1983 (Canadian Wheat Board, 1983).

Corresponding to increased grain production there has been a dramatic increase in the unit size of farms in Western Canada. The Canada Grains Council (1983) indicated that from 1951 to 1981 the number of farms in the 28 to 240 ha sizes had almost halfed while the number of farms larger than 650 ha had doubled. Farm population has also decreased falling from 345,222 in 1959 to 195,284 in 1981 (Canada Grains Council, 1983) indicating that increased mechanization has occured to permit the decreased population to achieve present levels of production.

The small farms were able to work with relatively small storage structures because labour was generally more available and only a small quantity of grain was stored. Commercially manufactured bins for these farms were not optimally designed because overdesign would not affect the cost of the structure to any large degree. Also, savings to be made did not justify the cost of optimization.

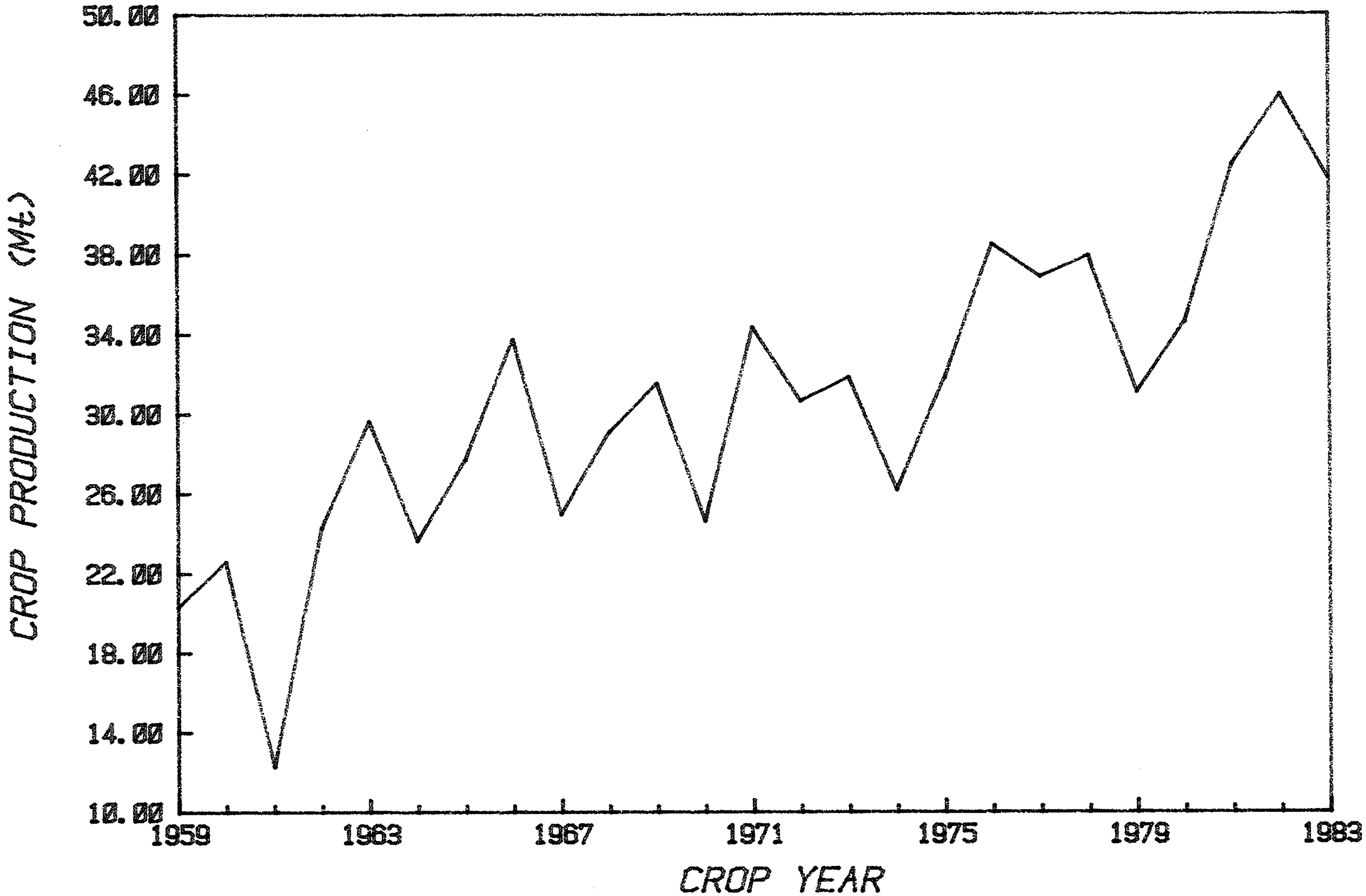


Figure 1.1: Production of major grains in the Western Prairie Provinces.

With increased farm size, the rate at which grain had to be moved increased rapidly and it became impractical to use manual labour. This resulted in a rapidly increasing use of mechanized grain handling so that more grain could be moved by a single person and at a much faster rate. The associated equipment cost and space taken up by small storage structures however did not lend itself well to mechanization of grain movement. Larger storage structures were introduced to minimize the problems that existed with small storage bins. These large storage structures, where grain depth could exceed the diameter, were generally commercially manufactured storage structures which were durable, long lasting and simple to erect. This created considerable pressure on bin manufacturers to optimize their designs because overdesign of large storage structures greatly affects the cost of the bin. In addition if a failure occurs the magnitude of the failure becomes significant. Optimization of bin design implies minimizing the steel used by obtaining the maximum strength-to-thickness ratio of the steel while maintaining the safety of the structure.

Despite what is known about grain pressure Isaacson and Boyd (1965) state that "the determination of static and dynamic pressure exerted by grain in the containing deep bin structures continues to be a hazardous task for the design engineer." The thin-walled structures, often in the form of corrugated-sheet steel, create unique design problems due to the difficulty in accurately estimating the loads due to the pressure of the stored material as well as predicting the magnitude of the pressures themselves. Predicting the magnitude of pressures due to stored material is required first before loads on the structure can be determined and so the focus of this work will be on these pressures.

Numerous theories exist to predict grain pressures but all rely on the knowledge of certain material properties. In the development of some of the theories certain assumptions regarding properties of the stored material have been made and they may not be correct. Thus, if a thorough knowledge of material properties could be obtained, more accurate estimation of material pressures would be possible. Important properties include the bulk density, coefficient of friction on various surfaces and the lateral-to-vertical grain pressure ratio as well as the effect of factors such as moisture content and overburden on the properties of the grain.

The objective of this research was to employ model studies to determine values for the product of the friction coefficient and lateral-to-vertical grain pressure ratio. Specific objectives were to examine:

1. the effect of sidewall configuration of the model bin;
2. the effect of model-bin diameter;
3. the effect of depth of grain to bin diameter ratio (H/D); and
4. the effect of overpressure applied to the top of the grain mass on the product of the two dependent variables.

Chapter II

REVIEW OF LITERATURE

2.1 REVIEW OF HISTORICAL LITERATURE

Many of the grain pressure theories which exist are based upon theories concerning lateral pressure on earth retaining walls. The classical theories of earth pressure were advanced by Coulomb in 1776 and Rankine in 1857 (Craig, 1978). Both these theories assumed that the fill was a dry cohesionless granular mass which exhibited semi-fluid behavior, and was of an indefinite extent with particles held in place by friction. These theories are used for the design of shallow bins in the Canadian Farm Building Code (National Research Council of Canada, 1983).

Rankine's theory assumes a state of plastic equilibrium, that is, when shear failure of the soil is about to occur. This requires the retaining wall to deflect. Figure 2.1 illustrates the basic element on which Rankine's theory was derived. In addition his theory assumes that

1. there is no wall friction,
2. the retaining wall has a vertical surface on the soil side, and
3. the soil is acted upon by its self weight only.

For a cohesionless granular mass with a horizontal surface the lateral pressure is given by:

$$p = K\,w\,y\,g \qquad [2.1]$$

where: K=pressure ratio
p=lateral pressure, Pa
w=bulk density, kg/m^3
y=depth of material, m
g=acceleration due to gravity, 9.81 m/s^2

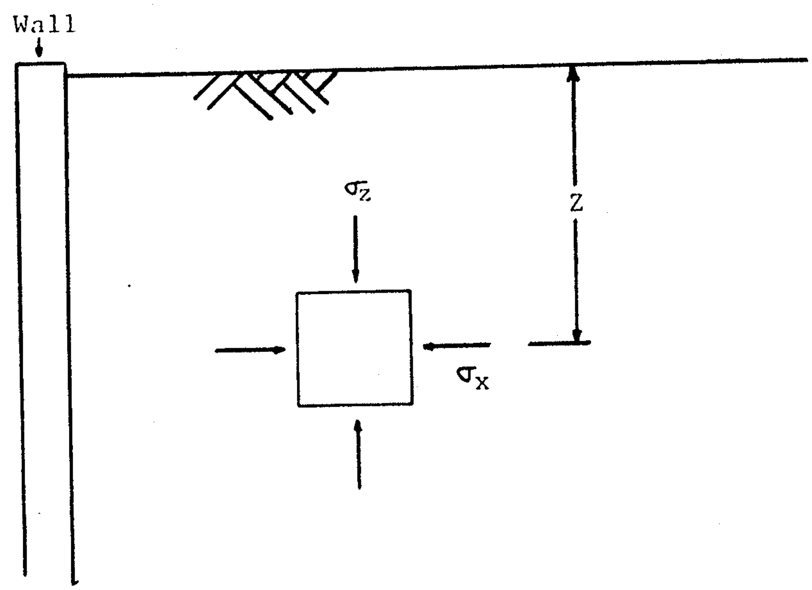


Figure 2.1: Equilibrium of a soil element for Rankine's theory.

Coulomb's theory takes into account wall friction and allows for an inclined surface and non-vertical wall. The theory assumes a wedge having the wall as one side and a plane called the plane of rupture as the other side. The plane of rupture is at an angle from the horizontal such that it exerts the maximum thrust on the wall. Coulomb's solution is similar to Rankine's. Figure 2.2 illustrates that Coulomb's theory is simply a static analysis of a sliding wedge of soil. The chief difference between the two theories is that Coulomb's theory predicts a resultant lateral pressure which is inclined with respect to the normal. For backfill with an inclined surface Rankine's theory predicts a resultant force which is parallel to the surface incline. Coulomb's theory does not predict a resultant load which is directly related to the surface

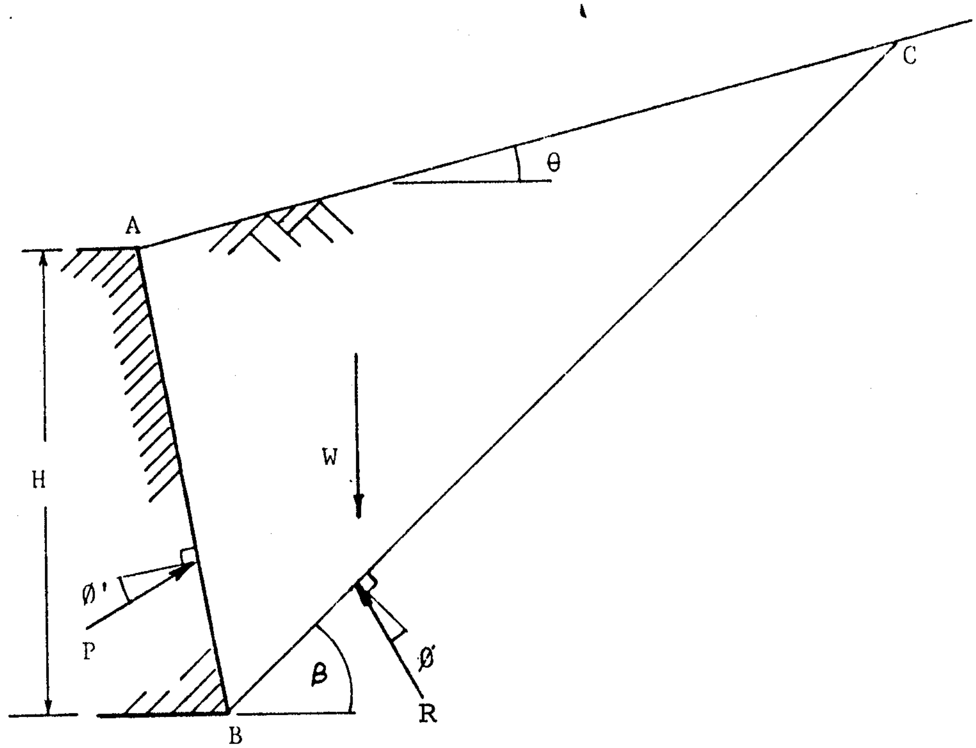


Figure 2.2: Equilibrium of a sliding wedge for Coulomb's theory.

inclination.

Both theories consider two cases; an active case where the wall moves away from the soil mass and a passive case where the wall moves toward the soil mass. For each case a pressure coefficient is defined which relates vertical stress at any point in the soil mass to the horizontal stress. The passive pressure coefficient is the inverse of the active pressure coefficient and is given by

$$K_a = \frac{1}{K_p} = \frac{(1-\sin\emptyset)}{(1+\sin\emptyset)} \qquad [2.2]$$

where: Ka=active pressure coefficient
Kp=passive pressure coefficient
Ø=internal angle of friction, degrees

For grain pressure only the active case is generally considered.

Machey (1966) showed that the use of Rankine's and Coulomb's theories for design of shallow bins with a circular plan was invalid. He noted that a wedge of material taken normal to a flat wall will have parallel sides, while a wedge taken normal to a curved surface does not have a uniform thickness and as a result is affected by lateral pressure and variation of mass for concave or convex surfaces. A new theory was developed by analyzing wedges from concave and convex surfaces and integrating around the bin perimeter. The theory showed that for active pressure on a concave surface, such as inside a circular bin, the pressure predicted was greater than the Rankine effect but approached the Rankine effect as curvature became large. In addition wall friction effects were found to be small.

Based on Rankine's theory the theory of equivalent fluid density was developed. The theory predicts a lateral pressure distribution assuming a fluid which has an effect equivalent to that of the granular backfill. This was applied to the design of early grain storage structures before the realization of the effect of vertical load on the walls due to friction. It has also been used in building codes for the design of shallow bins (National Research Council of Canada, 1977). The realization that there existed a vertical wall load due to friction stimulated engineers and applied mathematicians to learn more about grain pressure.

One of the first recorded works specifically on grain pressure was by Isaac Roberts in 1882 and 1884 (Ketchum, 1919). Using small circular bins 178 mm to 527 mm in diameter and large rectangular bins, 2.057 m by 1.829 m and 15.900 m high, he found that no increase in bottom pressure occurred after the bins were filled with wheat to a depth of more than two times the width of the bins. This work established the existence of frictional forces and resulting vertical wall compression.

In 1895 Janssen published his theory on pressures in a grain storage structure. It was developed by considering the equilibrium of a differential element of grain, homogeneous in cross section, at some depth below the grain surface (Clower, 1971). By assuming a constant density, w, coefficient of wall friction, u, and a constant value of the ratio of lateral to vertical pressure, K, he was able to solve the differential equation to yield

$$p = \frac{Rwg}{u}\left(1 - e^{-uKy/R}\right) \qquad [2.3]$$

$$q = p/K$$

where: R=hydraulic radius, m
w=bulk density, kg/m^3
u=coefficient of wall friction
p=lateral pressure, Pa
K=p/q
e=napierian logarithmic base
y=depth below surface, m
g=acceleration due to gravity, 9.81 m/s^2
q=vertical pressure, Pa

To verify his mathematical model Janssen performed tests on wooden rectangular model bins, the walls of which were supported by jack screws. The bins had loose bottoms supported on a scale so bottom loads could be measured (Ketchum, 1919). Using wheat he measured the proportion of the total weight of grain resting on the bin bottom. The vertical pressure measured was compared to the computed vertical pressure predicted by his equation. From the comparison he found K = 0.67 and a coefficient of wall friction on the wooden walls of 0.30 for the dry wheat used.

In 1896, Prantes (Ketchum, 1919) measured lateral pressures in two cylindrical iron bins which were 1.500 m and 3.800 m in diameter, and 19.000 m high. Using a diaphragm supported on knife edges he measured at-rest lateral pressures which were slightly less than computed lateral pressures using Janssen's equation. In addition he observed dynamic lateral pressures four times the magnitude of static lateral pressures. Investigators have felt that the results obtained by Prantes were inaccurate due to poor measuring apparatus and the possibility that he had off-center unloading which would explain the high dynamic pressures measured.

More carefully conducted tests were done by Toltz in 1897 (Ketchum, 1919). Measurements of lateral pressure were made on a wheat filled bin 4.267 m square and 19.800 m deep. These results agreed with Prantes's experiments and Toltz based an elevator design on Prantes's work.

In a paper titled "The Pressures of Grain" Airy, in 1897, (Jamieson, 1904) reported the results of several experiments to determine the angle of repose and coefficient of friction of grain on walls for several combinations of grain and wall material. He also proposed a theory on grain pressure based on density, angle of internal friction and angle of wall friction, eliminating the need for the lateral pressure coefficient K. Vertical pressure (Lenzcner, 1963) was predicted using

$$F = \frac{gwD^2\tan\varnothing'}{2}\left[\frac{Q - R}{\tan\varnothing+\tan\varnothing'}\right] \qquad [2.4]$$

where: $Q=[(2y/D)(\tan\varnothing+\tan\varnothing')+1-\tan\varnothing\tan\varnothing']^{0.5}$

$R =[\ 1 + \tan^2\varnothing]^{0.5}$

F=friction force per unit wall length, N/m
w=bulk density of grain, kg/m^3
D=diameter of silo, m
Ø=internal friction angle, degrees
Ø'=wall friction angle, degrees
y=depth below grain surface, m
g=acceleration due to gravity, 9.81 m/s^2

Knowing the total mass of stored material and the predicted vertical wall load, a bottom load could be determined. The theory predicted a maximum bottom load at a depth of 2.5 times the bin diameter and decreasing for depths greater than 2.5 diameters to where only a small weight remained on the bin bottom (Lenczner, 1963). More significantly Airy was the first to establish the difference between shallow and deep bins (Ravenet, 1983). A deep bin was defined as a bin where the plane of rupture intersected the bin wall before reaching the grain surface (Clower, 1971).

Ketchum and Varnes in 1903 and 1904 (Ketchum, 1919) conducted tests on a 305 mm square model bin 2.590 m high made of dressed white pine with a vertical grain. A movable bottom supported on a scale allowed measurement of vertical load and a diaphragm in the wall allowed measurement of lateral pressure. The bottom and lateral pressures for wheat were measured during filling, static storage, and emptying. They were unable to detect any pressure differences between emptying and static conditions and found the pressure ratio for their tests to be K=0.40.

Jamieson (1904) in a well documented report described tests conducted on commercial size bins owned by the CPR and on model bins of square cross section with walls of corrugated steel, smooth and rough wood boards, and flat steel plate as well as round model steel bins of different diameters. Pressures were measured using a rubber sheet diaphragm backed with water and connected to a mercury or water column gauge. In tests in commercial bins with Manitoba wheat he found a maximum lateral pressure increase of 4% during emptying compared with pressure during filling or static grain. Model bin tests indicated a value of 10%. Good correlation was obtained between his results and Janssen's equation. For wheat Jamieson found K=0.60.

In the same year Bovey (1904) conducted tests on commercial sized bins to verify Jamieson's results. Lateral and vertical pressures were measured using hydraulic diaphragms like Jamieson used. Bovey observed a maximum lateral pressure increase during unloading of 9.7% and that sudden stoppage of flow had no effect on lateral pressure. These results supported Jamieson's work.

Luft (1904) in 1902 and 1903 ran tests in two circular concrete bins 7.260 m and 3.429 m in diameter and 16.700 m deep that had been designed using equivalent fluid density theory. Glycerine filled rubber diaphragm load cells were used to measure lateral pressures during tests done with wheat and corn. The results of the tests agreed closely with pressures predicted using Janssen's theory. Only a slight increase in lateral pressure was found during emptying. Luft also found that lateral pressure decreased with time and hypothesized that due to settlement the angle of repose and coefficient of wall friction would be increased.

Plessiner (Ketchum, 1919) ran a series of tests from 1902 to 1905 on a variety of bin surfaces including two cribbed timber bins, two planked bins and a reinforced concrete bin with cross sections ranging from a 1.500 m square to a 2.500 m by 3.150 m rectangle and 17.240 m to 18.000 m deep. Vertical and lateral pressures were determined by observing deflections of planks which were part of the structure or via a scale and rod arrangement. Tests were done with wheat, rye, flaxseed, and rape for a total of 126 tests. Static results agreed closely with pressures predicted by Janssen's equation.

Tests by Ketchum and Williams in 1909 (Ketchum, 1919) on a model bin filled with wheat verified the results of previous experiments and Janssen's equation. Bottom pressures were measured with a movable bottom supported on a scale. Lateral pressures were measured by measuring current through a set of calibrated carbon plates.

In his book Ketchum (1919) summarized the experimental work to that point in time and drew several conclusions. The most important of these are:

1. grain behaves as a semi-fluid,
2. lateral pressure is 30% to 60% of vertical pressure and increases little beyond depths greater than 2.5 to 3 diameters,
3. the pressure ratio, K, is not a constant but varies with depth, grain, and bin wall material, and should be determined by experiment,
4. dynamic lateral pressures are about 10% greater than static lateral pressures for central unloading,

5. maximum lateral pressure occurs during or immediately after filling, and
6. pressures calculated by Janssen's or Airy's theories are good estimates of actual lateral pressures.

The period from 1920 to 1965 was described as a time of misconceptions and misinformation compared to the work done prior to 1920 (Sundaram and Cowin, 1979). Relatively little research work was done in this period in terms of grain pressure prediction as Janssen's theory was taken to accurately describe the pressure distribution in a grain storage structure. In a summary of grain storage design Long (1932) reported that for practical design, values of u=0.417, K=0.60, and w=800 kg/m^3 were generally assumed. In addition, for central unloading a lateral pressure increase of 10% was taken for moving grain over static pressure conditions . Some important work was done during the period and a discussion of that work follows.

Using an empirical basis the Reimberts in 1943 developed an equation which gives results similar to Janssen's equation for large depths in a deep bin (Jenkyn, 1978). The main difference between the two is that Janssen's theory predicts an exponential decrease in pressure while Reimbert's theory predicts a hyperbolic decrease in pressure. Reimbert's equation takes the form

$$p = \frac{gwD}{4u}\left[1-\left[\frac{y}{A}+1\right]^{-2}\right] \qquad [2.5]$$

where: $A = \frac{D}{4uKo} - \frac{ho}{3}$

$$v = w[y(y/A+1)^{-1} + ho/3]$$

$Ko = \tan^2[pi/4 - \emptyset/2]$

w=bulk density, kg/m^3
u=coefficient of wall friction
y=grain depth below surface, m
D=diameter of silo, m
ho=surcharge height, m
Ø=internal angle of friction, degrees
p=lateral pressure, Pa
v=vertical pressure, Pa
g=acceleration due to gravity, 9.81 m/s^2

Looking at the equations, a knowledge of the wall friction and K (ie. Ø=internal friction) are still required.

A different approach to predicting silo pressures was taken by Jaky (1948). He stated that Janssen's equation was incorrect because of the assumption that the wall friction angle was a constant. In his analysis he divided the silo into two sections. In the upper section Jaky showed that the wall friction increased approximately linearly to a maximum value and asymptotically tended to a limiting value in the lower section. At the wall, K was shown to increase with depth but became a constant value in the lower section of the silo. In the lower section of the silo he took K as Ko=1-sinØ, where Ø=internal friction angle. The solution derived was quite involved and was not well suited to design purposes. Jaky suggested that K (ie. Ko) should be considered the earth pressure coefficient at rest and this is recognized as a major contribution to soil mechanics (Smith and Simmonds, 1983).

Much of the development of existing pressure prediction theories and significant experimental work has been covered. Work since that time has generally been aimed at improving the existing theories, evaluating important coefficients such as the pressure ratio and friction angles, determining the effect of dynamic loading or looking at flow in a bin. For this thesis a historical overview is considered to be sufficient and the literature review will now focus on two of the variables identified as critical to grain pressure prediction, the pressure ratio and the wall friction angle.

2.2 RATIO OF LATERAL-TO-VERTICAL PRESSURE

2.2.1 Definition of the Pressure Ratio

The pressure ratio, K, is the ratio between horizontal and vertical pressure at a given point in a soil mass and in soil mechanics is referred to as the coefficient of lateral earth pressure (Smith and Simmonds, 1983). The pressure ratio is assumed to be independent of the mass of the fill and wall height and dependent on inclination of the wall, the angle of repose, surcharge angle, and the angle which the resultant lateral force makes with a normal to the back of the wall (Ketchum, 1919). If the pressure ratio is to be interpreted as a material property, then it should be independent of the container wall surface, and hence independent of the coefficient of wall friction. The fact that Ketchum suggests that the resultant angle affects K seems to indicate that K may be a function of the grain-wall interface.

2.2.2 The Pressure Ratio In Grain Pressure Theory

In the derivation of his theory in 1895, Janssen (Ketchum, 1919) assumed several factors to be constant to facilitate a solution to the differential equation derived. One of the factors was the pressure ratio K, or the ratio of lateral to vertical grain pressure. This factor was assumed constant not only across the cross-section of the bin, but over the total height of the bin as well. Janssen found, in his model tests, that using a value of K=0.67 in his theory would predict the pressures measured in his bins. To use the pressure ratio in practice, experiments had to be conducted for the grain and bin material of interest and Janssen only evaluated K for the materials he used.

Koenen in 1896 (Smith and Simmonds, 1983) suggested the use of Rankine's theory of earth pressure to evaluate K in Janssen's equation giving K as a function of internal friction

$$Ka = \frac{(1-\sin\emptyset)}{(1+\sin\emptyset)} = \tan^2\left[\frac{pi}{4} - \frac{\emptyset}{2}\right] \qquad [2.6]$$

where Ø is the internal friction angle. Smith and Simmonds (1983) noted that this was a reasonable assumption if the grain mass reached an active state of failure but that it could lead to a lower bound on the lateral pressure predicted by Janssen's equation.

Jamieson (1904), in his model and commercial bin tests, found that the theoretical value of K as suggested by Koenen did not agree well with the ratio of lateral and vertical pressures obtained at the bottom of the bins. He found for wheat with internal angle of friction (assumed to be equal to the angle of repose) of $\emptyset = 28^\circ$, that K=0.60. Amundson (1945) measured stresses of horizontal bands on a cylindrical grain bin filled with wheat. He found a value of K=0.458 satisfied Janssen's equation and concluded that Janssen's equation would yield a safe design. Jenike et al. (1973a, 1973b, 1973c) found that a value of K=0.4 was suitable for most materials to predict initial pressures using Janssen's equation.

Some investigators have speculated that K is not a constant as Janssen assumed and varies with depth (ie. vertical pressure) and across the cross-section of the bin. One group of investigators, Clower et al. (1973), evaluated K by measuring the frictional resistance to pulling a vertically and horizontally orientated bar through a grain mass. The ratio of friction forces was shown to be equal to the pressure ratio. They found K was independent of vertical pressure yielding a value K=0.52 for wheat but found K to be variable for vertical pressures below 13.8 kPa. Moysey and Brown (1979) measured the angle of internal friction in wheat and durum wheat and found it to be unaffected by vertical pressure. They speculated that if K was a function of Ø as in Janssen's equation then little variation in K with pressure (ie. depth) should occur.

Lenczner (1963) found in tests on a model silo filled with sand that the vertical pressure on the bottom was uniform across the cross-section supporting Janssen's assumption of uniform vertical pressure. He concluded that even if K was a function of vertical pressure, the use of a constant K across a cross-section appeared to be justified.

Pleissner from 1902 to 1905 (Ketchum, 1919) found that K was not a constant for grain at different depths in a bin. He found K to be greater for small depths than large and varying with different bins and grains. For wheat Pleissner found K ranged from 0.30 to 0.50. Similarly Caughey et al. (1951) found that K decreased with increasing depth for materials such as wheat. Ketchum and Williams in 1909 (Ketchum, 1919) also found that K was not a constant but increasing with depth of grain. Lenczner (1963), using model bins, also found that K varied almost linearly with depth to a height to depth ratio of 4.0. Above a height of four diameters K became hyperbolic tending towards a limiting value of 0.2075. Machey (1966) found from the development of a new theory of pressure distribution on a curved surface that pressure distribution was non-linear, ie. that the earth pressure coefficient varied with depth.

Experimenting with rough rice in a model bin, Kramer (1944) found that K increased very rapidly at low vertical pressures and became constant at large vertical pressures. Values of K started at 0.30 and increased to 0.48. As mentioned earlier Jaky (1948) found that the pressure ratio was variable in the top section but almost constant in the bottom section of a bin. In the upper section the value of the pressure ratio along the wall, K, was given by

$$K = Ko - \frac{(a/2r)^2}{yw - (a/2)w^2} \qquad [2.7]$$

where: $Ko = 1 - \sin\emptyset$

$$a = w - \frac{Ko\ w}{r[1 + u_0 (Ko)^{0.5}]}$$

$\emptyset$=angle of internal friction, degrees
r=bin radius, m
u_0=friction coefficient
w=bulk density, kg/m^3
y=depth of grain, m

Reimbert and Reimbert (1976) from tests with silos of many shapes and dimensions, from reduced scale to commercial silos, found that the ratio of mean lateral thrust to vertical thrust was not a constant but varied with the depth of ensiled material and the shape of the silos. In a discussion of the results they stated that if the pressure ratio was a constant then the plot of pressure ratio versus depth would be a straight line and that this would only be true for a semi-infinite depth in a very large silo with no wall friction. Their tests showed that for small depths lateral pressure was much greater and actual vertical pressure was much less than according to theoretical calculations. Based on these observations the Reimberts concluded that $K \geq (1-\sin\phi)/(1+\sin\phi)$ and the curve would asymptotically approach the equality value at great depth as shown in Figure 2.3. In addition they stated that at the bottom of the silo there exists a vertical load when no lateral load is present and so concluded that the curve extends out from the origin at very low depths. Despite this observation they continue to use their equation with a constant K based on the argument that the pressures of concern will occur at large depths where K has reached its asymptotic value.

Ross et al. (1979), working with ground shelled corn, developed a relationship which related the pressure ratio to vertical pressure and moisture content. Using this relationship in a computer technique to estimate wall pressures they found that discrepancies between experimental findings and pressures predicted by Janssen's equation could be explained.

An alternative to physical measurement of the pressure ratio is to use empirical methods based on mathematical derivation. One such approach was made by Jofriet and LeLievre (1984). They stated that if the material contained in a cylindrical body was an isotropic Hookean material and subjected to a uniformly distributed load along a horizontal plane then $K=v/(1-v)$ where v=poisson's ratio of the material. Further the authors stated that if a stored material was stratified orthotropic, ie. the properties in the horizontal and vertical directions were different, then using polar coordinates , z along the axis of the cylinder,

$$K = \frac{Vrz\ Er}{(1-Vro)Ez} \qquad [2.8]$$

where: Vrz=ratio of radial to vertical strain due to vertical stress
Vro=ratio of radial to circumferential strain due to a radial stress

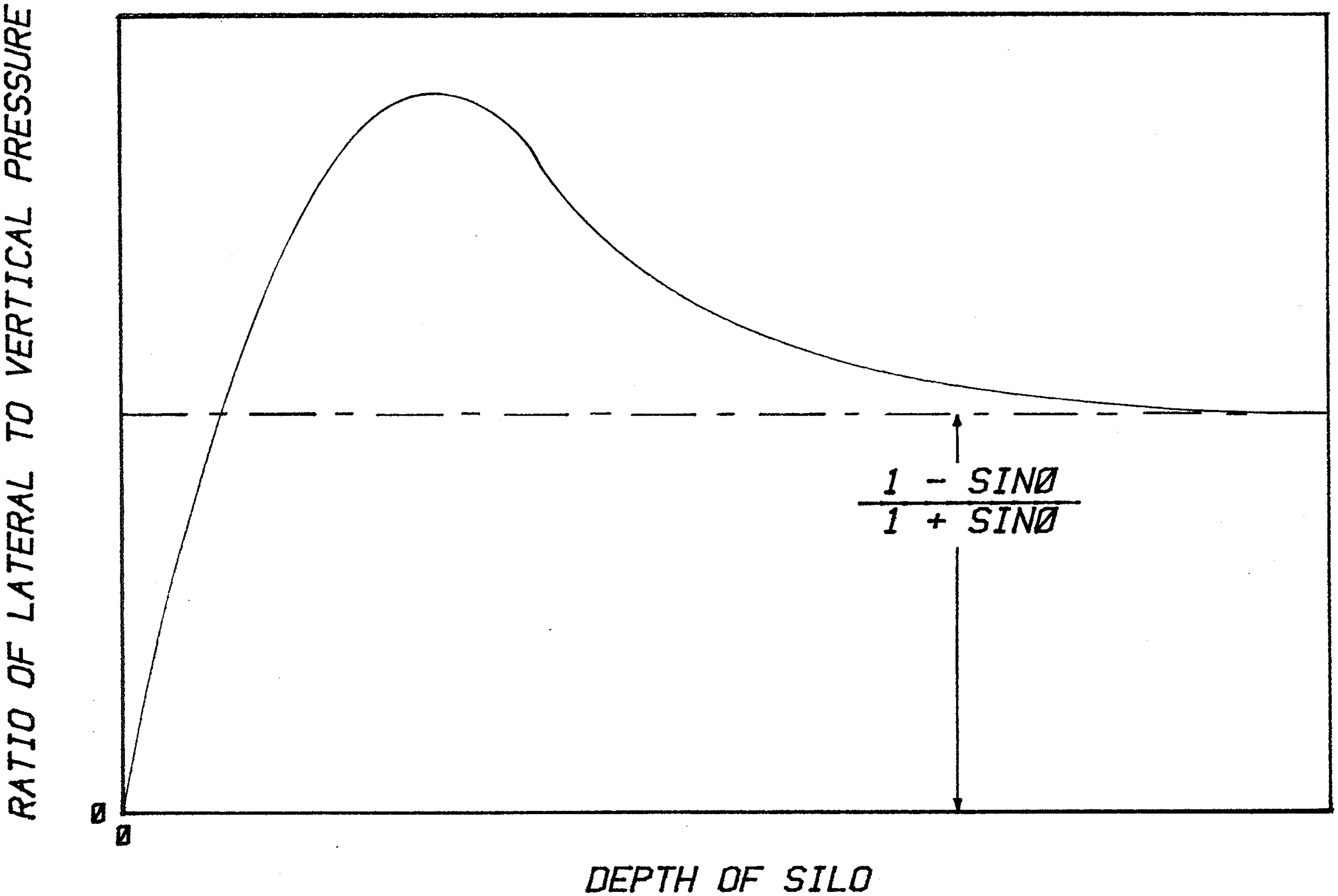


Figure 2.3 : Proposed relationship between pressure ratio and depth of silo.

Er,Ez=moduli of elasticity in the radial and vertical directions, MPa

To use this equation four independent material constants need to be determined. Physical limits could make these properties difficult to determine. Manbeck and Nelson (1970) have found that wheat is anisotropic and so this type of approach would be logical.

Cowin (1979) pointed out that if $K=v/(1-v)$ and equation [2.6] were both correct then both expressions could not be true unless $\sin\emptyset=1-2v$. Using the vertical pressure averaged over the cross-section, V, and the horizontal compressive stress averaged over the perimeter of the cross-section Cowin showed that

$$Ko = \frac{Va\ Et}{(1-Vt)Ea} - \frac{Q}{V} \qquad [2.9]$$

where: Vt=transverse poisson's ratio
Va=axial poisson's ratio
Et=transverse shear modulus, MPa
Ea=axial shear modulus, MPa
V=vertical pressure averaged over the cross-section, kPa
Q=difference between total horizontal normal stress and cross-sectional average, averaged over the perimeter of the cross-section, kPa

Cowin explained that Q could not be zero and hence even if the material was isotropic, where Vt=Va and Et=Ea, K would not equal $v/(1-v)$. In addition Cowin (1977) in his rederivation of Janssen's equation showed that K should be interpreted as the horizontal stress averaged over the lateral boundary perimeter to the vertical stress averaged over the cross-sectional area of the bin. Continuing in his paper Cowin (1979) showed that if K was assumed a constant and satisfied the Mohr-Coulomb yield theory , ie. that the material was a perfectly plastic cohesionless material, then bounds on the pressure ratio could be obtained as

$$1 \geq K \geq \frac{1-\sin\emptyset}{1+\sin\emptyset} \qquad [2.10]$$

where: Ø=internal angle of friction.

The active and passive pressure coefficients, as given in equation [2.2], provide limits on the value of K. The development of these limits assumes a non-cohesive granular solid against a wall with no friction. For these limits to exist sufficient movement of the soil must occur so that a state of incipient failure occurs. Vevancos (Jenkyn, 1978) recommended the active coefficient for filling and the passive pressure coefficient for emptying in bins with a small diameter and filled with a material with a low angle of internal friction.

Jenike and Johanson (1969), based on a theoretical analysis, state that in a plastic state the ratio of minor to major pressure is a constant

$$\frac{S_2}{S_1} = \frac{1-\sin\emptyset}{1+\sin\emptyset} \qquad [2.11]$$

where: Ø=angle of internal friction, degrees
S_1=minor plastic stress, kPa
S_2=major plastic stress, kPa

The axes referred to above are not the vertical and horizontal axes previously referred to for the pressure ratio. The plastic pressure coefficient is then given by

$$Kpl = \frac{Sv}{Sh} = \frac{1-\sin\emptyset\cos 2a}{1+\sin\emptyset\cos 2a} \qquad [2.12]$$

$$a = 0.5[\sin^{-1}(\sin\emptyset'/\sin\emptyset) - \emptyset']$$

where: a=angle between the direction of the major pressure S_1 and the vertical axis.
Ø'=wall friction angle, degrees

$\emptyset$=internal friction angle, degrees
Sv=vertical stress, kPa
Sh=horizontal stress, kPa

In most bins they found Kpl to be small and that Janssen's equation would likely represent both the plastic and elastic states of stress.

Jenkyn (1978) also used a theoretical analysis and proposed that the internal angle of friction be obtained from a shear box test. Once found, a series of relations were manipulated and solved to determine Ko. Jenkyn noted that $Ko \geq 1.0$.

The German standard DIN 1055 uses K values which are modified to take into account dynamic effects of emptying and filling (Fankhauser 1977). It recommends the use of K=0.5 for filling and K=1.0 for emptying. The Canadian Farm Building Code (National Research Council of Canada, 1983) recommends a value of K=0.40 for wheat on a smooth wall and K=0.60 for wheat on a rough wall.

2.2.3 Discussion

Much of the work cited indicates that K may not be a material property. A true material property would not be affected by depth (or pressure) or bin diameter. A possible explanation is that what investigators are measuring is not the pressure ratio but a value which is affected by various external factors and these factors are not being accounted for in the results. This is due to the fact that, in general, K has been determined by measuring vertical load at the bottom of the bin and lateral load at some point on the side of the bin where effects of bin diameter, wall deflection, transducer deflection, and other factors are occurring. To be able to measure the actual K, there may have to be a concentrated effort at obtaining a measurement by some means, within the grain mass. Attempts at this were made by Moysey (1983).

Investigators have developed several means of theoretically determining a K value, but the variation among these techniques leaves the design engineer wary of using any of them. In most cases the prediction techniques proposed are complicated and cumbersome. So even if equation [2.6] is incorrect, its use will continue because of the simplicity of the equation. Alternatively values could be chosen so that a safe design can be made, such as the Canadian Farm Building Code (National Research Council of Canada, 1983) has recommended.

Some of the investigators mentioned found K values for Janssen's equation which accurately predicted their experimental pressures. These values were selected to obtain a good fit and are in general applicable only to the test conditions for which they were selected.

2.3 FRICTION AND THE COEFFICIENT OF FRICTION

2.3.1 Definitions

In considering agricultural materials and their interactions with surfaces they contact, two types of friction, static and kinetic, must be considered. Sir W.B. Hardy in 1936 (Brubaker and Pos, 1965) defined static friction as the tangential force per unit area which just fails to cause motion. More generally static friction forces are those forces which are acting between two contacting surfaces at rest with respect to each other. Kinetic friction forces are then those forces which act between two contacting surfaces in relative motion to each other.

The coefficient of friction between two surfaces is the ratio of the friction force between the two surfaces divided by the normal force pressing the two surfaces together. Symbolically

$$u=P/N \quad [2.13]$$

where: u=coefficient of friction
P=force due to friction, N
N=normal force at contact surface, N

The angle of inclination of a free surface of grain at equilibrium is called the angle of repose. The angle of internal friction is the angle whose tangent is the coefficient of internal friction of the particles on one another. The angle of internal friction is the average frictional resistance of the grain within the granular mass. Engineers commonly assume that the angle of internal friction and angle of repose are equal.

2.3.2 Friction Theories

For agricultural materials the classical laws of friction as stated by Leonardo de Vinci, Amontons, and Coulomb (Stewart et al., 1969, Moshenin, 1968) are applicable. These laws are generally stated as:

1. Friction forces are proportional to the normal load,
2. Friction forces are independent of the area of the sliding surface,
3. Friction forces are independent of the sliding velocity, and
4. Friction forces depend upon the nature of the materials in contact.

Sherwood in 1951 (Moshenin, 1968) described friction as the action of two types of forces, one shearing and deforming asperities and the second as forces of adhesion and cohesion. In addition he stated that friction was directly proportional to the actual contact area and that it was velocity dependent. Despite these observations the classical laws have been found to adequately describe friction of agricultural materials.

2.3.3 Coefficient of Friction

Design values for the coefficient of friction, static and kinetic, of agricultural materials on various surfaces are not widely available. This is due to the lack of work in this area and because frictional properties have generally been determined for a particular use or purpose rather than for a general application. In tests which have been conducted the physical properties of the materials were often not defined, surfaces not accurately described and test methods variable. In addition, reported values often do not differentiate between static and kinetic conditions.

The most common methods of determining the static and kinetic coefficients of friction are tilting of a table until the material slides on the surface and moving a surface against a material respectively. Investigators such as Bickert and Buelow (1966), Stewart et al. (1969), and Brubaker and Pos (1965) used a horizontal table on which various surfaces were mounted. Static and kinetic coefficients of friction were determined by measuring the horizontal force required to restrain the material samples as the table was moved. Various table speeds and different normal loads on the samples were used.

Richter (1954) determined the kinetic coefficient of friction by placing a sample of material on a rotating disc of the required surface and measured the restraining force to prevent movement of the sample. Static coefficients of friction were determined by pulling a sample over a surface. Lawton (1980) measured static coefficients of friction by measuring the torque required to rotate an annular plate on top of the material being tested. Smith and Simmonds (1983) state that the shear box or cell apparatus is often used. This approach has several problems as results are affected by grain size, hence the shear box size must be increased for increased particle size.

Despite variability between test methods and results of the investigations mentioned the general conclusions reached about the effect of factors such as material moisture content, environmental conditions, normal load, and relative velocity between the material and the surface are the same. The general conclusions reached are:

1. the coefficients of static and kinetic friction are independent of normal pressures,
2. to obtain reproducible data, the surface must be conditioned by repeated passes of the material,
3. kinetic coefficients of friction are independent of the relative velocity of the contact surfaces, and
4. increasing moisture content gives increasing coefficients of friction.

The previously mentioned work done in determining the coefficient of friction on various surfaces focused on planar surfaces only. Moore et al. (1983) conducted tests to determine the kinetic coefficient of friction of wheat on circular smooth and corrugated metal surfaces. They found that the friction of wheat on a smooth and corrugated surface and wheat on wheat were dependent on the lateral pressure and the relative velocity between surfaces. Additionally they found that the shear plane on the corrugated surface developed within the wheat confined to the valleys of the corrugations. Reimbert and Reimbert in 1980 (Moore et al., 1983) suggested that for corrugated bins the value of the sidewall friction be taken as equal to the angle of internal friction.

It is well documented that wall friction increases with moisture content but several investigators have found that the coefficient of wall friction is not a constant for a given moisture content. Ross et al. (1979), for example, determined a functional relationship among the coefficient of friction, lateral pressure and moisture content for ground shelled corn. The relationship predicted a decreasing coefficient of friction for increasing vertical pressure. Similarly Jofriet and Negi (1983) showed that the coefficient of friction for silage on the wall surfaces decreased with increasing normal pressure. Jaky (1948), based on experimental results, found that wall friction increased approximately linearly for small depths and tended to become a constant for large depths. Thompson and Ross (1983) pulled metal blades through a grain mass and also found that the coefficient of friction was affected by vertical pressure.

Investigators such as Bickert and Bakker-Arkema (1968) have found that normal pressure had no effect on the coefficient of friction. A similar conclusion was reached by Bickert and Buelow (1966), Snyder et al. (1965) and Moysey and Hiltz (1984).

2.3.4 Discussion

In the works of investigators cited, coefficients of friction for wheat on smooth steel ranged from 0.49 to 0.29. For a shallow bin the effect of this change on predicted loads results in a 41% decrease in predicted vertical load. A ±10% error in the value of u results in a ±10% error in predicted vertical load using Rankine's theory. For deep bins, the above change in the value of u in Janssen's equation yields about a 15% decrease in predicted lateral pressure for a 5.000 m diameter, 6.150 m high bin with no surcharge. In Reimbert's equation this results in a 28% decrease for the same size bin. Thus if the friction coefficient is taken too small a larger vertical wall load will exist if the actual coefficient is higher. The Canadian Farm Building Code of Canada (National Research Council of Canada, 1983) gives a value of 0.30 for wheat on smooth steel. This value is low relative to published data, giving low vertical load estimates which would be exceeded if a higher wall friction actually existed.

The ability to accurately predict bin loads due to grain depends on the degree to which we can accurately predict factors such as the coefficient of friction. This requires a standardized testing procedure to be developed as different experimental methods give conflicting results.

Chapter III

THEORETICAL ANALYSIS

Janssen's equation as commonly used assumes a free top surface. A rederivation of Janssen's equation follows using the same basic assumptions made by Janssen but allowing for a surcharge at the top surface. The derived equation is then further manipulated to allow for solution of the product of the coefficient of friction and the lateral to vertical grain pressure ratio.

Consider a horizontal differential element of height dy at some depth y below the top surface of a bin with a circular horizontal cross-section of radius r (see Figure 3.1). Summing forces in the vertical direction (y positive in the downward direction) yields

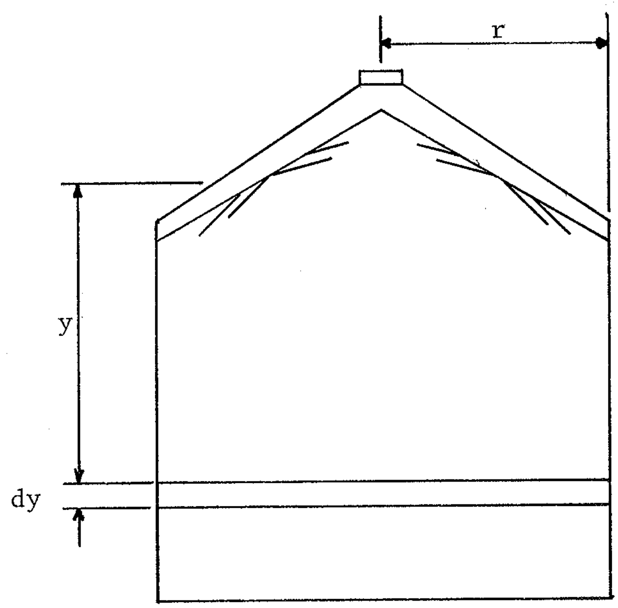
$$qA-(q+dq)A-fCdy+wAgdy=0 \qquad [3.1]$$

where: A=cross sectional area, m^2
f=friction force per unit wall length, N/m^2
C=circumference of bin, m
q=vertical pressure, kPa
w=bulk density, kg/m^3
g=acceleration due to gravity, 9.81 m/s^2
dy=differential depth of element, m

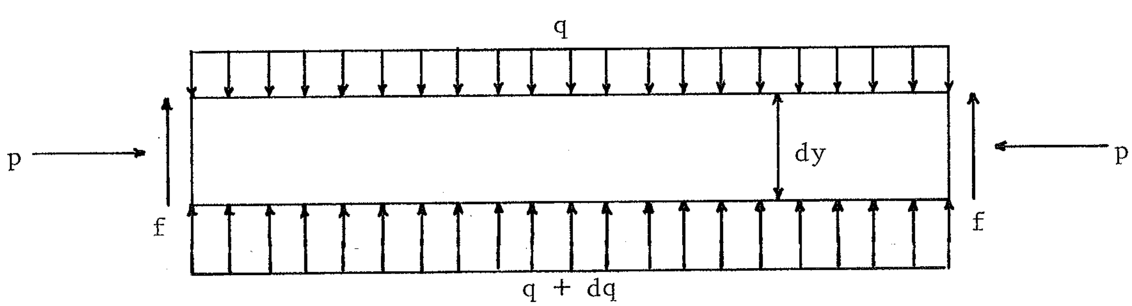
which by manipulation may be reduced to

$$dq/dy+f(C/A)=wg \qquad [3.2]$$

The assumption is made that a uniform stress exists across any horizontal plane and the sample density is uniform. Jofriet and Negi (1983) found these to be reasonable assumptions for high overpressures, such as



a) Cross-section of bin



b) Differential element

Figure 3.1: Free body diagram of a differential element of grain.

those used in this study. Additional terms are defined with respect to p, the lateral pressure, as the coefficient of friction

$$u=f/p \text{ (dimensionless), and} \qquad [3.3]$$

the lateral to vertical grain pressure ratio,

$$K=p/q \text{ (dimensionless).} \qquad [3.4]$$

The hydraulic radius is defined as

$$R=A/C \text{ (m).} \qquad [3.5]$$

Also β is defined as

$$\beta=uK/R \ (m^{-1}). \qquad [3.6]$$

Substituting equations [3.3] to [3.6] into equation [3.2] yields

$$dq/dy + \beta = wg \qquad [3.7]$$

The general solution is

$$q= Me^{-\beta\int dy} + (e^{-\beta\int dy}) \int wg\, e^{\beta\int dy} dy \qquad [3.8]$$

where M is an arbitrary constant.

For y=0 can define $q(0)=q_0$ where q_0 is the applied pressure at the top of the grain specimen. Then

$$M=q_0\, e^{\beta\int dy}\Big|_{y=0} -wg\int e^{\beta\int dy} dy \Big|_{y=0} \qquad [3.9]$$

Factoring and solving [3.8] and [3.9] yields

$$q = e^{-\beta\int dy}\left[\int wge^{\int\beta dy} dy + \left[q_0 e^{-\beta\int dy} - wg\int e^{\beta\int dy} dy \right]\right]\Bigg|_{y=0} \qquad [3.10]$$

Integrating

$$q = e^{-\beta y}\left[(wg/\beta)e^{\beta y} + q_0 - (wg/\beta)\right] \qquad [3.11]$$

Collecting terms we get

$$q = q_0 e^{-\beta y} + wg/\beta\,[\,1 - e^{-\beta y}\,] \qquad [3.12]$$

which is Janssen's equation modified for a surcharge.

To solve for the product uK, exponential terms containing β are gathered

$$q = wg/\beta + q_0 e^{-\beta y} - e^{-\beta y}\,(wg/\beta) \qquad [3.13]$$

or

$$e^{-\beta y} = (q - wg/\beta)/(q_0 - wg/\beta)$$

finally

$$\beta = \left[\ln[(q_0 - wg/\beta)/(q - wg/\beta)]\right]/y \qquad [3.14]$$

Using a numerical technique, equation [3.14] may be solved for β. Once β has been found then from equation [3.6]

$$uK = \beta R$$

or

$$uK = \beta D/4 \qquad [3.15]$$

where D=bin diameter, m.

Chapter IV

EXPERIMENTAL EQUIPMENT

4.1 MODEL BINS AND MATERIAL HANDLING

To meet the objectives of this study model bins with corrugated and smooth walls in three diameters were examined. Wheat was contained in the model bins by plywood discs at the bottom and top of the grain mass. A surcharge was applied to the top of the mass using a lever arm made of square tubing and a pan onto which masses were placed (see Figure 4.1). The applied load at the top of the grain mass as well as the resultant load at the bottom of the grain was measured using load transducers situated as shown in Figure 4.1.

The model corrugated bins were 665 mm long sections of culvert pipe formed from galvanized steel 1.57 mm thick with corrugations 67 mm wide and 13.5 mm deep. Unriveted pipes were supplied by Westeel so that rivets normally used to fasten the seams would not disrupt the characteristics of the inside surface. The seams were closed by welding from the outside, making certain that a uniform diameter was maintained along the length of each pipe. The mean diameters of the corrugated bins, taken as the average of the diameter of concave and convex corrugations, were 307 mm, 269 mm, and 219 mm.

The smooth-wall metal bins were constructed with the same diameters as the mean diameters of the corrugated model bins using galvanized steel 0.813 mm thick and 770 mm high. Final diameters of 307 mm, 270 mm

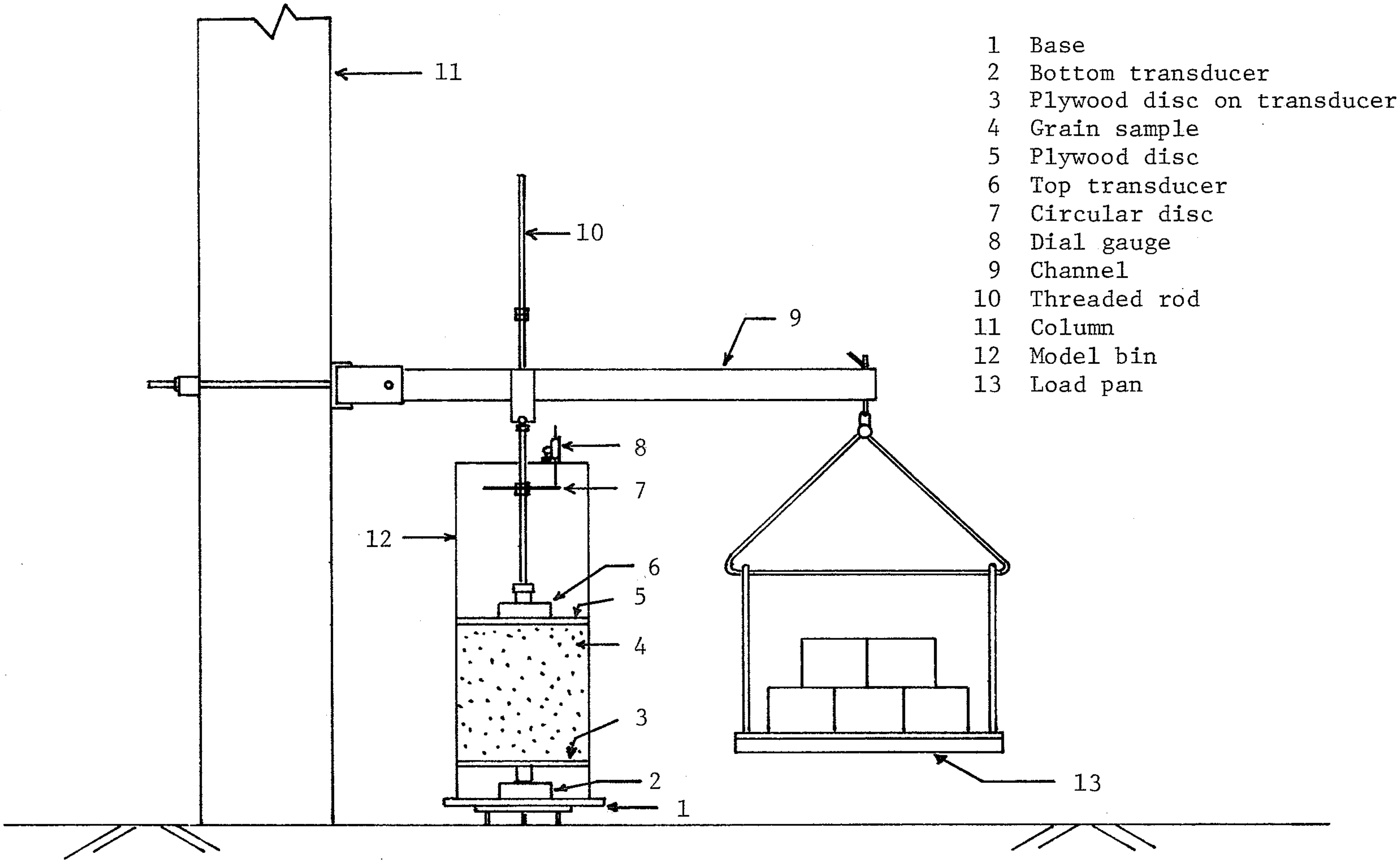


Figure 4.1: General arrangement of equipment for load tests.

and 220 mm were obtained. Overlapped seams were also used but fastened by spot welding every 25 mm along the seam in two offset rows.

Loose fitting 12.8 mm thick plywood discs with 1 to 2 mm of clearance between the model bin sidewalls and the discs were fabricated for the bottom of each bin so that the bottom load could be measured. A disc for the top of each bin with the same clearance allowed for the application of load to the grain mass. The plywood discs for the corrugated model bins were made to fit to the inward facing corrugations so they could move freely.

Two bases were constructed and each mounted on three adjustable legs to assure that the model bins were vertical during testing. A bottom transducer was orientated on the center of each of these bases.

For consistent loading of the model bins a hopper with about 0.079 m^3 capacity was mounted on legs with caster wheels. The hopper was located above the center of a bin using orientation marks on the floor and locating pins on the legs of the hopper. In this fashion the hopper could quickly and consistently be located above the center of each bin. The hopper outlet was located approximately 1100 mm above the bin bottoms and was 52 mm by 55 mm in size. Grain flow was controlled via a sliding valve. The hopper is shown in Figure 4.2.

To minimize grain loss a vacuum cleaner was used to remove grain from the bins at the completion of each test.

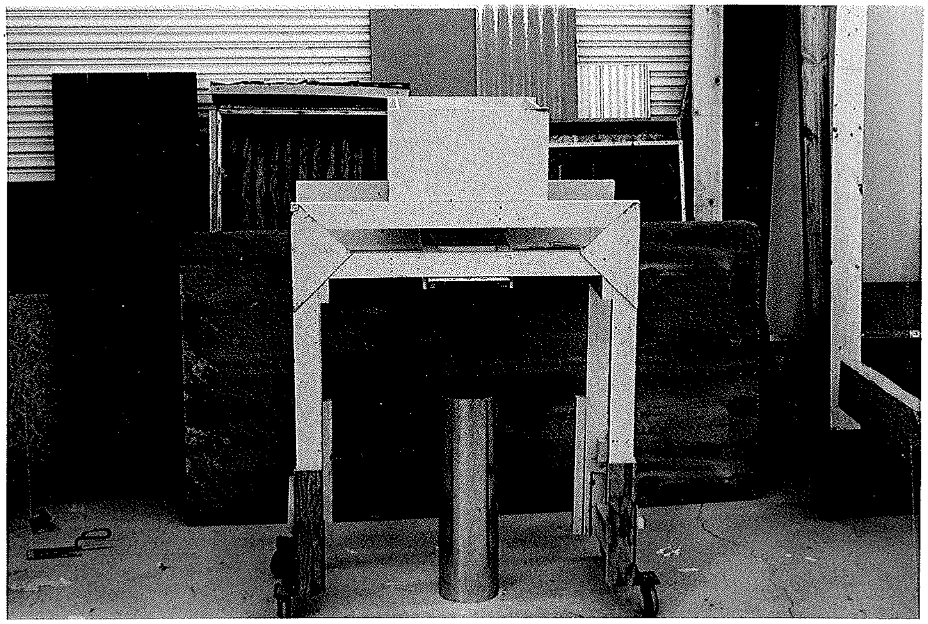
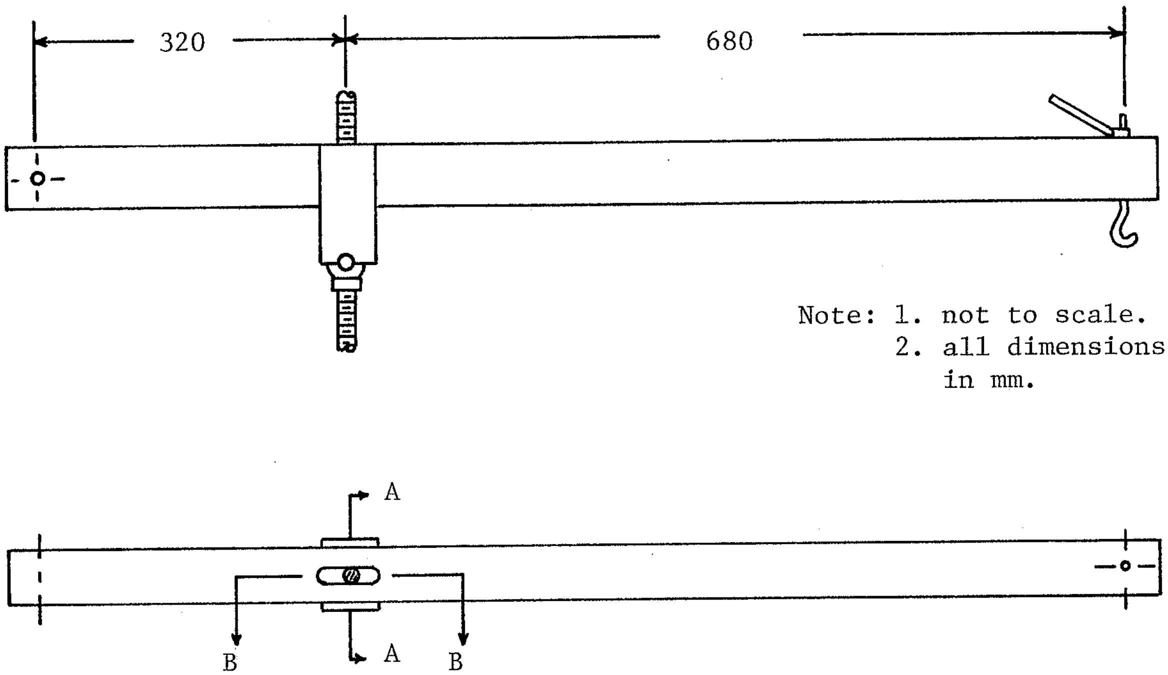


Figure 4.2: Hopper used to fill model bins from a uniform height.

4.2 LOAD APPLICATION

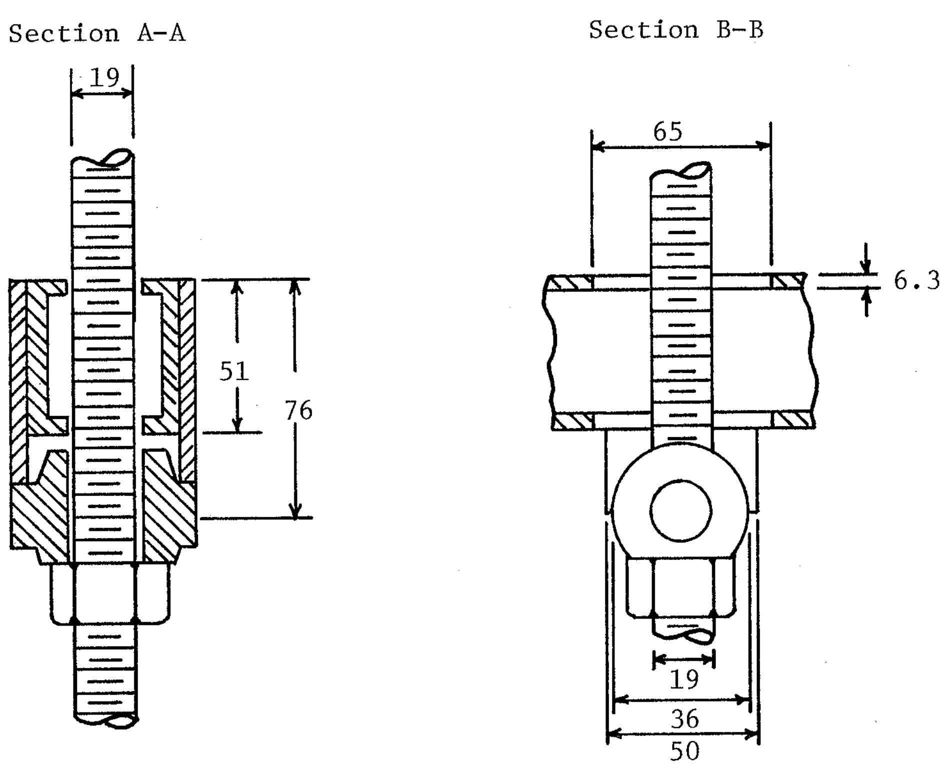
Lever arms were used for applying overpressure so the weight required for a test was reduced. A pivot point was attached to a wide flange column and two lever arms were attached at angles of 35° outward from the normal to create sufficient space in which to work. The point of load application for the bins relative to the pivot point and weight end gave an applied load of approximately three times the pan load. Weights which were placed on load pans consisted of 20 kg and 30 kg masses. The pans were hung from hooks on the lever arms.

Lever arms were constructed from 51 mm square steel tubing with 6.3 mm wall thickness. The dimensions of the arms were as shown in Figure 4.3. A slot was cut through both sides of the tube along the vertical axis to allow for passage of the threaded rods used for loading. To



Note: 1. not to scale.
2. all dimensions in mm.

a) Lever arms



b) Pivot-nut assembly

Figure 4.3: Lever arms used for load application to model bins.

strengthen the tube at the slot location, plates were welded on the tube along the sides. The plates were also used to transfer load to the threaded rods through pivot-nut assemblies (see Figure 4.3). Pan hooks were attached by drilling a vertical hole near one end of the tube. Threaded hooks were used so that slack could be taken up when the load pan was attached and so the lever arms could be leveled without applying a load while the pan was on the threaded hooks. The pivot point was made by drilling a horizontal hole through the other end of the tube.

The pivot base was made of 76 mm steel channel with the major axis vertical. It was fastened to the wide flange column with bolts to achieve a clamping effect on the column. To ensure the base would not move, emery paper was inserted between the contact surfaces. Attached to the channel were two sets of 10 mm thick parallel plates as shown in Figure 4.4. They allowed pinning of the lever arms such that only vertical movement of the free end was obtained.

Weight pans were constructed of sufficient capacity to hold approximately 300 kg and large enough to allow room for the weights.

Load was transfered to a bin through a 19 mm NC threaded rod. The threaded rod allowed compensation for grain deflection during loading and during the coarse of a test. To allow for small angular movement of the rod from the vertical a pivot-nut assembly was used on the lever arm as shown in Figure 4.3. A spherical end on the threaded rod and a cupped load block on the top transducer allowed small angular movement of the top plywood disc if uneven settling of the grain mass occurred.

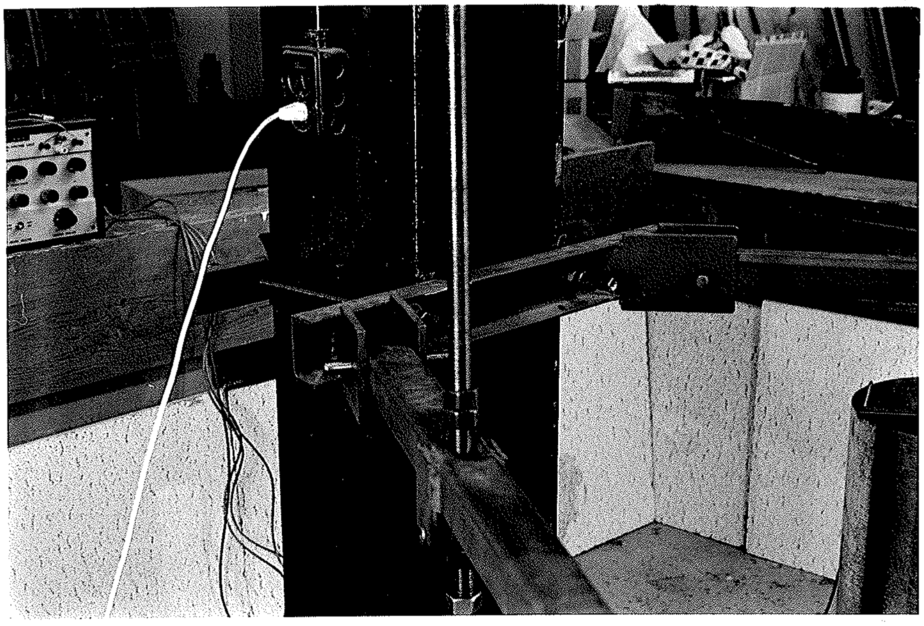


Figure 4.4: Base of lever arms.

4.3 LOAD MEASUREMENT

A load transducer on the top of the plywood disc sensed the applied load while the bottom load was sensed by a load transducer beneath the bottom plywood disc during a test. The main requirements of the load transducers used were:

1. that they have a relatively low profile;
2. that they have good vertical stability to prevent tipping; and
3. that they have small deflection over the working range.

The transducer plan selected was a circular diaphragm with strain gauges mounted on the inside face of the diaphragm. Ease of construction dictated the circular shape. Beckwith and Buck (1969) reported that a thin metal transducer generally has a linear output if the maximum deflection of the diaphragm is less than 30% of its thickness.

The transducer base was fabricated from a pipe with an inside diameter of 128.2 mm and a wall thickness of 6.3 mm. Load was to be applied through a circular ring mounted on the diaphragm. Calculations were made using accepted equations for circular plates (Roarke, 1965) to determine the required thickness of the diaphragm for the expected loads. The calculations were carried out for both a fixed edge support and knife edge support (see Appendix A). It was desired to construct a diaphragm with a fixed edge but physical limitations were expected, at best, to produce an edge with characteristics somewhere between fixed and knife edge conditions. A mild steel diaphragm of 3.048 mm thickness was used in transducer construction. The diaphragm was attached to the base ring by a series of spot welds along the circumference of the plate. Foil strain gauges type EA-06-125AD-120 from MicroMeasurements were mounted as shown in Figure 4.5. The gauge factor of the gauges was 2.04±0.5%.

The plate on the transducer was in tension at the center and in compression near the edge of the surface away from applied load. Strain gauges located as shown (Figure 4.5) could therefore be put in adjacent arms of a Wheatstone bridge. This configuration also provided temperature compensation in the bridge.

The circular ring used to apply load to the diaphragm was 25 mm high and had 3.6 mm wall thickness. Attachment of the ring was initially made using solder. This proved to be a poor technique as creep in the solder required a long time period before output from the gauges stabilized after applied load was changed. A silicone sealant was finally used to attach the rings.

Four transducers were constructed and wired to a BLH Switching and Balancing unit, Model 225, with 10 channel capability. The unit was in turn wired to a Vishay model P-350A strain indicator.

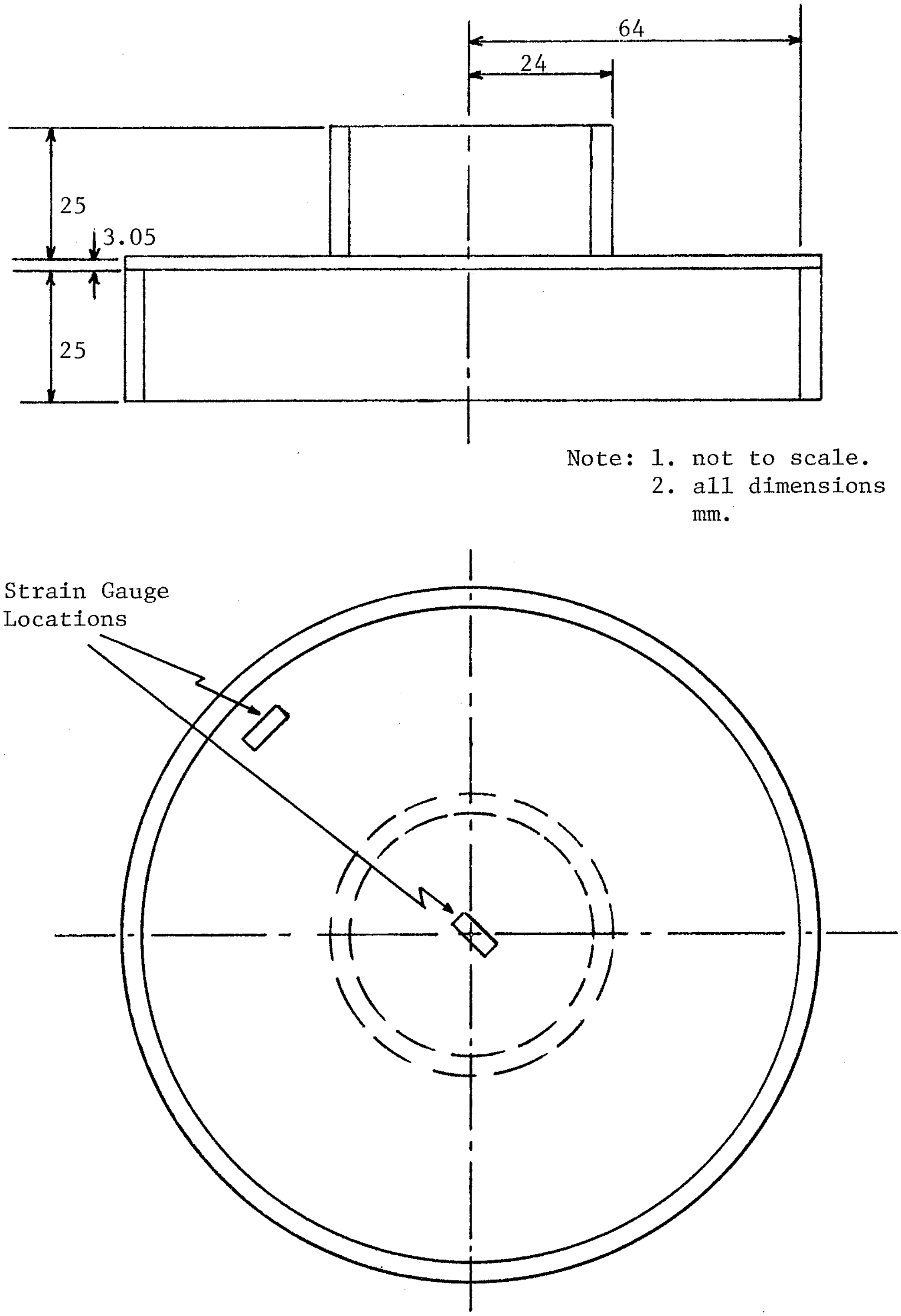


Figure 4.5: Section views of load transducer.

As mentioned before the transducers were placed below the bottom and on top of the grain mass. Wires from the bottom transducers were run through holes out the bottom base. Wires from the top transducer were run over the top edges of the bins. A load block was made so one end would fit into the circular ring of the top transducer. The opposite end was made with a semi-spherical hole to facilitate the end of the threaded rods. This allowed for easy centering of the transducer and angular movement of the top plywood disc.

Centering of the transducers on the plywood discs was done using three screws 120° apart in each disc such that the transducers could just be placed in.

4.4 DEFLECTION MEASUREMENT

Deflection of the grain mass during testing was measured using a Mitutoyo dial gauge model 3052-01 with a 30 mm range and 0.01 mm readability. The top edge of a bin was used as a reference point for the dial gauge. A circular disc held on the threaded rod was used to transfer the settlement of the grain mass. As the grain mass settled the threaded rod, hence the disc, would move downward relative to the bin. This movement was detected by the dial gauge. In this manner the average deflection of the grain mass was obtained and not affected by non-uniform settling of the grain mass. Initial height of the grain mass was obtained by indirect measurement with a tape measure. This initial height was correlated to the dial gauge reading so a continuous reading of the grain height was obtained. The technique is illustrated in Figure 4.6.

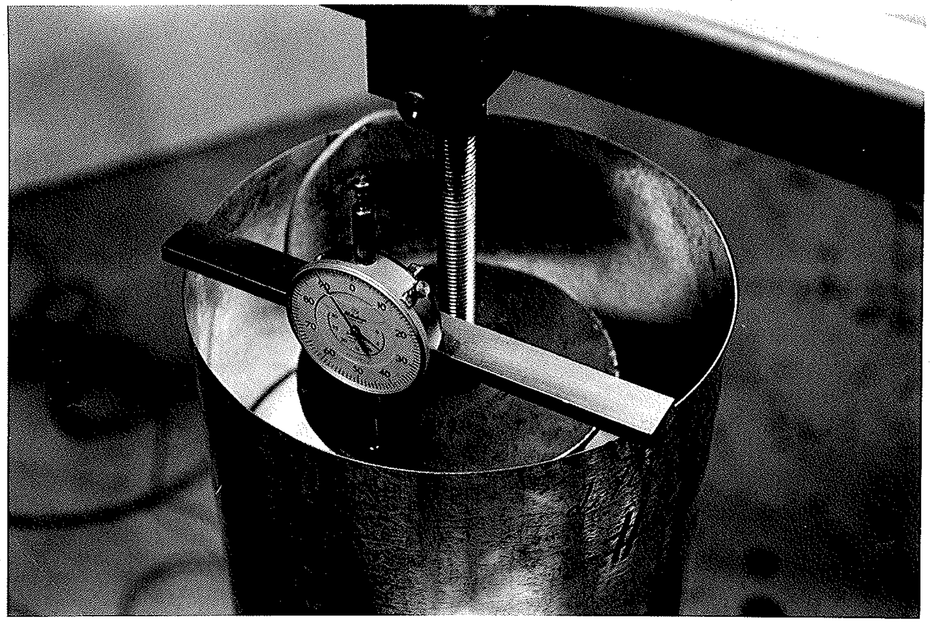


Figure 4.6: Measurement of grain settlement during testing.

Chapter V

PROCEDURE

5.1 GRAIN SELECTION AND PROPERTIES

Neepawa wheat was used for all tests. The wheat selected was Canada #1 Hard Red Spring wheat with 1.5% dockage and about 8% moisture content (w.b.). The low moisture content was felt to be non-representative of commercial storage conditions and not suitable. Moisture content of test samples was increased to about 12.4% (w.b.) by rewetting. The water was added while the grain was mixed in a concrete mixer to ensure uniform distribution. After all rewetting was completed the moisture was allowed to equilibrate for approximately 2 weeks. The rewetting process reduced the grade to #2 due to discoloration of the kernels.

Coefficients of friction of wheat on smooth steel, corrugated steel and a wheat surface, created by gluing wheat to a steel backing, were determined. The tilting table method was used (see Figure 4.7). The table was constructed with a galvanized sheet metal surface. The other surfaces were tested by placing them over the smooth steel surface on the table. A screw mechanism was used to raise and lower the table. Angle at which grain movement began was measured using a protractor and plumb bob on a string. The protractor was fastened to the tilting table and the plumb bob hung from a nail at the center of the protractor. This allowed a direct reading of table slope.

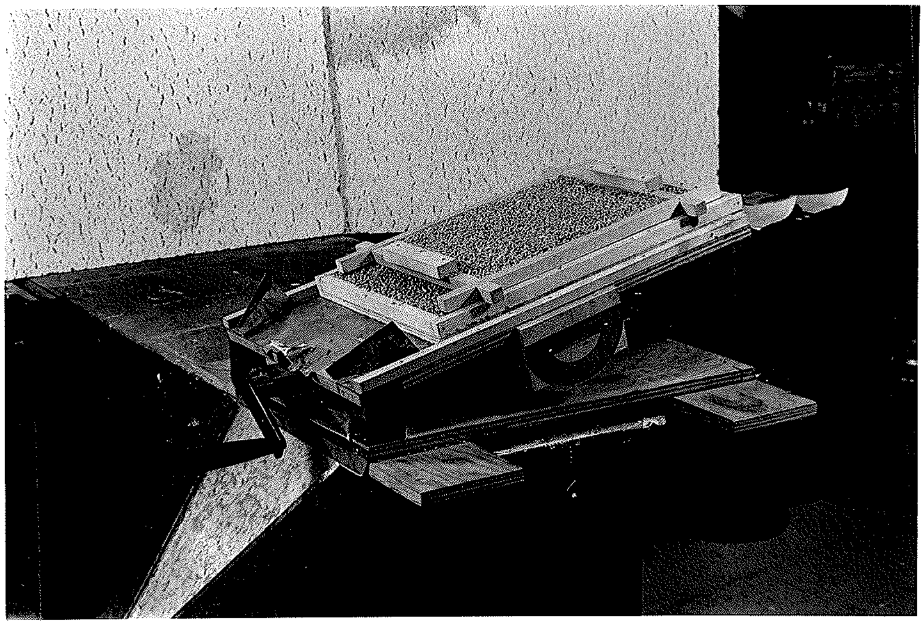


Figure 4.7: Tilting table method of determining the coefficient of friction.

To conduct a friction test the table was lowered to less than 15° slope and the appropriate surface selected. A wooden frame was placed on the surface, filled with wheat and struck level. The frame was then raised slightly so that friction at the wheat-wood interface and small kernels below the frame held the frame away from the table top surface. The table was then carefully tilted until the sample started to move at, which point the table slope was recorded.

Five tests with five repetitions each were conducted on all three surfaces giving 25 repetitions for each surface. The results for each surface were averaged.

Moisture content of the wheat was monitored daily using a Labtronics model 919 moisture meter. Random oven-dry moisture contents were also done to confirm the results of the electric moisture meter. Grain moisture at the completion of load testing was found to be 11.7%.

5.2 TRANSDUCER CALIBRATION

The transducers were individually calibrated using a Baldwin Tate-Emery Model PTF144 Test Machine. The load block was set on top of the transducer and a ball bearing placed in the semi-spherical hole. This was done so only vertical loads would be applied to the transducer. Before applying load the strain indicator was zeroed. Load was then applied up to the expected maximum of 5.4 kN in increments of about 200 N. Strain readings, X, were taken as the load, Y, was applied and removed for two load applications.

The calibration data were analyzed using the GLM procedure of the Statistical Analysis System (Anon. ,1982). A linear model was fitted to the data points and forced through the origin to yield the regression equations given in Appendix B. Strain output from the transducers in microstrain is inputed as X and load is given by Y in newtons. A typical curve of the calibration data is shown in Figure 4.8. Theoretical sensitivity was computed to be 8.77 N/microstrain. Actual sensitivity was found to range from 5.54 N/microstrain to 10.92 N/microstrain. These differences were suspected to result from slight differences in strain gauge locations on the diaphragm and positioning of the diaphragm plate on the base ring. The desired strain gauge locations were marked on the diaphragm plates before the plates were fastened to the base rings. The mark for the outer gauge was unintentionally located too close to the base ring resulting in difficulty applying this gauge. Additionally the gauge positions were marked by finding the plate center before assembly.

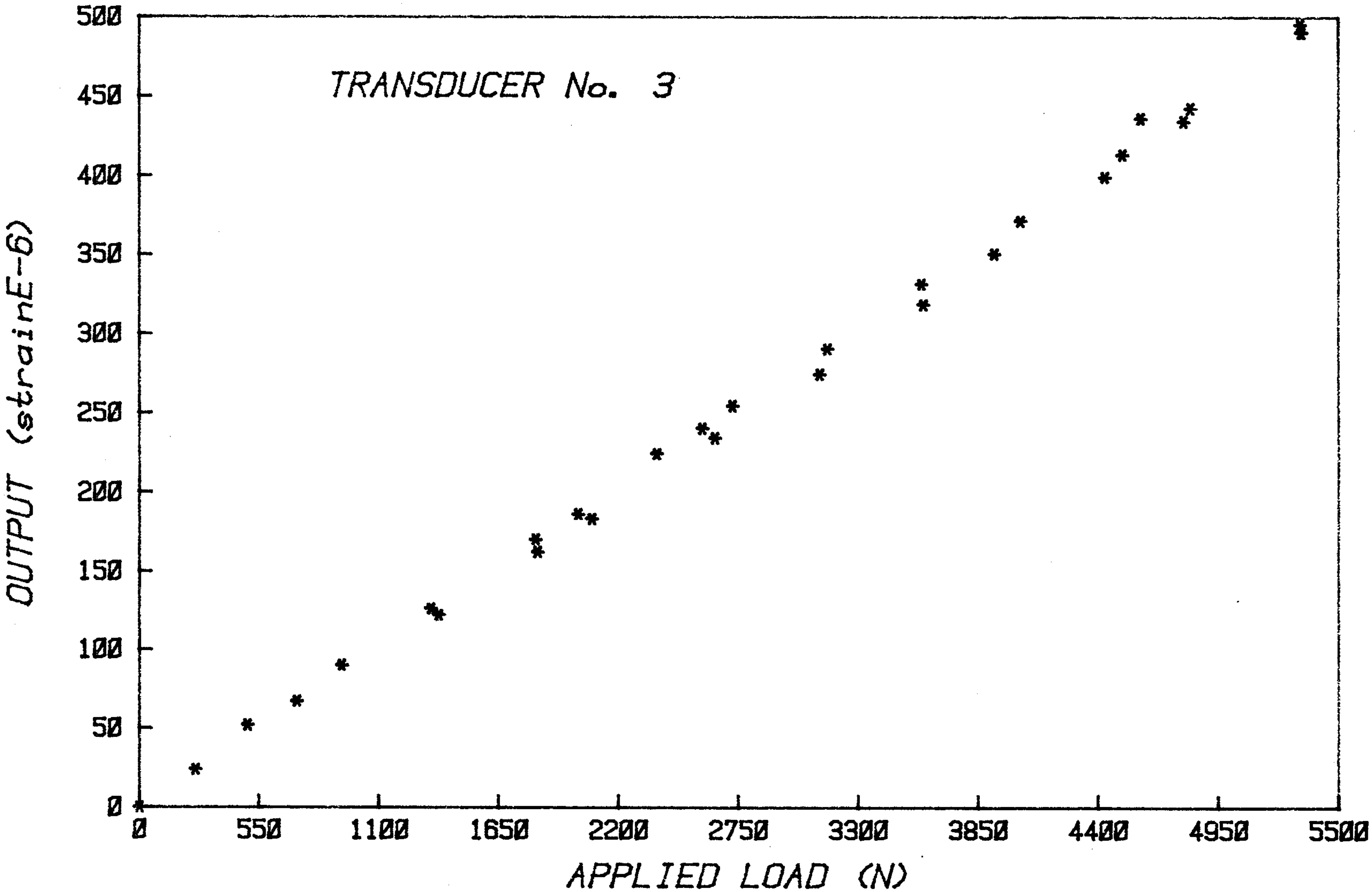


Figure 4.8: Typical calibration curve for load transducer used.

Precise centering of the plate was not obtained. Also the degree of rigidity of the edge was different for each transducer resulting in a variable sensitivity. Finally material properties for the steel were not precisely known and may have varied from plate to plate. The sensitivity of the transducers was considered to be satisfactory.

5.3 TESTING CONDITIONS

Test conditions were established based on research objectives. Each test used certain combinations of the variables examined so that the effect of each individual variable could be determined. The variables used were:

1. bin wall configuration, corrugated versus smooth,
2. grain depth using initial H/D ratios of approximately 1.0 and 2.0, and
3. overpressure, with levels of 40, 55, and 70 kPa.

5.4 TESTING PROCEDURE

The equipment available allowed two bins to be tested per day. The tests were randomized with respect to overpressure level, grain depth, and bin diameter using the SAS PLAN procedure (Anon., 1982). Randomization was carried out to allow five replications of each test condition.

To carry out a test the required bin and corresponding plywood discs were selected. A plywood disc was centered over the bottom transducer which was located on the leveled base. The bin was then placed over the disc, being careful not to disturb the disc. Depth from the top edge of the bin to the plywood disc was measured from three locations, approximately 120° apart. A rod was used to mark off this depth and a tape measure was used to measure the rod length. The depths for the bin were averaged and recorded.

Using the suspended hopper the bin was filled with wheat so that the depth of grain exceeded the required depth. Excess grain was then removed using a large vacuum cleaner so the surface was left reasonably level (within 5 mm) and at the desired height. The grain mass was topped off with a plywood disc and the depth measured from the bin top edge to the disc in the same fashion as described for determining overall bin depth. Knowing the thickness of the top plywood disc, the initial grain height after filling and the overall bin depth the initial volume of the grain mass could be determined. During the filling process readings of the relative humidity were taken to check the effect of atmospheric moisture.

Next the top transducer was placed on the top plywood disc with the load block on the circular ring. The threaded rod was inserted through the lever arm and the pivot-nut assembly adjusted so that the lever arm would be level when the end of the threaded rod was placed in the load block hole. Additionally the disc on the threaded rod was adjusted so that the dial gauge would start at the extreme end of it's scale. The load pan was placed below the pan hook and the appropriate quantity of mass added to the weight pan for the desired overpressure level.

Once again the grain height was determined by measuring the depth of the top plywood disc from the bin edge in the previously described manner. A dial gauge was then hung over the top edge of the bin from a horizontal beam to which it was attached. The dial gauge was located above a marked position on the rod disc and bin edge so that it could easily be relocated if moved. The initial reading on the dial gauge was related to the last depth measurement made so a continuous record of the grain compaction could be made. The setup for a test is shown in Figure 4.9.

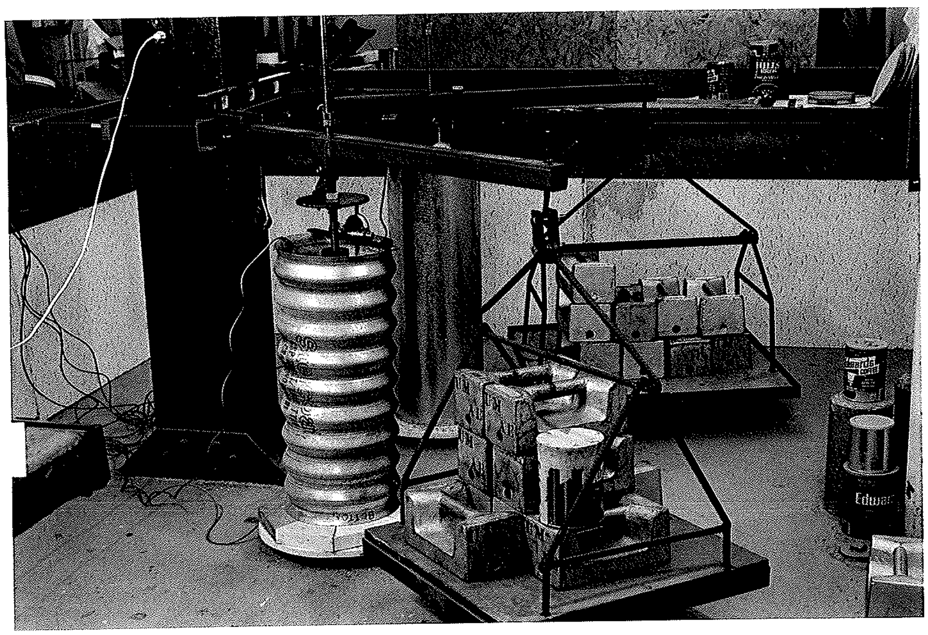


Figure 4.9: Setup for a typical load test.

The above procedure was then carried out for the second model bin.

Prior to load application the strain indicator was zeroed for all four transducers using the Switching and Balancing unit. Thus an undetermined initial load existed on the grain mass, which was used to take up any slack in the system.

A bin was then loaded by hooking up the weight pan and taking up the threads on the threaded hook and adjusting the threaded rod so that the pan was picked off the ground. The pan was raised until the lever arm was level.

Immediately after loading a reading of the dial gauge was taken as well as the strain output from the top and bottom transducers. The second bin was then loaded and readings taken as was done for the first. Additional readings were taken approximately 30 min after the first reading and every hour thereafter. The bins were left loaded for a period of 6 to 8 h.

At the end of the test period a measurement of the depth of the top disc below the top edge of the bin was made using the rod and tape method previously described as a check on the dial gauge readings. The load was removed by lowering the load pans back down to the ground and clearing the loading equipment from the bins. The grain was removed from the bins using a large vacuum cleaner and temporarily storing the grain from each bin in separate containers. The grain mass was determined using a Mettler PC 16 (16 kg capacity) scale for each bin and recorded.

Grain heights during the tests were computed from deflection readings of the dial gauge. Computation of the product uK was accomplished using a computer program written to solve equation [3.14] for β by a bisection technique as given in Appendix C.

Chapter VI

RESULTS AND DISCUSSION

6.1 INTRODUCTION

All results from the load tests and friction tests were analyzed using the SAS procedure GLM (Anon., 1982). Comparison of the results from friction tests were done to determine if repetitions on a given surface were statistically different. Similarly results for the three surfaces were compared. The results of the load tests, in the form of the product of the coefficient of friction and the lateral to vertical grain pressure ratio, uK, were examined to determine the effect of wall surface configuration, model bin diameter, grain depth, and level of applied overpressure. Possible interaction of the above factors on the coefficient of friction and the lateral to vertical grain pressure ratio were also examined. For ease of discussion the lateral to vertical grain pressure ratio will simply be referred to as the pressure ratio.

6.2 COEFFICIENT OF FRICTION

A summary of test results is given in Table 6.1. An analysis of variance at the alpha=0.05 level of the results showed that for surfaces tested there was a significant difference between the five tests conducted on each surface. In the case of the corrugated surface successive tests were found to give increasing coefficients of friction. This could indicate that a conditioning of the corrugated surface was occuring as testing progressed. Results for the remaining surfaces were randomly orientated about the mean value indicating that variation was random. A certain amount of variation in the results is to be expected but

TABLE 6.1

Summary of coefficient of friction test results.

SURFACE	TEST*	FRICTION COEFFICIENT	S.D.	R.H. (%)	GRAIN M.C. (% w.b.)
Wheat on smooth steel	1	0.2849	0.0044	82	12.1
	2	0.2811	0.0045	50	12.1
	3	0.3134	0.0125	71	12.3
	4	0.2905	0.0052	60	12.4
	5	0.3192	0.0110	67	12.0
	mean	0.2978	0.0173		
Wheat on corrugated steel (across corrugations)	1	0.4426	0.0100	52	12.2
	2	0.4644	0.0277	46	12.0
	3	0.4845	0.0345	66	12.0
	4	0.5030	0.0125	61	12.0
	5	0.5075	0.0226	64	12.0
	mean	0.4804	0.0271		
Wheat on wheat	1	0.5620	0.0139	75	12.1
	2	0.5454	0.0246	68	12.0
	3	0.5616	0.0338	60	12.0
	4	0.5186	0.0253	70	12.0
	5	0.5728	0.0132	72	12.1
	mean	0.5521	0.0211		

* - each test represents the mean of 5 repetitions.

the magnitude which is acceptable has not been clearly defined.

A comparison of results between surfaces using an analysis of variance showed that the mean coefficients of friction for each surface were significantly different at the alpha=0.05 level. As expected the coefficient of friction of wheat on smooth steel was less than that for wheat on corrugated steel which in turn was less than that for wheat on wheat.

6.3 LOAD TESTS

6.3.1 Surface Effects

Figure 6.1, which shows a plot of uK versus time for smooth and corrugated walled bins, makes it clear that a difference between surfaces exists. An analysis of variance was conducted on the overall results for each wall surface and showed the wall surfaces to be significantly different at the alpha=0.05 level. The difference is also apparent from data in Table 6.2.

When the overall mean value of uK on each surface (see Table 6.2) was divided by the appropriate friction coefficient from Table 6.1 K values of 0.67 and 0.31 for the corrugated and for the smooth-wall bins were obtained. Thus not only is the coefficient of friction affected by the surface characteristics but the pressure ratio is affected as well. These results agree with pressure ratios recommended in the Canadian Farm Building Code (National Research Council of Canada, 1983) for rough and smooth walls of 0.60 and 0.40 respectively.

In general, results in the corrugated bin showed an increase in uK over that obtained at time=0 h which tended to a limiting value as time passed. This indicated that the bottom load was decreasing from the initial load at time zero. The reduction was possibly due to reorientation of the grain in the model bin. The corrugated sidewalls had sufficient friction to restrain the grain mass from large settlements and so

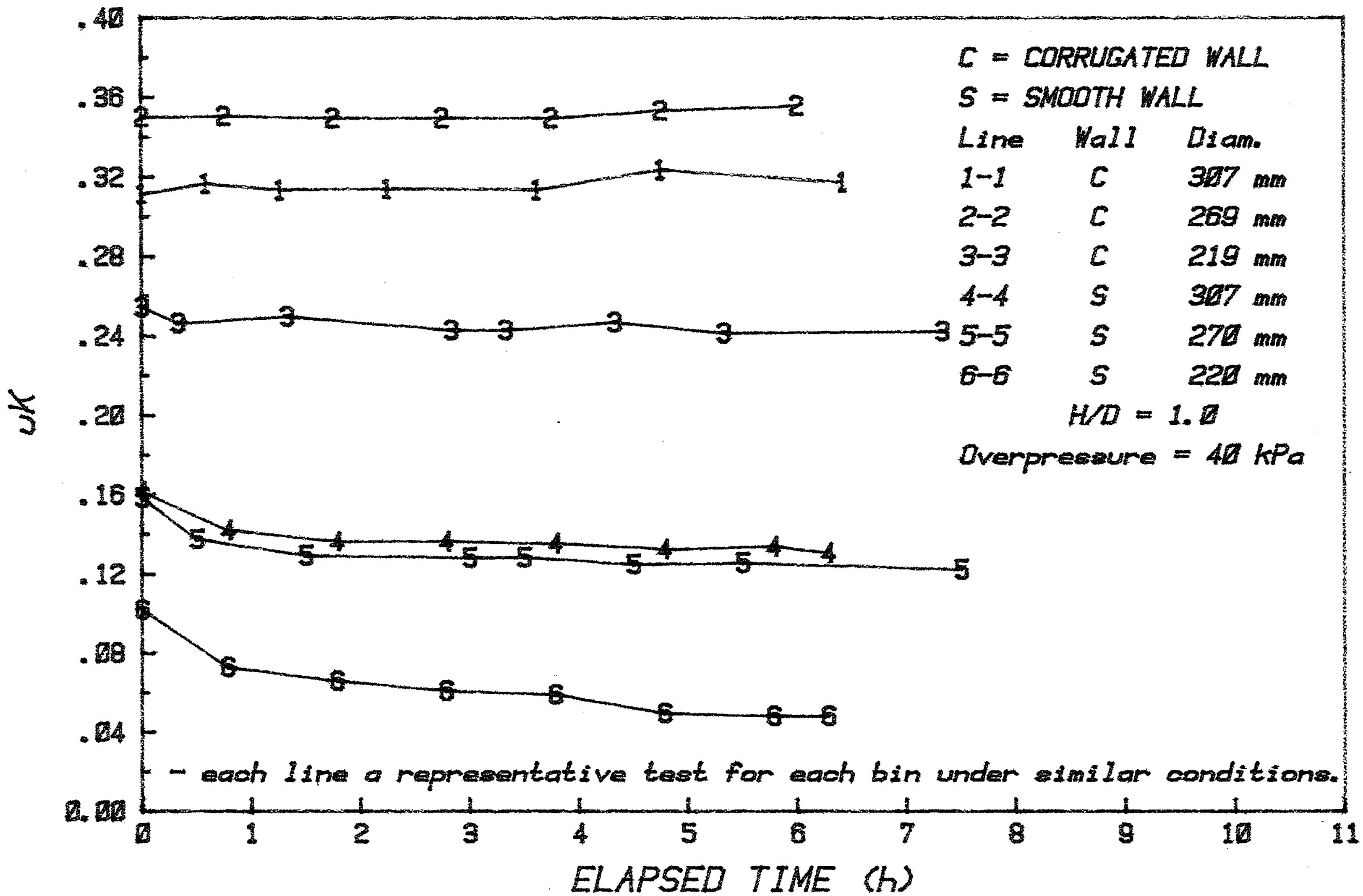


Figure 6.1: uK versus time for corrugated and smooth-wall bins.

TABLE 6.2

Summary of mean uK classified by surface.

	CORRUGATED SIDEWALL			SMOOTH SIDEWALL		
Bin Diameter (mm)	307	269	219	307	270	220
uK mean	0.3188	0.3345	0.3063	0.1147	0.1020	0.0608
overall mean		0.3200			0.0931	

the bottom load was relaxed and was taken up by the walls. The smooth wall bins on the other hand had an initial rapid decrease in uK after time=0 h, which tended to a limiting value. Here again, reorientation of the grain may have occurred but because of much lower wall friction the grain mass settled giving an increase in the bottom load with time while a decrease in wall load occured. This type of behavior was more prominent in small diameter model bins than in larger diameter model bins. Collected results summarized in Appendix D show these general patterns.

6.3.2 Diameter Effects

Using an analysis of variance to compare mean uK values the three bin diameters for each surface were found to be significantly different at the alpha=0.05 level. Further analysis in comparing bins was done by classifying the data by the overpressure applied, by H/D ratios, and by overpressure applied and H/D ratios combined. These tests showed that in general the results from the different sized bins were different at the alpha=0.05 level.

A summary of mean results is given in Table 6.3. Looking at these values one intuitively can see that while some means are of about the same magnitude the results between bins are generally of different mag-

TABLE 6.3

Summary of uK means classified by pressure and H/D.

		CORRUGATED SIDEWALL			SMOOTH WALL		
Bin diameter(mm)		307	269	219	307	270	220
	Overpressure (kPa)						
	40	0.3129	0.3563	0.2586	0.1373	0.0916	0.0419
H/D=1	55	0.3264	0.3144	0.2627	0.1225	0.0966	0.0548
	70	0.3418	0.3263	0.2584	0.1127	0.0975	0.0596
	mean	0.3268	0.3326	0.2599	0.1246	0.0955	0.0515
	40	0.3002	0.3642	0.4092	0.1226	0.1226	0.0640
H/D=2	55	0.3091	0.3318	0.3187	0.1024	0.0995	0.0753
	70	0.3351	0.3220	0.3263	0.0964	0.1073	0.0702
	mean	0.3135	0.3362	0.3516	0.1064	0.1095	0.0692
Overall mean		0.3188	0.3345	0.3064	0.1147	0.1020	0.0608

nitudes. This is further illustrated in Figure 6.1.

A possible explanation for the significant effect of bin diameter was that grain size relative to bin diameter became critical for smaller bins. The small radius of the bin could have created a considerable amount of interaction between wedges of grain of a given width as compared with similar wedges taken from a much larger diameter bin. Alternatively the grain may, once the model bin was filled, have been in a more stable orientation in the smaller bins than grain in a larger model bin and as a result gave significantly different results. Additionally Hartlen et al. (1984) noted that effects due to cohesion in model bins can be important and give errors that would become more important as bin diameter decreased.

6.3.3 Effect of Grain Depth

Grain depths in the bins were such that grain depth to bin diameter ratios of approximately 1.0 and 2.0 were used. This allowed comparisons to be made among the bins to determine the effect of grain depth on the product uK. This does not indicate that the results in this study may be applied to any desired bin diameter where the H/D ratio is same. The grain depth to bin diameter ratio, H/D, is a convenient way of comparing results obtained.

The effect of grain depth was found to be significant at the alpha=0.05 level for all bins used, except the 269 mm diameter corrugated bin, when the mean uK values at different H/D ratios were compared using an analysis of variance. The actual means as summarized in Table 6.3 for each bin are approximately of the same magnitude for the two H/D ratios used. Only the 219 mm corrugated bin shows a considerable difference between results at the two H/D ratios used. Intuitively this would lead to the conclusion that, in the range studied, the depth of grain relative to bin diameter had no effect except for the smallest corrugated bin. Since statistical analysis showed most of the differences to be significant no firm conclusions may be drawn.

Further comparisons between H/D ratios were made on each bin for the three overpressure levels used in testing. The results of an analysis of variance indicated that mean uK for 4 of the 6 bins at an applied overpressure of 70 kPa were not significantly different with the H/D ratios used at the alpha=0.05 level. These bins were the 307 mm and 269 mm diameter corrugated bins and the 270 mm and 220 mm smooth walled bins. Thus at the high overpressures used the effect of depth was almost eliminated.

Plots of uK versus overpressure made of the mean results for the two H/D ratios used are shown in Figure 6.2 and Figure 6.3. Figure 6.2 illustrates that the smaller corrugated bin was affected by the H/D ratio whereas the effect for the remaining bins was not as large. The smallest bin shows a relatively large increase at all overpressure levels as the H/D ratio doubled in magnitude. The middle sized corrugated bin also shows an increase but not as large as for the smallest bin. Finally the largest bins show the opposite trend where uK decreases slightly as H/D ratio increased. This transition in behavior would indicate that a limiting point in model bin size may have occurred somewhere between 307 mm and 269 mm diameter. Similar observations for the smooth-wall bins can be made from Figure 6.3. The significance of H/D ratios points out that care must be taken in selecting realistic values in addition to selection of a reasonable bin diameter. Once again the term H/D is used for convenience and does not indicate that the results obtained in this study are applicable to other bins which have the same grain depth to bin diameter ratio.

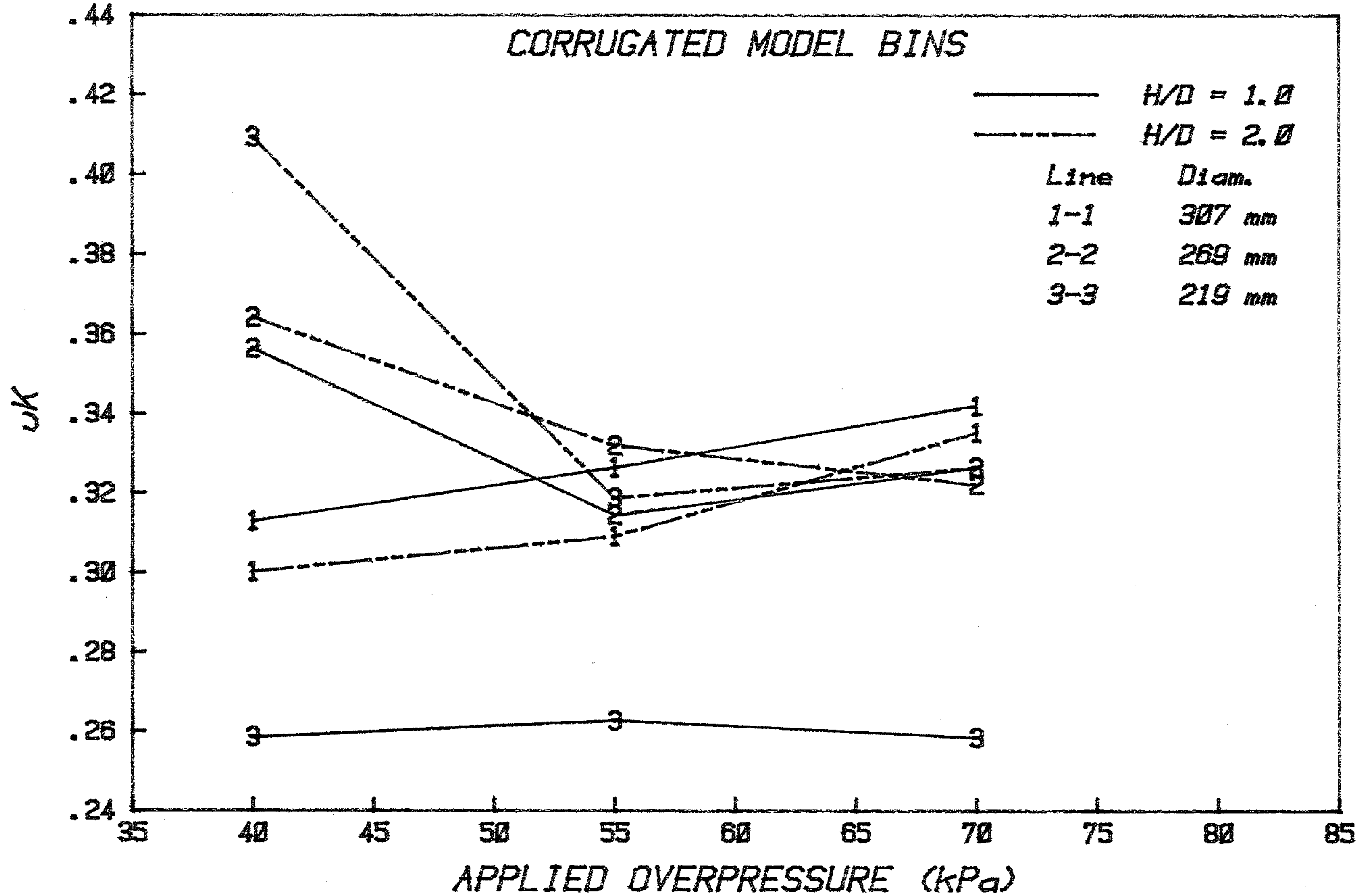


Figure 6.2: uK versus overpressure for corrugated model bins.

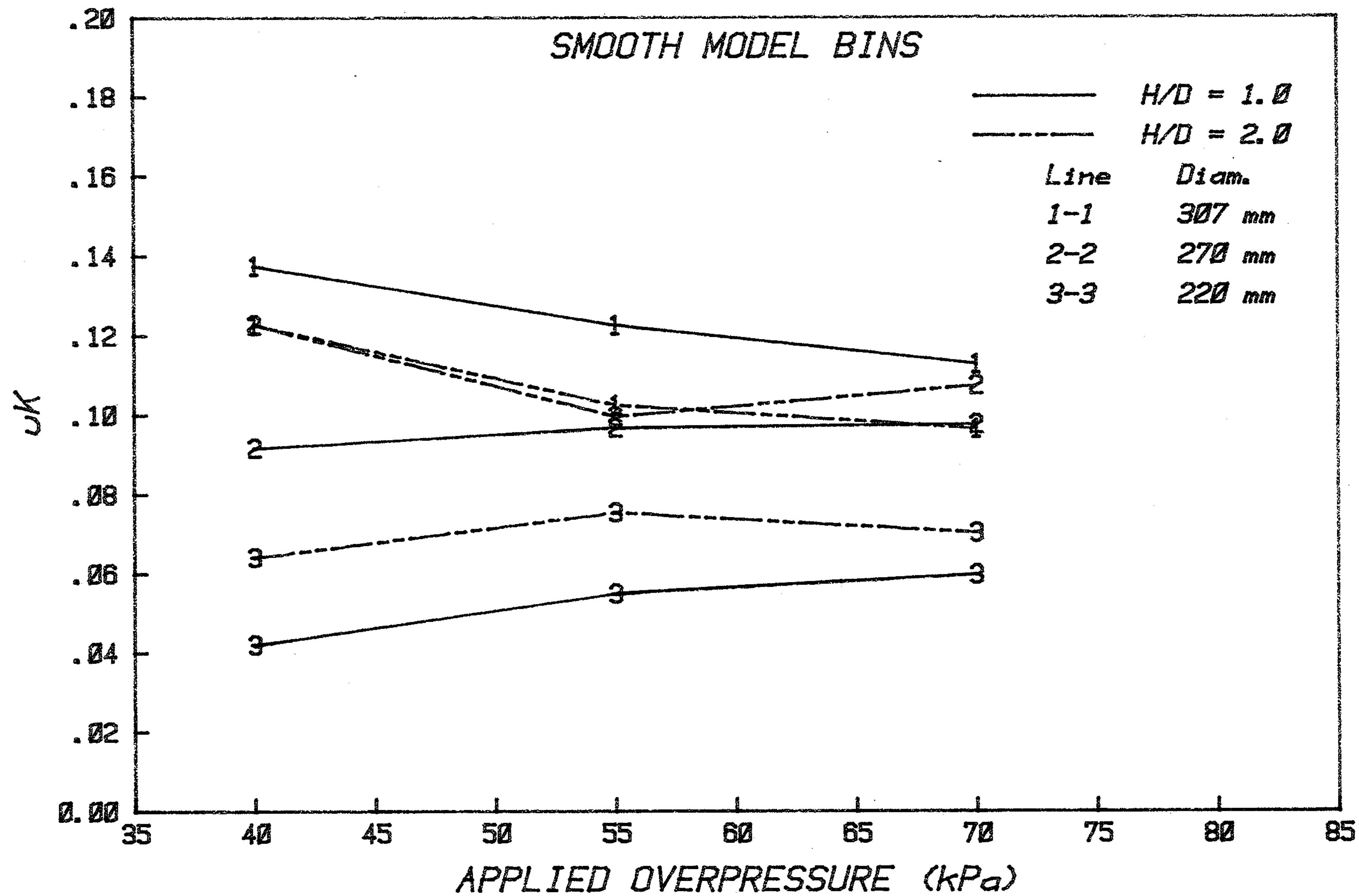


Figure 6.3: uK versus overpressure for smooth model bins.

6.3.4 Overpressure Effect

The effect of overpressure depends upon the diameter of the bin. Table 6.4 summarizes the comparison of uK means made at different pressure levels for bins tested taking into account H/D ratios and combining them. Taking into account H/D the large diameter bins show significant differences among overpressures for the shallow depth (H/D=1) at alpha=0.05. The remainder of the results indicate that uK at different pressure levels for the shallow depth are in general not significantly different at the alpha=0.05 level. For H/D=2 the results indicate that uK for the bins at 55 and 70 kPa overpressure were generally the same and that the 70 kPa overpressure was not required. The 269 mm diameter corrugated bin is an exception showing significant differences at all overpressure levels for H/D=2.0. No explanation for this can be made. This observation may also be made by looking at the means shown in Table 6.3. The results are illustrated in Figure 6.2 and Figure 6.3.

Where the results from the two H/D ratios are combined the comparisons in each bin at the 55 kPa and 70 kPa overpressure levels are generally the same at the alpha=0.05 level of significance. Hence the 70 kPa overpressures were possibly too high for the model sizes used or no effect above 55 kPa exists.

TABLE 6.4

Summary of comparisons of uK means among pressure levels.

Surface	Bin Diameter (mm)	OVERPRESSURE (kPa) H/D = 1			H/D = 2			Combined H/D		
		40	55	70	40	55	70	40	55	70
	307	0	0	0	X	X	0	X	X	0
Corrugated	269	0	X	X	0	0	0	0	X	X
	219	X	X	X	0	X	X	0	X	X
	307	0	0	0	0	X	X	0	X	X
Smooth	270	X	X	X	0	X	X	X	X	X
	220 |	0	X	X	X	0	X	0	0	0
	|	X	X	0	0	X	X	0	X	X

0 - indicates a significant difference at alpha=0.05
X - indicates no significant difference at alpha=0.05
| - indicates comparisons which cannot be combined.

6.3.5 Interaction of Independent Variables With u and K

In the corrugated models (see Figure 6.4), uK increased as overpressure increased for the 307 mm diameter model bin. The two smaller diameter bins, on the other hand, indicate a trend to a decreasing uK with increasing overpressure that levels off with the highest overpressure used.

A possible explanation for the observed behavior of the 307 mm diameter bin may be based on the assumption that the coefficient of friction for a corrugated bin is made up of a combination of the friction coefficient of grain on grain and grain on steel, as hypothesized by Moore et al. (1983). The proposed failure plane is illustrated in Figure 6.5.

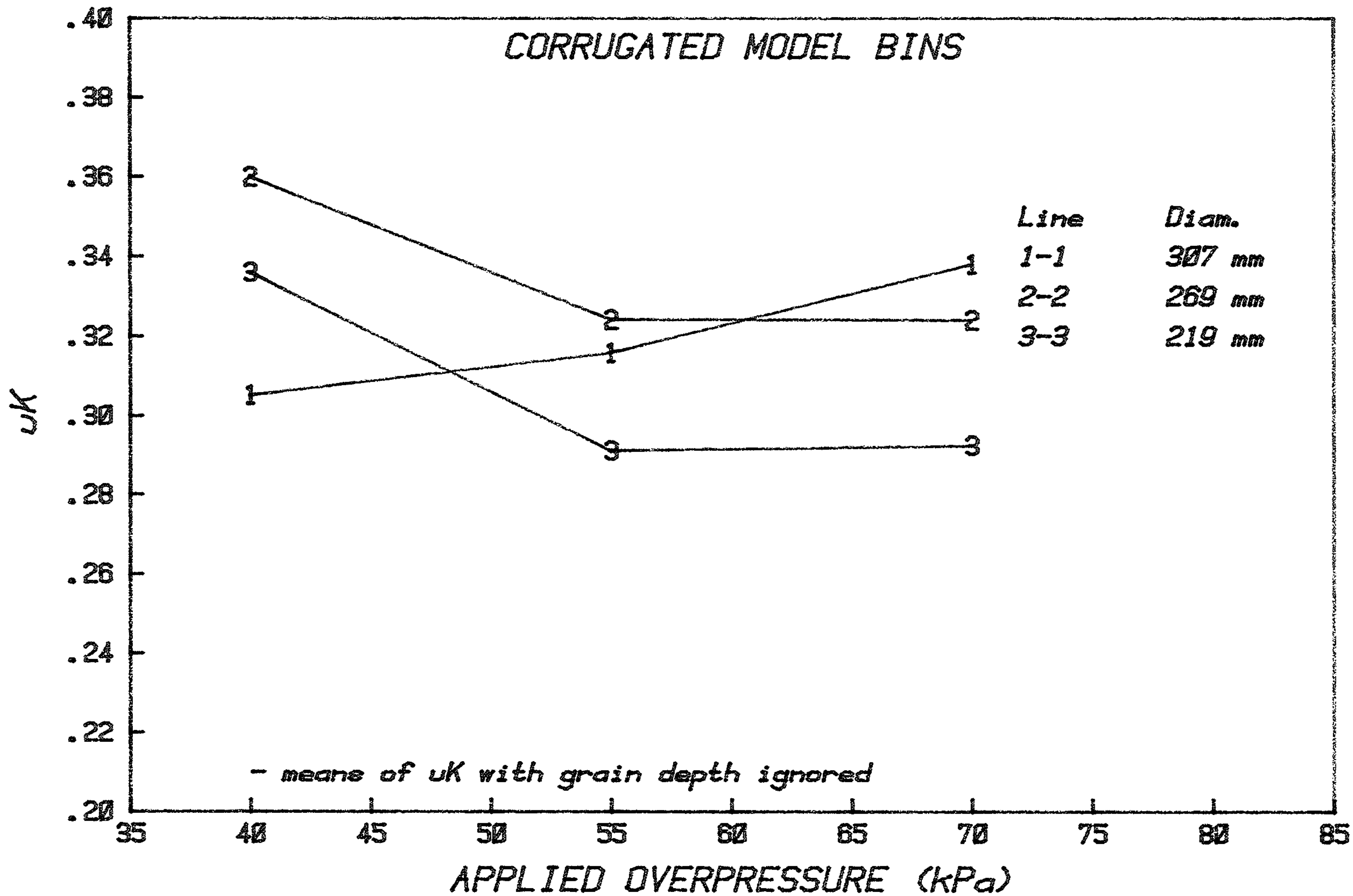


Figure 6.4: uK versus overpressure for corrugated model bins.

At any given vertical pressure the failure plane would be located somewhere within the grain contained in the corrugations. An increased vertical pressure could cause some reorientation of the grain mass and increase the degree of interlocking thereby holding the grain in the corrugations more firmly. The failure plane, as a result, could move into the grain mass, which would lead to an increase in the overall wall friction coefficient. Thus the upper bound on the coefficient of wall friction would be the internal friction coefficient or the coefficient of friction of grain on grain. To verify this theory assume that the pressure ratio, K, is a constant. Using a value of K=0.66, which was the overall pressure ratio calculated for the corrugated bin in Section 6.3.1, then, for the 307 mm diameter corrugated bin u becomes 0.46, 0.48 and 0.51 (approximately) at overpressures of 40, 55, and 70 kPa respectively.

Assuming that the coefficient of friction is unaffected by the diameter of the bin, then the increasing values of the coefficient of friction calculated above should be applicable to the smaller diameter corrugated bins. Using these coefficient of friction values on the results from the smaller bins lead to the observation that K must decrease with increasing overpressure. This leaves several alternatives:

1. the assumption of no effect of diameter on the coefficient of friction could be wrong. But even if the coefficient of friction was a constant, the K values in the smaller bins would still decrease with increasing overpressure and in the large bin K would be increasing. It is not likely that the coefficient of wall friction would decrease or be bin dimension dependent.

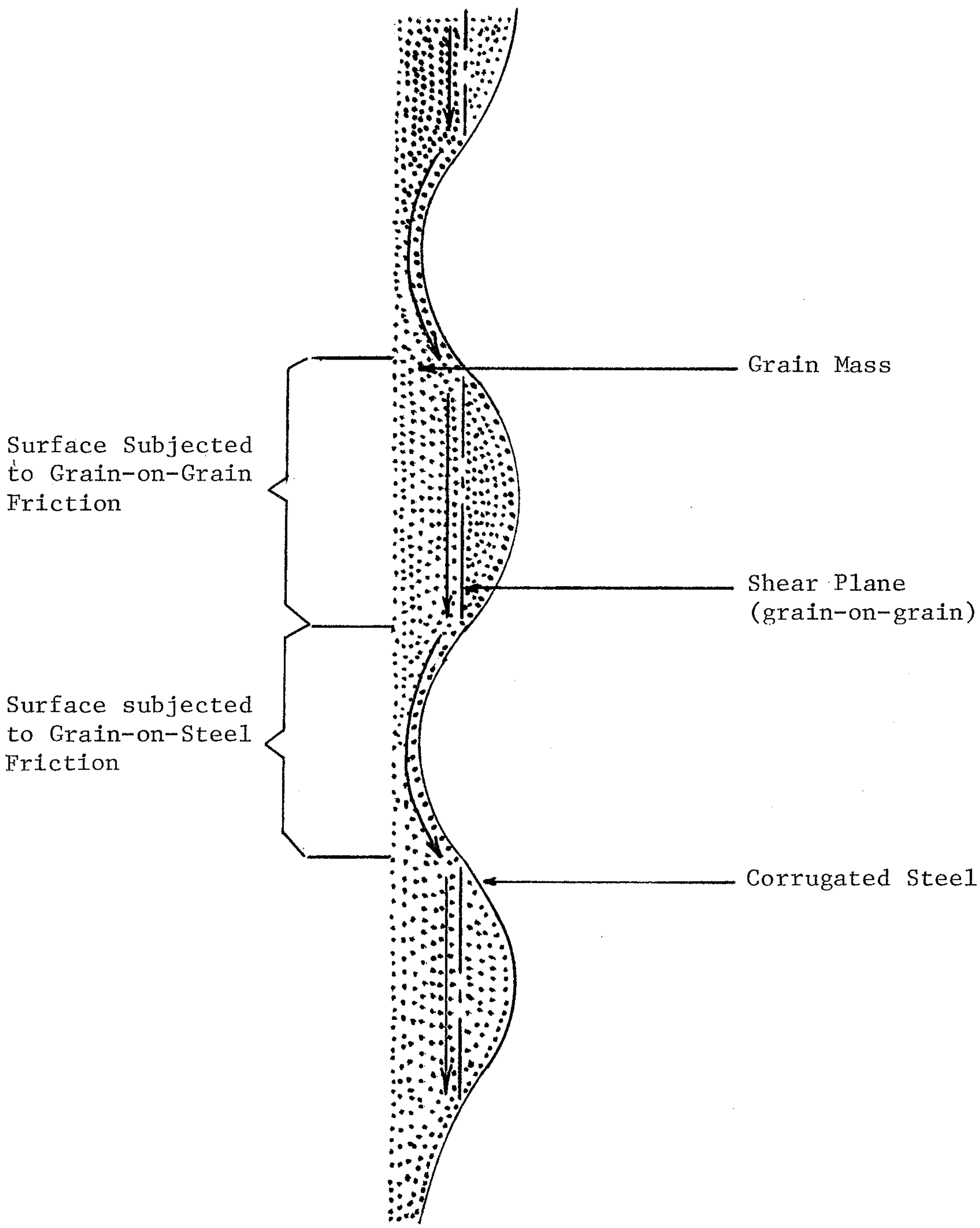


Figure 6.5: Shear failure plane along corrugated surface (Moore et al., 1983).

2. the assumption of a constant pressure ratio in the large bin as shown was incorrect and the pressure ratio actually decreases with increasing overpressure. A decreasing pressure ratio would predict values of the coefficient of friction greater than the internal friction coefficient of wheat, which is not likely.
3. the smaller model bins failed to simulate commercial size bin conditions leading to the conclusion that model sizes for corrugated bins less than 307 mm fail to realistically model a commercial size bin.

In the large bin a behavior which approached that of the commercial size bin may have been obtained. As a result the friction coefficient may have began as wheat on steel and rapidly increased to a large proportion of the wall friction being made up of wheat on wheat friction. If a simulation of commercial sized bin behavior existed, the decrease in K could be negligibly small or, could even be increasing with increasing overpressure.

Considering the curves of uK versus overpressure for the smooth wall model bins in Figure 6.6 the product uK seems to decrease with increasing overpressure for the largest bin. The next largest bin remains approximately stable and the smallest bin indicates an increase in uK. Unlike the corrugated wall the coefficient of friction would be either the friction coefficient of wheat on wheat or wheat on steel. The smaller of the two is most likely, ie. the grain on steel coefficient. Brubaker and Pos (1965) and Bickert and Beulow (1966) have shown that this should be unaffected by the level of overpressure used unless the wheat at the grain-steel interface changes its properties. This is highly unlikely

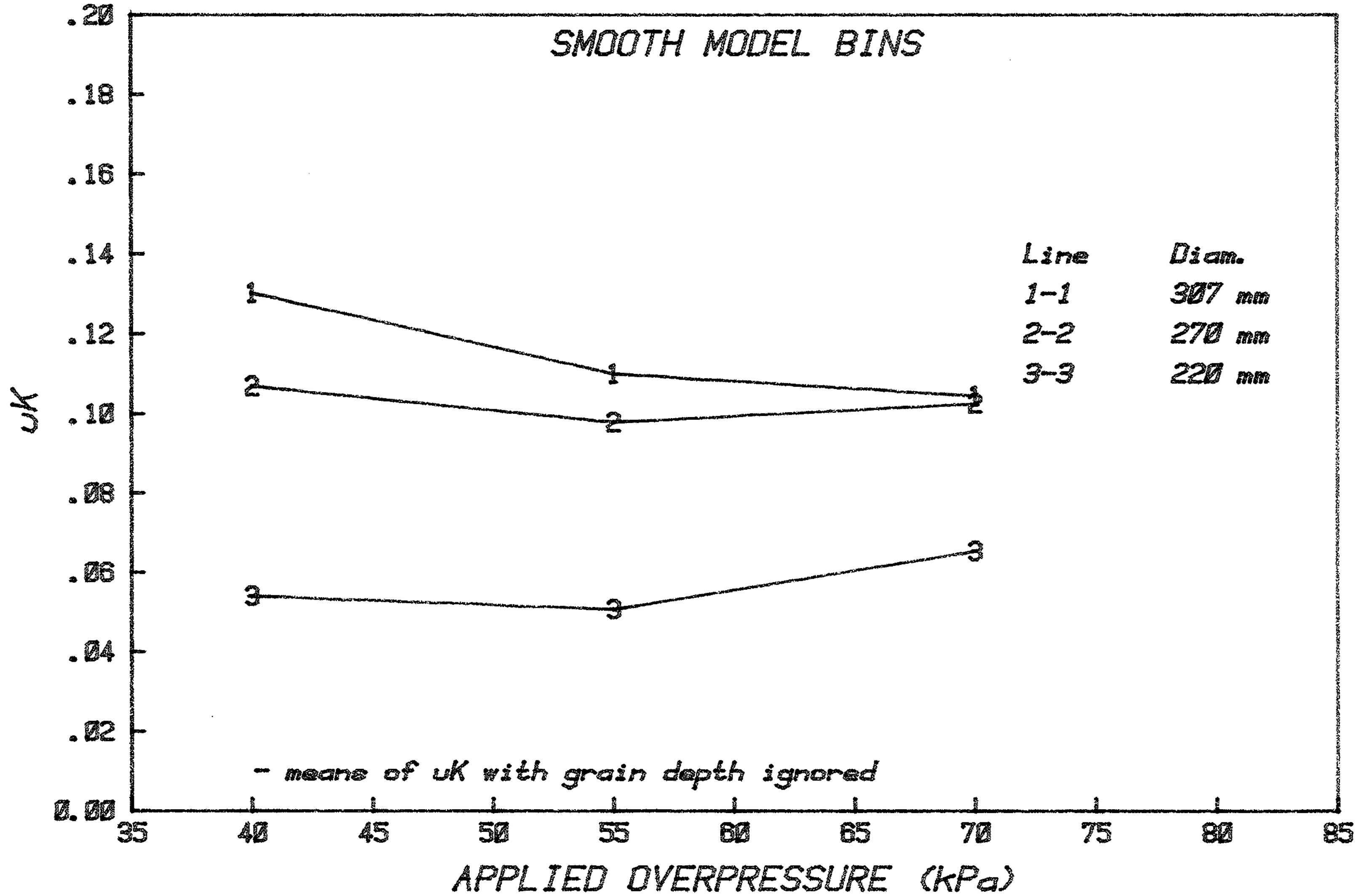


Figure 6.6: uK versus overpressure for smooth model bins.

and it would seem safe to suggest a constant coefficient of friction exists. The only explanation for the observed change in uK is a change in the pressure ratio, K.

Results from the largest smooth wall bin would suggest, for a constant coefficient of friction, that the pressure ratio decreased with increasing vertical pressure. For the next largest bin the resulting uK is roughly a constant indicating no change in the value of the pressure ratio. This bin would seem to indicate that such a diameter has been reached at which the relative size of the grain and the bin have reached a critical point where simulation of a commercial size bin is no longer obtained. Finally for the smallest bin an increase of some type in K is indicated for an increase in overpressure. This could be due to the diameter of the bin, the degree of packing or the grain orientation in the small bin.

If we consider the observations made on the smooth and corrugated bins and compare them it would indicate that the pressure ratio could be a function of the nature of the grain-wall interface. From friction tests on smooth steel the coefficient of friction of wheat on steel was found to be approximately 0.30. Consider the 307 mm diameter smooth bin, which had been speculated to simulate a commercial size bin, where the overall mean of the product uK was found to be 0.1147. These figures yield an expected K=0.382. If K was a material property only, then the corrugations in a bin should not change this value. The overall mean of the product uK for the 307 mm diameter corrugated bin was found to be 0.3188. Using the constant K calculated above gives a friction coefficient of 0.839. This value exceeds the physical limit of 0.55, which was found to be the internal friction coefficient of grain, hence K would appear to be some function of the sidewall configuration.

In addition the relative changes in magnitude of the pressure ratio with increasing overpressure were affected by the sidewall configuration. The corrugated model bins based on previous speculation about the friction coefficient had a pressure ratio which was approximately constant for the large bin and then had a decreasing K with increasing overpressure and decreasing bin diameter. The smooth model bins, on the other hand, had a pressure ratio that decreased with increasing overpressure in the large bin. This trend changed to an increasing pressure ratio with overpressure for the smallest model bin. The reason for this pattern is unclear.

Chapter VII

CONCLUSIONS

1. Based on the tests conducted, it was confirmed that, the static coefficient of friction of wheat on smooth steel is less than wheat on corrugated steel which in turn is less than the wheat on wheat coefficient of friction.
2. The pressure ratio, K, was found not to be a property of the bulk grain alone. In tests conducted K was found to be less for smooth than corrugated bin walls.
3. In corrugated bins the pressure ratio decreases and coefficient of friction increases with increasing overpressure. In smooth-wall bins the pressure ratio decreases with increasing overpressure.
4. Bin diameter has an effect on results from the model bins. Results indicate that of the bin diameters tested those smaller than 307 mm diameter failed to simulate commercial size bins.
5. Overpressure levels were found to significantly affect results in the 307 mm diameter bins but not in the bins of smaller diameter.
6. Statistical analysis at alpha=0.05 indicated a significant effect due to grain depth. Trends in results indicate that grain depth at realistic grain depth to bin diameter ratios, is only of use in model studies if model bins are of sufficient size to simulate commercial size bins.

Chapter VIII

RECOMMENDATIONS FOR FURTHER WORK

1. Work should be done on bins larger than 307 mm to determine if this model simulates commercial bin conditions.
2. Work in commercial sized bins should be conducted to confirm the results obtained from scale model tests.
3. Further work should be directed at evaluating the pressure ratio within a grain mass.
4. A standard procedure for determining the coefficient of friction should be adopted.
5. Tests similar to those I conducted should be continued using greater grain depths.
6. Tests should be conducted using bins which have grain glued on the sidewalls to give further insight into the behavior of stored grain.

LIST OF REFERENCES

Amundson, L.R. 1945. Determination of band stresses and lateral wheat pressures for a cylindrical grain bin. Agric. Eng. 26:321-324.

Anonymous, 1982. SAS user's guide: statistics. SAS Institute Inc. Box 8000. Cary, North Carolina. 27511.

Beckwith, T.G. and N.L. Buck. 1969. Mechanical Measurements. Reading, Mass., Addison-Wesley Publishing Co.

Bickert, W.G. and F.W. Bakker-Arkema. 1968. Inconsistencies among friction data for grains. Quarterly Bulletin of the Michigan Agricultural Experiment Station, 50(4) May:591-598.

Bickert, W.G. and F.H. Buelow. 1966. Kinetic friction of grains on surfaces. Trans. ASAE 9(1):129-124.

Bovey, H.T. 1904. Experiments of grain pressures in deep bins and the strength of wooden bins. Engineering News. 52(2):32-34.

Brubaker, J.E. and J. Pos. 1965. Determining the static coefficients of friction of grains on structural surfaces. Trans. ASAE 8(1):53-55.

Canada Grains Council. 1983. Canadian Grains Industry Statistical Handbook 83. Winnipeg, Manitoba. Canada Grains Council.

Canadian Wheat Board. 1983. Annual Report 1982-83. Winnipeg, Manitoba. Canadian Wheat Board.

Caughey, R.A., C.W. Tooles and A.C. Scheer. 1951. Lateral and vertical pressure of granular materials in deep bins. Bulletin 172, Iowa Engineering Experimental Station, Ames, Iowa.

Clower, R.E. 1971. Properties of compressible granular materials as related to the forces acting on bulk storage structures. Unpublished MSc. Thesis. University of Kentucky, Lexington, Ky.

Clower, R.E., I.J. Ross, G.M. White. 1973. Properties of compressible granular materials as related to forces in bulk storage structures. Trans. ASAE 16(3):478-481.

Cowin, S.C. 1977. The theory of static loads in bins. Journal of Applied Mechanics. 44(3):409-412.

Cowin, S.C. 1979. The pressure ratio in the theory of bin pressures. Journal of Applied Mechanics 46(3):524-528.

Craig, R.F. 1978. Soil Mechanics. New York, New York: Van Nostrand Reinhold Company. 2nd Edition.

Fankhauser, C.D. 1977. Analysis and design of corrugated grain tanks. ASAE Paper # 77-4502. 16 pp.

Hartlen, J; Nielson, J; Ljunggren, L; Martensson, G and Wigram, S. 1984. The wall pressure in large grain silos: inventory, pressure measurements, material investigations. Document D2:1984. Swedish Council for building research to Soil Mechanics and Foundation Engineering. The Lund Institute of Technology. Lund.

Isaacson, J.D. and J.S. Boyd. 1965. Mathematical Analysis of lateral pressures in flat bottomed, deep grain bins. Trans. ASAE. 8:368-360,364.

Jaky, J. 1948. Pressure in silos. Proceedings of the second international conference on soil mechanics and foundation engineering, Rotterdam. 1:103-107

Jamieson, J.A. 1904. Grain pressures in deep bins. Engineering News. 51(10):236-293.

Jenike, A.W. and J.R. Johanson. 1969. On the theory of bin loads. Journal of Eng. for Industry, Trans. ASME, Series B, 91(2) MAY:339-344.

Jenike, A.W., J.R. Johanson and J.W. Carson. 1973a. Bin loads-part 2: Concepts. Journal of Eng. For Industry, Trans. ASME., Series B, 95(1) Feb.:1-5.

Jenike, A.W., J.R. Johanson and J.W. Carson. 1973b. Bin loads-part 3: Mass-flow bins. Journal of Eng. For Industry, Trans. ASME., Series B, 95(1) Feb.:6-12.

Jenike, A.W., J.R. Johanson and J.W. Carson. 1973c. Bin loads-part 4: Funnel-flow bins. Journal of Eng. For Industry, Trans. ASME., Series B, 95(1) Feb.:13-16.

Jenkyn, R.T. 1978. Calculation of material pressures for the design of silos. Proc. Instn. Civil Engrs. 65(2):821-838.

Jofriet, J.C. and B. LeLievre. 1984. Stratified orthotropic material behavior of whole plant silage. Can. Agric. Eng. 26(1):79-80.

Jofriet, J.C. and S. Negi. 1983. Indirect testing of friction using model farm silos. Can. Agric. Eng. 25(1):89-93.

Ketchum, M.S. 1919. The design of walls, bins and grain elevators. Third Edition. New York, New York: McGraw-Hill Book Co.

Kramer, H.A. 1944. Factors influencing the design of bulk bins for rough rice. Agric. Eng. 25:463-466.

Lawton, P.J. 1980. Coefficients of Friction between cereal grain and various silo wall materials. Journal of Agric. Eng. Res. 25:75-86.

Lenczner. D. 1963. An investigation into the behavior of sand in a model silo. The Structural Engineer. 41(12):389-398.

Long, J.D. 1932. The design of grain storage structures. Trans. ASAE. 26:26.

Luft, E. 1904. Tests of grain pressure in deep bins at Buenos Aires, Argentina. Eng. News. 52(24):531-532.

Machey, R.D. 1966. Active and passive pressures on curved surfaces. Soils. 17:31-40.

Manbeck, H.B. and G.L. Nelson. 1970. Methods and instrumentation for evaluating the three dimensional strain behavior of biological particulate media en masse. ASAE Paper no. 70-803. ASAE Winter Meeting. Dec.

Moore, D.W., G.M. White and I.J. Ross. 1983. Coefficient of friction of wheat on smooth and corrugated metal surfaces. ASAE Paper no. 83-2-111. ASAE Summer Meeting.

Moshenin, N.N. 1968. Physical properties of plant and animal materials. Part II of Volume 1: Texture of foods, mechanical damage, aero and hydrodynamic characteristics and frictional properties. Dept. of Agricultural Engineering. The Pennsylvania State University. pp. 604-692,715-745.

Moysey, E.B. and S. Hiltz. 1984. Friction properties of fertilizer. CSAE Paper No. 84-409.

Moysey, E.B. 1983. Static and dynamic pressures in grain storages. Phase III. DSS Contract # OSG83-00004.

Moysey, E.B. and T. Brown. 1979. Factors affecting internal friction of grain. ASAE Paper No. 79-303. Presented at North Central ASAE Meeting.

National Research Council of Canada, 1977. Canadian Farm Building Code. NRCC No. 15564. Association Committee on the National Building Code. NRCC, Ottawa. pp. 99-109.

National Research Council of Canada, 1983. Canadian Farm Building Code. NRCC No. 21312. Association Committee on the National Building Code. NRCC, Ottawa.

Richter, D.W. 1954. Friction coefficients of some agricultural materials. Agric. Eng. 35(6):411-413.

Reimbert, M. and A. Reimbert. 1976. Silos: theory and practice. Clausthal, Germany: Trans Tech Publications.

Roarke, R.J. 1965. Formulas for stress and strain. 4th Edition. New York, New York: McGraw-Hill Co. pp.214-258.

Ross, I.J., T.C. Bridges, O.J. Loewen, J.N. Walker. 1979. Grain bin loads as affected by grain moisture content and vertical pressure. Trans. ASAE. 22(3):592-597.

Smith, A.B.B. and S.H. Simmonds. 1983. Lateral coal pressures in a mass flow silo. Structural Engineers Report No. 113. Dept. Civil Eng., University of Alberta. Edmonton, Alberta, Canada.

Stewart, B.R., Q.A. Hossain and O.R. Kunze. 1969. Friction coefficients of sorghum grain on steel, teflon, and concrete surfaces. Trans. ASAE. 12(4):415-418.

Snyder, L.H., W.L. Roller and G.E. Hall. 1965. Coefficients of kinetic friction of wheat on various metal surfaces. ASAE Paper No. 65-321.

Sundaram, V. and S.C. Cowin. 1979. A reassessment of static bin pressure experiments. Powder Technology. 22:23-32.

Thompson, S.A. and I.J. Ross. 1983. Compressibility and friction coefficients of wheat. Trans. ASAE. 26(4):1171-1176,1180.

Appendix A

TRANSDUCER DESIGN CALCULATIONS

CAPACITY REQUIRED

An expected maximum pressure of 80 kPa was to be applied to a 300 mm diameter bin to give an applied load of:

$$Y=PA=80 x pi/4 x (0.300)^2 = 5.655 \text{ kN}$$

DESIGN CALCULATIONS

Known : $a= 64.1$ mm
$r_0= 23.8$ mm

Assume : maximum applied force, Y = 5.655 kN
poisson's ratio, v = 0.333
modulus of elasticity of mild steel, E = 2.068 E5 MPa
maximum deflection for linear behavior = 0.30t
yield strength = 345 mPa

From Roarke (1965):

a) For a simply supported diaphragm with a uniform load on a concentric circular ring:

$$defl= \frac{3Y(m^2-1)}{2piEm^2t^3}\left[\frac{(3m+1)a^2-(m-1)r_0^2}{2(m+1)} - r_0^2\left[\ln\frac{a}{r_0}+1\right]\right]$$

where m=1/v

Substituting in the known constants and solving for t:

t= 3.500 mm

b) For a fixed edge diaphragm with a uniform load on a concentric circular ring:

$$defl= \frac{3Y(m^2-1)}{2piEm^2t^3}\left[\frac{(a^2-r_0^2)}{2} - r_0^2\ln\frac{a}{r_0}\right]$$

Substituting in known constants and solving for t:

t=2.616 mm

The desired thickness is somewhere between the two extremes so a 3.048 mm thick plate was selected. In addition calculations will be carried out based on a fixed edge since those based on a simple edge will only show that failure will occur.

Checking the stress at the center

$$S = \frac{3Y}{4pimt^2}\left[(m+1)\left[2\ln\frac{a}{r_0} + \frac{r_0^2}{a^2} - 1\right]\right]$$

substituting in the known parameters:

$S = 216.9$ MPa $\therefore$ OK

Tangential stress at edge:

$$St = \frac{3Y}{2pimt^2}\left[1 - \frac{r_0^2}{a^2}\right]$$

substituting in the known parameters:

$St = 83.5$ MPa

$$\text{Strain at the center} = \frac{216.9 \text{ MPa}}{2.068 \text{ E5 MPa}} = 1048.7 \text{ microstrain}$$

$$\text{Tangential strain} = \frac{83.52 \text{ MPa}}{2.068 \text{ E5 MPa}} = 403.9 \text{ microstrain}$$

Total strain sensed is difference of these strains because they are in adjacent arms and both are positive. Therefore

total strain sensed = 1048.7 - 403.9 = 644.8 microstrain

$$\text{Theoretical sensitivity} = \frac{5.655 \text{ kN}}{644.8} = 8.77 \text{ N/microstrain}$$

Appendix B

LOAD TRANSDUCER CALIBRATION RESULTS

Transducer No. 2

$Y = 6.41\ X$

$r = 1.00$ linearity = 6.0%

Transducer No. 3

$Y = 10.91\ X$

$r = 1.00$ linearity = 3.1%

Transducer No. 4

$Y = 8.68\ X$

$r = 1.00$ linearity = 5.6%

Transducer No. 5

$Y = 5.54\ X$

$r = 1.00$ linearity = 5.8%

Y = applied load, N

X = strain output, microstrain

Appendix C

COMPUTER PROGRAM TO DETERMINE β

```
100 REM ************************************************************************
110 REM **       Program to evaluate the product of UK from test data          **
120 REM **                                                                     **
130 REM **       Written by Patrick Versavel                                   **
140 REM **                                                                     **
150 REM **       Data is inputed and stored in a random file. Beta is          **
160 REM **       solved for by using a bisection technique. Results as         **
170 REM **       computed are stored so that they may be later transferred     **
180 REM **       to the mainline computer for further analysis.                **
190 REM **                                                                     **
200 REM **                                                                     **
210 REM **        This program was written on a CORONA personal computer,      **
220 REM **        which is a 16-bit system compatible with software and        **
230 REM **        peripheral cards for the IBM personal computer.              **
240 REM **        The computer used an MS-DOS operating system and the         **
250 REM **        the program was written using Microsoft GWBASIC.             **
260 REM **                                                                     **
270 REM ************************************************************************
280 REM ********  LISTING OF SIGNIFICANT VARIABLES USED IN PROGRAM  **********
290 REM AREA     - CROSS-SECTIONAL AREA OF BIN,m^2
300 REM B        - BETA=4UK/D
310 REM BD(I)    - ARRAY TO STORE BIN DIAMETER USED
320 REM BTS,TTS  - CALIBRATION EQUATIONS FOR BOTTOM AND TOP TRANSDUCERS
330 REM BL,TL    - BOTTOM AND TOP LOAD, N
340 REM D         - BIN DIAMETER FOR CALCULATIONS, m
350 REM DT       - ELAPSED TIME, hours
360 REM BN       - BIN NUMBER
370 REM DENSITY  - BULK DENSITY , kg/m
380 REM BS,TS    - BOTTOM AND TOP STRAIN, microstrain
390 REM GM       - GRAIN MASS, kg
400 REM MC       - MOISTURE CONTENT OF GRAIN, %W.B.
410 REM N        - NUMBER OF OBSERVATIONS
420 REM PL$      - PRESSURE LEVEL DESIGNATION
430 REM PO       - OVERPRESSURE, kPa
440 REM PZ       - BOTTOM PRESSURE, kPa
450 REM SLOPE    - SLOPE OF TRANSDUCER CALIBRATION EQUATIONS
460 REM SUM      - RUNNING SUM OF APPLIED OVERPRESSURES
470 REM SUM2     - SUM OF SQUARES OF APPLIED OVERPRESSURES
480 REM SUK      - RUNNING SUM OF CALCULATED uK VALUES
490 REM SUK2     - SUM OF SQUARES OF CALCULATED uK VALUES
500 REM SDUK     - STANDARD DEVIATION OF uK
510 REM SDPO     - STANDARD DEVIATION OF APPLIED OVERPRESSURES
520 REM TEST$    - TEST DESIGNATION
530 REM TT, BT   - DESIGNATION OF TOP AND BOTTOM TRANSDUCERS
540 REM Z        - DEPTH OF GRAIN, mm
550 REM
560 REM ******     MAIN PROGRAM     ********
570 PI=3.14159265359#
580 DIM BD(7),RES(25,5),DAT(25,10)
590 FOR I=1 TO 7
600 READ BD(I)
610 NEXT I
620 DATA .307, .269, .219, .307, .27, .22, .26165
630 CLS
640 CLS
650 REM
```

```
660 REM **** SELECTION OF DATA INPUT METHOD  ****
670 REM
680 INPUT "INPUT DATA FROM KEYBOARD (K) OR DISK (D) ";T$
690 IF T$="K" THEN GOSUB 1570 :GOTO 750
700 IF T$="D" THEN GOSUB 1850 :GOTO 710 ELSE GOTO 640
710 INPUT "DO YOU WANT TO PRINT DATA OUT (Y/N) ";H$
720 IF H$="Y" THEN GOSUB 2520 : GOTO 750
730 IF H$="N" THEN GOTO 750 ELSE GOTO 710
740 REM *** INITIALIZATION ***
750 SUM=0
760 D=BD(BN)
770 ON TT GOSUB 1490,1500,1510,1520,1530
780 TTS=SLOPE
790 ON BT GOSUB 1490,1500,1510,1520,1530
800 BTS=SLOPE
810 AREA=PI*D^2*.25
820 CLS
830 FOR I=1 TO N
840 TS=DAT(I,1)
850 BS=DAT(I,2)
860 Z=DAT(I,3)
870 DT=DAT(I,4)
880 DENSITY=GM*1000/(AREA*Z)
890 TL=TS*TTS
900 PO=TS*TTS/(AREA*1000)
910 BL=BS*BTS
920 PZ=BS*BTS/(AREA*1000)
930 IF I=1 THEN B=0:UK=0:H=Z:SUM=0:SUM2=2: GOTO 1100
940 REM
950 REM **** CALCULATION OF B BY BISECTION METHOD ****
960 REM
970 BE=4.5
980 DEF FNBETA(B)=B*Z/1000-LOG((PO-DENSITY*9.806/(1000*B))/(PZ-DENSITY*9.806/(10
00*B)))
990 IF FNBETA(BE)<0 THEN GOTO 1030
1000 BH=BE :BE=BE-.5
1010 IF BE=0 THEN BL=.000001:GOTO 1050 ELSE GOTO 1020
1020 IF FNBETA(BE)<0 THEN BL=BE :GOTO 1050 ELSE GOTO 1000
1030 BL=BE:BE=BE+.5
1040 IF FNBETA(BE)>0 THEN BH=BE :GOTO 1050 ELSE GOTO 1030
1050 B=(BL+BH)/2
1060 IF ABS(FNBETA(B))<.00001 THEN GOTO 1080
1070 IF FNBETA(B)>0 THEN BH=B: GOTO 1050 ELSE BL=B :GOTO 1050
1080 UK=B*D*.25
1090 SUM=SUM+PO :SUM2=SUM2+PO^2 :' SUM OF APPLIED PRESSURE
1100 RES(I,1)=DENSITY : RES(I,2)=PO :RES(I,3)=PZ :RES(I,4)=B :RES(I,5)=UK
1110 IF I=1 THEN SUK=0:SUK2=0 :GOTO 1130 ELSE GOTO 1120
1120 SUK=SUK + UK : SUK2=SUK2 + UK^2
1130 NEXT I
1140 SDUK=SQR((SUK2-((SUK^2)/(N-1)))/(N-2)):'** STANDARD DEVIATION OF uK **
1150 SDPO=SQR((SUM2-((SUM^2)/(N-1)))/(N-2)):'** STANDARD DEVIATION OF Po **
1160 CLS
1170 REM
1180 REM ****  PRINT OUT OF RESULTS ON AN EXTERNAL PRINTER ****
1190 REM
1200 PRINT "DO YOU WANT OUTPUT ON SCREEN (S) OR PRINTER (P) "
1210 A$=INKEY$ : IF A$="" THEN GOTO 1210
1220 IF A$="S" THEN GOTO 2270 : IF A$="P" THEN GOTO 1230 ELSE GOTO 1200
```

```
1230 CLS
1240 PRINT "WOULD YOU LIKE TO ENTER ANY COMMENTS ?"
1250 A$=INKEY$ : IF A$="" THEN GOTO 1250
1260 IF A$="N" THEN GOTO 1280 :IF A$="Y" GOTO 1270 ELSE GOTO 1230
1270 INPUT "ENTER YOUR COMMENTS ",COMMENTS$
1280 LPRINT "TEST NUMBER " TEST$ "  BIN NUMBER " BN
1290 LPRINT "BIN DIAMETER (m)" D
1300 LPRINT "PRESSURE LEVEL DESIGNATION " PL$
1310 LPRINT "GRAIN MOISTURE CONTENT : " MC "%"
1320 LPRINT "H/D (initial)" H/(D*1000)
1330 LPRINT "  TIME       DENSITY       PO             PZ            B
   UK  "
1340 LPRINT "  (hrs)      (kg/m3)      (kP)           (kPa)         (1/m)"
1350 FOR I=1 TO N
1360 LPRINT USING "###.#####    ";DAT(I,4),RES(I,1),RES(I,2),RES(I,3),RES(I,4),R
ES(I,5)
1370 NEXT I
1380 LPRINT:LPRINT "PO (average)= " SUM/(N-1),"                         UK MEAN= "SUK
/(N-1)
1390 LPRINT "        S.D.= "           SDPO,"                            S.D.= " SDUK
1400 IF A$="Y" THEN LPRINT COMMENTS$
1410 LPRINT :LPRINT :LPRINT
1420 PRINT "DO YOU WANT TO SAVE THE RESULTS (Y/N)?"
1430 A$=INKEY$ :IF A$="N" GOTO 1450
1440 IF A$="Y" THEN GOSUB 3200 ELSE GOTO 1430
1450 PRINT "DO YOU WANT TO CHECK ITEMS STORED (Y/N)?"
1460 A$=INKEY$ :IF A$="N" GOTO 640
1470 IF A$="Y" THEN GOSUB 3320 ELSE GOTO 1460
1480 GOTO 640
1490 PLEASE RE-ENTER TRANSDUCER VALUES: GOTO 700
1500 SLOPE=6.40806257# :RETURN :' TRANSDUCER #2
1510 SLOPE=10.9208659# :RETURN :' TRANSDUCER #3
1520 SLOPE=8.68174886# :RETURN :' TRANSDUCER #4
1530 SLOPE=5.53720881# :RETURN :' TRANSDUCER #5
1540 REM
1550 REM ****  SUBROUTINE TO INPUT DATA  ****
1560 REM
1570 INPUT "BIN NUMBER ",BN
1580 INPUT "GRAIN MASS (kg) ",GM
1590 INPUT "TOP TRANSDUCER # ",TT
1600 INPUT "BOTTOM TRANSDUCER # ",BT
1610 INPUT "NUMBER OF OBSERVATIONS ",N
1620 INPUT "TEST # ",TEST$
1630 INPUT "PRESSURE LEVEL DESIGNATION  ",PL$
1640 INPUT "GRAIN MOISTURE CONTENT (%) ",MC
1650 FOR I=1 TO N
1660 PRINT "OBSERVATION ",I
1670 INPUT "TOP STRAIN READING ",TS
1680 INPUT "BOTTOM STRAIN READING ",BS
1690 INPUT "GRAIN HEIGHT (mm) ",Z
1700 INPUT "ELAPSED TIME (hrs) ",DT
1710 DAT(I,1)=TS
1720 DAT(I,2)=BS
1730 DAT(I,3)=Z
1740 DAT(I,4)=DT
1750 NEXT I
1760 CLS
1770 INPUT "DO YOU WANT TO SAVE THE DATA (Y/N) ";Q$
```

```
1780 IF Q$="Y" THEN GOSUB 2090 :GOTO 1800
1790 IF Q$="N" THEN GOTO 1800 ELSE GOTO 1770
1800 INPUT "DO YOU WANT TO PRINT DATA OUT (Y/N) ";H$
1810 IF H$="Y" THEN GOSUB 2520 : GOTO 1830
1820 IF H$="N" THEN RETURN ELSE GOTO 1800
1830 RETURN
1840 REM
1850 REM ****  SUBROUTINE TO RETRIEVE DATA AND UNPACK FROM A RANDOM FILE  ****
1860 REM
1870 INPUT "INPUT DESIRED TEST ",TEST$
1880 F$="B:"+TEST$+".1" : F2$="B:"+TEST$+".2"
1890 OPEN "R",#1,F$,18 :FIELD #1, 2 AS BN$, 4 AS GM$, 2 AS TT$, 2 AS BT$, 2 AS N
$,2 AS PL1$, 4 AS MC$
1900 GET #1,1
1910 BN=CVI(BN$)
1920 GM=CVS(GM$)
1930 TT=CVI(TT$)
1940 BT=CVI(BT$)
1950 N=CVI(N$)
1960 MC=CVS(MC$)
1970 PL$=PL1$
1980 OPEN "R",#2, F2$,12: FIELD #2, 2 AS TS$ , 2 AS BS$, 4 AS Z$ , 4 AS DT$
1990 FOR I=1 TO N
2000 GET #2,I
2010 DAT(I,1)=CVI(TS$)
2020 DAT(I,2)=CVI(BS$)
2030 DAT(I,3)=CVS(Z$)
2040 DAT(I,4)=CVS(DT$)
2050 NEXT I
2060 CLOSE #1,#2
2070 RETURN
2080 REM
2090 REM ****  SUBROUTINE TO PACK AND SAVE DATA IN A RANDOM FILE  ****
2100 REM
2110 F$="B:"+TEST$+".1"
2120 F2$="B:"+TEST$+".2"
2130 OPEN "R",#1,F$,18 :FIELD #1 ,2 AS BN$, 4 AS GM$, 2 AS TT$, 2 AS BT$, 2 AS N
$, 2 AS PL1$, 4 AS MC$
2140 LSET BN$=MKI$(BN):LSET GM$=MKS$(GM):LSET TT$=MKI$(TT):LSET BT$=MKI$(BT)
2150 LSET N$=MKI$(N):LSET PL1$=PL$ :LSET MC$=MKS$(MC)
2160 PUT #1,1
2170 OPEN "R",#2,F2$,12 :FIELD #2, 2 AS TS$, 2 AS BS$, 4 AS Z$, 4 AS DT$
2180 FOR I=1 TO N
2190  LSET TS$=MKI$(DAT(I,1))
2200  LSET BS$=MKI$(DAT(I,2))
2210  LSET Z$=MKS$(DAT(I,3))
2220 LSET DT$=MKS$(DAT(I,4))
2230 PUT #2,I
2240 NEXT I
2250 CLOSE #1,#2
2260 RETURN
2270 CLS
2280 REM
2290 REM **** SUBROUTINE TO PRINT RESULTS ON SCREEN  *****
2300 REM
2310 PRINT "TEST NUMBER " TEST$ " BIN  NUMBER " BN
2320 PRINT "BIN DIAMETER (m)" D
2330 PRINT "PRESSURE LEVEL DESIGNATION " PL$
```

```
2340 PRINT "GRAIN MOISTURE CONTENT" MC "%"
2350 PRINT "H/D (initial)" H/(D*1000)
2360 REM PRINT :PRINT :PRINT :PRINT :PRINT "PRESS ANY KEY TO CONTINUE"
2370 REM A$=INKEY$ :IF A$="" THEN GOTO 4042 ELSE GOTO 4049
2380 REM CLS
2390 PRINT "DENSITY       PO              PZ                 B            UK   "
2400 PRINT "(kg/m^3)     (kPa)           (kPa)             (1/m)     "
2410 FOR I=1 TO N
2420 PRINT RES(I,1),RES(I,2),RES(I,3),RES(I,4),RES(I,5)
2430 NEXT I
2440 PRINT :PRINT "PO (average)=" SUM/(N-1),"                 UK MEAN= "SUK/(N-1
)
2450 PRINT "      S.D.="             SDPO,"                          S.D.= " SDUK
2460 PRINT "PRESS ANY KEY TO CONTINUE"
2470 A$=INKEY$ : IF A$="" THEN GOTO 2470 ELSE GOTO 2480
2480 PRINT "DO YOU WANT A HARDCOPY  ? (Y/N)"
2490 A$=INKEY$ :IF A$="" THEN GOTO 2490
2500 IF A$="Y" THEN GOTO 1230
2510 IF A$="N" THEN GOTO 1420 ELSE GOTO 2480
2520  PRINT "ON SCREEN (S) OR ON PRINTER (P) ? "
2530 A$=INKEY$ : IF A$="" THEN GOTO 2530
2540 IF A$="S" THEN GOTO 2550 : IF A$="P" GOTO 2740 ELSE GOTO 2520
2550 PRINT "TEST NUMBER " TEST$ "   BIN NUMBER " BN
2560 D=BD(BN)
2570 CLS
2580 REM
2590 REM ****  SUBROUTINE TO PRINT INPUT DATA ON SCREEN  ****
2600 REM
2610 PRINT "BIN DIAMETER (m) " D
2620 PRINT "PRESSURE LEVEL DESIGNATION " PL$
2630 PRINT "GRAIN MOISTURE CONTENT : " MC "%"
2640 PRINT "GRAIN MASS " GM
2650 PRINT "OBS            TIME        TOP STRAIN  BOTTOM STRAIN  GRAIN HEIGHT"
2660 PRINT "               (hrs)         (mE)          (mE)           (mm)"
2670 FOR I=1 TO N
2680 PRINT I,DAT(I,4),DAT(I,1),DAT(I,2),DAT(I,3)
2690 NEXT I
2700 GOTO 2900
2710 REM
2720 REM ****  SUBROUTINE TO PRINT DATA TO AN EXTERNAL PRINTER  ****
2730 REM
2740 LPRINT "TEST NUMBER " TEST$ "   BIN NUMBER " BN
2750 D=BD(BN)
2760 LPRINT "BIN DIAMETER (m) " D
2770 LPRINT "PRESSURE LEVEL DESIGNATION " PL$
2780 LPRINT "GRAIN MOISTURE CONTENT : " MC "%"
2790 LPRINT "GRAIN MASS " GM
2800 LPRINT "OBS          TIME      TOP STRAIN  BOTTOM STRAIN  GRAIN HEIGHT"
2810 LPRINT "             (hrs)       (mE)          (mE)           (mm)"
2820 FOR I=1 TO N
2830 LPRINT I,DAT(I,4),DAT(I,1),DAT(I,2),DAT(I,3)
2840 REM
2850 NEXT I
2860 REM
2870 REM ****  ROUTINE TO ALLOW CORRECTIONS TO BE MADE TO INPUT DATA OR TEST
2880 REM
2890 REM       DESCRIPTION  ****
2900 PRINT "DO YOU WANT TO MAKE ANY CORRECTIONS ? (Y/N) "
```

```
2910 B$=INKEY$: IF B$="" GOTO 2910
2920 IF B$="Y" THEN GOSUB 2940 : GOTO 2900
2930 IF B$="N" THEN RETURN ELSE GOTO 2900
2940 PRINT "CHANGE DATA (D) OR TEST DESCRIPTION (T) ?"
2950 A$=INKEY$ : IF A$="" GOTO 2950
2960 IF A$="D" GOTO 2980
2970 IF A$="T" GOTO 3160 ELSE GOTO 2940
2980 INPUT "INPUT OBSERVATION NUMBER ", IZ
2990 PRINT "OBSERVATION ",IZ
3000 INPUT "TOP STRAIN READING ",TS
3010 INPUT "BOTTOM STRAIN READING ",BS
3020 INPUT "GRAIN HEIGHT (mm) ",Z
3030 INPUT "ELAPSED TIME (hrs) ",DT
3040 DAT(IZ,1)=TS
3050 DAT(IZ,2)=BS
3060 DAT(IZ,3)=Z
3070 DAT(IZ,4)=DT
3080 PRINT "DO YOU WANT DATA PRINTED OUT ? (Y/N)"
3090 A$=INKEY$ :IF A$="" GOTO 3090
3100 IF A$="Y" THEN GOSUB 2520 :GOTO 3120
3110 IF A$="N" GOTO 3120 ELSE GOTO 3080
3120 PRINT "DO YOU WANT TO SAVE THE DATA ? (Y/N)"
3130 A$=INKEY$ : IF A$="" GOTO 3130
3140 IF A$="Y" THEN GOSUB 2090 :RETURN
3150 IF A$="N" THEN RETURN ELSE GOTO 3130
3160 INPUT "GRAIN MASS (kg) ",GM
3170 INPUT "PRESSURE LEVEL DESIGNATION  ",PL$
3180 INPUT "GRAIN MOISTURE CONTENT (%) ",MC
3190 GOTO 3080
3200 HTD=H/(D*1000)
3210 POB=SUM/(N-1)
3220 IF BN<4 THEN SURF$="C" ELSE SURF$="S"
3230 REM ****  SUBROUTINE TO STORE RESULTS SEQUENTIALLY  ****
3240 OPEN "A:DATA2" FOR APPEND AS #1
3250 PRINT #1,TEST$;" ";BN;" ";D;" ";SURF$;" ";HTD;" ";MC;" ";N;" ";POB;" ";SDPO
;" ";GM
3260 FOR I=1 TO N
3270  PRINT #1,DAT(I,4),RES(I,1),DAT(I,3),RES(I,5)
3280 NEXT I
3290 CLOSE #1
3300 RETURN
3310 REM
3320 REM ****  SUBROUTINE TO CHECK RESULTS STORED  ****
3330 REM
3340 INPUT "INPUT DESIRED TEST";CHECK$
3350 OPEN "A:DATA2" FOR INPUT AS #1
3360 IF EOF(1) THEN PRINT "FILE NOT FOUND " :GOTO 3450
3370 INPUT #1,TEST$,D,BN,SURF$,HTD,MC,N,POB,SDPO,GM
3380 FOR I=1 TO N
3390  INPUT #1,DAT(I,4),RES(I,1),DAT(I,3),RES(I,5)
3400 NEXT I
3410 IF TEST$=CHECK$ THEN GOTO 3420 ELSE GOTO 3360
3420 PRINT TEST$,BN,D,SURF$,HTD,MC,N,POB,SDPO,GM
3430 FOR I=1 TO N
3440 PRINT DAT(I,4),RES(I,1),DAT(I,3),RES(I,5)
3450 NEXT I
3460 CLOSE #1
3470 PRINT "PRESS ANY KEY TO CONTINUE"
```

Appendix D

SUMMARY OF COLLECTED DATA

OBS	TEST	BN	D	SURFACE	HOD	PO	MC	GM	TIMPASS	UK
1	7A-1	1	0.307	C	0.84984	40.5330	12.1	14.4596	0.0000	0.311319
2	7A-1	1	0.307	C	0.84984	40.5330	12.1	14.4596	0.5833	0.316678
3	7A-1	1	0.307	C	0.84984	40.5330	12.1	14.4596	1.2660	0.313333
4	7A-1	1	0.307	C	0.84984	40.5330	12.1	14.4596	2.2495	0.313980
5	7A-1	1	0.307	C	0.84984	40.5330	12.1	14.4596	3.6162	0.313493
6	7A-1	1	0.307	C	0.84984	40.5330	12.1	14.4596	4.7495	0.323499
7	7A-1	1	0.307	C	0.84984	40.5330	12.1	14.4596	6.4200	0.317278
8	2C-1	1	0.307	C	0.85733	40.0842	12.2	14.4795	0.0000	0.347146
9	2C-1	1	0.307	C	0.85733	40.0842	12.2	14.4795	0.7500	0.355358
10	2C-1	1	0.307	C	0.85733	40.0842	12.2	14.4795	1.7500	0.359962
11	2C-1	1	0.307	C	0.85733	40.0842	12.2	14.4795	2.7500	0.366286
12	2C-1	1	0.307	C	0.85733	40.0842	12.2	14.4795	3.7500	0.364075
13	2C-1	1	0.307	C	0.85733	40.0842	12.2	14.4795	4.7500	0.369284
14	2C-1	1	0.307	C	0.85733	40.0842	12.2	14.4795	6.5000	0.366507
15	7E-1	1	0.307	C	1.04853	40.6185	12.0	17.9309	0.0000	0.266095
16	7E-1	1	0.307	C	1.04853	40.6185	12.0	17.9309	1.0000	0.269651
17	7E-1	1	0.307	C	1.04853	40.6185	12.0	17.9309	2.0000	0.269290
18	7E-1	1	0.307	C	1.04853	40.6185	12.0	17.9309	3.1670	0.270948
19	7E-1	1	0.307	C	1.04853	40.6185	12.0	17.9309	4.0000	0.272157
20	7E-1	1	0.307	C	1.04853	40.6185	12.0	17.9309	5.0000	0.274237
21	7E-1	1	0.307	C	1.04853	40.6185	12.0	17.9309	6.0000	0.272635
22	7E-1	1	0.307	C	1.04853	40.6185	12.0	17.9309	7.0000	0.274274
23	6H-1	1	0.307	C	1.06612	41.5816	11.8	18.2806	0.0000	0.314612
24	6H-1	1	0.307	C	1.06612	41.5816	11.8	18.2806	0.6667	0.318917
25	6H-1	1	0.307	C	1.06612	41.5816	11.8	18.2806	1.6670	0.319016
26	6H-1	1	0.307	C	1.06612	41.5816	11.8	18.2806	2.5000	0.321484
27	6H-1	1	0.307	C	1.06612	41.5816	11.8	18.2806	3.6670	0.326497
28	6H-1	1	0.307	C	1.06612	41.5816	11.8	18.2806	4.5000	0.323597
29	6H-1	1	0.307	C	1.06612	41.5816	11.8	18.2806	5.5000	0.326108
30	6H-1	1	0.307	C	1.06612	41.5816	11.8	18.2806	6.5000	0.323672
31	1I-1	1	0.307	C	1.07915	41.8154	11.8	18.4494	0.0000	0.295504
32	1I-1	1	0.307	C	1.07915	41.8154	11.8	18.4494	0.5000	0.296413
33	1I-1	1	0.307	C	1.07915	41.8154	11.8	18.4494	1.5000	0.299130
34	1I-1	1	0.307	C	1.07915	41.8154	11.8	18.4494	2.7500	0.301032
35	1I-1	1	0.307	C	1.07915	41.8154	11.8	18.4494	4.0000	0.302906
36	1I-1	1	0.307	C	1.07915	41.8154	11.8	18.4494	4.7500	0.302915
37	1I-1	1	0.307	C	1.07915	41.8154	11.8	18.4494	5.5000	0.302517
38	1I-1	1	0.307	C	1.07915	41.8154	11.8	18.4494	7.7500	0.307557
39	4A-1	1	0.307	C	1.72638	44.2241	11.7	28.4870	0.0000	0.293876
40	4A-1	1	0.307	C	1.72638	44.2241	11.7	28.4870	0.3330	0.294052
41	4A-1	1	0.307	C	1.72638	44.2241	11.7	28.4870	0.4170	0.296706
42	4A-1	1	0.307	C	1.72638	44.2241	11.7	28.4870	1.5833	0.296472
43	4A-1	1	0.307	C	1.72638	44.2241	11.7	28.4870	4.8330	0.294085
44	8D-1	1	0.307	C	1.72801	39.7489	12.1	28.9024	0.0000	0.293298
45	8D-1	1	0.307	C	1.72801	39.7489	12.1	28.9024	1.0000	0.290082
46	8D-1	1	0.307	C	1.72801	39.7489	12.1	28.9024	2.0000	0.289904
47	8D-1	1	0.307	C	1.72801	39.7489	12.1	28.9024	3.0000	0.292748
48	8D-1	1	0.307	C	1.72801	39.7489	12.1	28.9024	4.0000	0.292267
49	8D-1	1	0.307	C	1.72801	39.7489	12.1	28.9024	5.0000	0.289801
50	8D-1	1	0.307	C	1.72801	39.7489	12.1	28.9024	6.0000	0.294668
51	8D-1	1	0.307	C	1.72801	39.7489	12.1	28.9024	7.0000	0.294933
52	1F-1	1	0.307	C	1.76938	40.0949	12.1	28.8871	0.0000	0.282702
53	1F-1	1	0.307	C	1.76938	40.0949	12.1	28.8871	0.7500	0.278978
54	1F-1	1	0.307	C	1.76938	40.0949	12.1	28.8871	1.7500	0.285824
55	1F-1	1	0.307	C	1.76938	40.0949	12.1	28.8871	2.7500	0.291164
56	1F-1	1	0.307	C	1.76938	40.0949	12.1	28.8871	3.7500	0.291232

OBS	TEST	BN	D	SURFACE	HOD	PO	MC	GM	TIMPASS	UK
57	1F-1	1	0.307	C	1.76938	40.0949	12.1	28.8871	4.7500	0.287941
58	1F-1	1	0.307	C	1.76938	40.0949	12.1	28.8871	5.7500	0.291265
59	1F-1	1	0.307	C	1.76938	40.0949	12.1	28.8871	7.0000	0.291026
60	4A-3	1	0.307	C	1.73029	45.6753	12.0	28.3166	0.0000	0.283259
61	4A-3	1	0.307	C	1.73029	45.6753	12.0	28.3166	0.3330	0.287855
62	4A-3	1	0.307	C	1.73029	45.6753	12.0	28.3166	2.1330	0.296860
63	4A-3	1	0.307	C	1.73029	45.6753	12.0	28.3166	2.8330	0.301109
64	4A-3	1	0.307	C	1.73029	45.6753	12.0	28.3166	6.5000	0.312317
65	4G-1	1	0.307	C	1.71401	43.1431	11.9	28.7353	0.0000	0.320273
66	4G-1	1	0.307	C	1.71401	43.1431	11.9	28.7353	0.5000	0.320093
67	4G-1	1	0.307	C	1.71401	43.1431	11.9	28.7353	1.5000	0.317652
68	4G-1	1	0.307	C	1.71401	43.1431	11.9	28.7353	2.5000	0.320491
69	4G-1	1	0.307	C	1.71401	43.1431	11.9	28.7353	3.5833	0.320308
70	4G-1	1	0.307	C	1.71401	43.1431	11.9	28.7353	4.5000	0.317495
71	4G-1	1	0.307	C	1.71401	43.1431	11.9	28.7353	5.5000	0.317294
72	4G-1	1	0.307	C	1.71401	43.1431	11.9	28.7353	7.1670	0.320372
73	3J-1	1	0.307	C	1.71922	43.7322	11.6	29.0233	0.0000	0.302465
74	3J-1	1	0.307	C	1.71922	43.7322	11.6	29.0233	0.5000	0.298835
75	3J-1	1	0.307	C	1.71922	43.7322	11.6	29.0233	1.5833	0.294087
76	3J-1	1	0.307	C	1.71922	43.7322	11.6	29.0233	2.5833	0.298894
77	3J-1	1	0.307	C	1.71922	43.7322	11.6	29.0233	4.5833	0.298912
78	3J-1	1	0.307	C	1.71922	43.7322	11.6	29.0233	5.5000	0.301643
79	3J-1	1	0.307	C	1.71922	43.7322	11.6	29.0233	6.5000	0.304391
80	3J-1	1	0.307	C	1.71922	43.7322	11.6	29.0233	7.0000	0.303456
81	9J-1	1	0.307	C	1.73388	42.5634	11.5	29.5993	0.0000	0.296048
82	9J-1	1	0.307	C	1.73388	42.5634	11.5	29.5993	0.5833	0.300863
83	9J-1	1	0.307	C	1.73388	42.5634	11.5	29.5993	1.5833	0.309565
84	9J-1	1	0.307	C	1.73388	42.5634	11.5	29.5993	2.4167	0.309345
85	9J-1	1	0.307	C	1.73388	42.5634	11.5	29.5993	3.5833	0.302950
86	9J-1	1	0.307	C	1.73388	42.5634	11.5	29.5993	4.5000	0.309239
87	9J-1	1	0.307	C	1.73388	42.5634	11.5	29.5993	5.4167	0.312228
88	9J-1	1	0.307	C	1.73388	42.5634	11.5	29.5993	7.0833	0.315060
89	10J-1	1	0.307	C	1.73941	43.9379	11.3	29.6538	0.0000	0.294542
90	10J-1	1	0.307	C	1.73941	43.9379	11.3	29.6538	0.5833	0.294179
91	10J-1	1	0.307	C	1.73941	43.9379	11.3	29.6538	1.5833	0.298596
92	10J-1	1	0.307	C	1.73941	43.9379	11.3	29.6538	2.5833	0.301093
93	10J-1	1	0.307	C	1.73941	43.9379	11.3	29.6538	3.5000	0.301175
94	10J-1	1	0.307	C	1.73941	43.9379	11.3	29.6538	4.5833	0.304187
95	10J-1	1	0.307	C	1.73941	43.9379	11.3	29.6538	5.4167	0.307466
96	10J-1	1	0.307	C	1.73941	43.9379	11.3	29.6538	7.0833	0.304234
97	6B-1	1	0.307	C	0.86319	54.5427	12.2	14.4850	0.0000	0.333013
98	6B-1	1	0.307	C	0.86319	54.5427	12.2	14.4850	0.8833	0.344724
99	6B-1	1	0.307	C	0.86319	54.5427	12.2	14.4850	1.8833	0.344424
100	6B-1	1	0.307	C	0.86319	54.5427	12.2	14.4850	2.8833	0.344082
101	6B-1	1	0.307	C	0.86319	54.5427	12.2	14.4850	3.8833	0.348097
102	6B-1	1	0.307	C	0.86319	54.5427	12.2	14.4850	4.8833	0.344218
103	6B-1	1	0.307	C	0.86319	54.5427	12.2	14.4850	5.8833	0.343408
104	7C-1	1	0.307	C	0.84984	52.9718	12.0	14.2921	0.0000	0.304901
105	7C-1	1	0.307	C	0.84984	52.9718	12.0	14.2921	0.7500	0.311431
106	7C-1	1	0.307	C	0.84984	52.9718	12.0	14.2921	1.7500	0.316214
107	7C-1	1	0.307	C	0.84984	52.9718	12.0	14.2921	2.7500	0.313586
108	7C-1	1	0.307	C	0.84984	52.9718	12.0	14.2921	3.7500	0.316355
109	7C-1	1	0.307	C	0.84984	52.9718	12.0	14.2921	4.7500	0.316509
110	7C-1	1	0.307	C	0.84984	52.9718	12.0	14.2921	6.0000	0.325831
111	5F-1	1	0.307	C	0.83453	51.4651	11.9	14.1399	0.0000	0.310045
112	5F-1	1	0.307	C	0.83453	51.4651	11.9	14.1399	0.7500	0.320519

OBS	TEST	BN	D	SURFACE	HOD	PO	MC	GM	TIMPASS	UK
113	5F-1	1	0.307	C	0.83453	51.4651	11.9	14.1399	1.7500	0.329888
114	5F-1	1	0.307	C	0.83453	51.4651	11.9	14.1399	3.0000	0.331537
115	5F-1	1	0.307	C	0.83453	51.4651	11.9	14.1399	3.7500	0.331551
116	5F-1	1	0.307	C	0.83453	51.4651	11.9	14.1399	5.0000	0.334507
117	5F-1	1	0.307	C	0.83453	51.4651	11.9	14.1399	5.7500	0.336568
118	5F-1	1	0.307	C	0.83453	51.4651	11.9	14.1399	7.0000	0.336606
119	8G-1	1	0.307	C	0.84267	56.6172	11.7	14.3401	0.0000	0.311310
120	8G-1	1	0.307	C	0.84267	56.6172	11.7	14.3401	0.5000	0.320903
121	8G-1	1	0.307	C	0.84267	56.6172	11.7	14.3401	1.5000	0.317512
122	8G-1	1	0.307	C	0.84267	56.6172	11.7	14.3401	2.5000	0.319343
123	8G-1	1	0.307	C	0.84267	56.6172	11.7	14.3401	3.5000	0.320735
124	8G-1	1	0.307	C	0.84267	56.6172	11.7	14.3401	4.5000	0.320763
125	8G-1	1	0.307	C	0.84267	56.6172	11.7	14.3401	5.5000	0.324328
126	8G-1	1	0.307	C	0.84267	56.6172	11.7	14.3401	6.0000	0.319058
127	4J-1	1	0.307	C	0.83746	56.2525	11.4	14.3391	0.0000	0.317990
128	4J-1	1	0.307	C	0.83746	56.2525	11.4	14.3391	0.5000	0.324679
129	4J-1	1	0.307	C	0.83746	56.2525	11.4	14.3391	1.5000	0.325213
130	4J-1	1	0.307	C	0.83746	56.2525	11.4	14.3391	2.5000	0.328085
131	4J-1	1	0.307	C	0.83746	56.2525	11.4	14.3391	3.5000	0.328525
132	4J-1	1	0.307	C	0.83746	56.2525	11.4	14.3391	4.6670	0.328169
133	4J-1	1	0.307	C	0.83746	56.2525	11.4	14.3391	5.5000	0.328192
134	4J-1	1	0.307	C	0.83746	56.2525	11.4	14.3391	7.1670	0.330469
135	3B-1	1	0.307	C	1.71401	54.0832	12.2	28.9258	0.0000	0.316556
136	3B-1	1	0.307	C	1.71401	54.0832	12.2	28.9258	0.5000	0.321447
137	3B-1	1	0.307	C	1.71401	54.0832	12.2	28.9258	1.3330	0.325876
138	3B-1	1	0.307	C	1.71401	54.0832	12.2	28.9258	2.3330	0.330713
139	3B-1	1	0.307	C	1.71401	54.0832	12.2	28.9258	3.3330	0.330778
140	3B-1	1	0.307	C	1.71401	54.0832	12.2	28.9258	4.3330	0.327996
141	3B-1	1	0.307	C	1.71401	54.0832	12.2	28.9258	5.3330	0.330474
142	3B-1	1	0.307	C	1.71401	54.0832	12.2	28.9258	8.5170	0.330268
143	3B-1	1	0.307	C	1.71401	54.0832	12.2	28.9258	22.6300	0.330092
144	3B-1	1	0.307	C	1.71401	54.0832	12.2	28.9258	27.9500	0.326258
145	3B-1	1	0.307	C	1.71401	54.0832	12.2	28.9258	29.5670	0.336264
146	3B-1	1	0.307	C	1.71401	54.0832	12.2	28.9258	30.9333	0.336432
147	3B-1	1	0.307	C	1.71401	54.0832	12.2	28.9258	46.5500	0.336505
148	8B-1	1	0.307	C	1.72215	49.8515	12.3	28.6731	0.0000	0.265550
149	8B-1	1	0.307	C	1.72215	49.8515	12.3	28.6731	0.7500	0.268976
150	8B-1	1	0.307	C	1.72215	49.8515	12.3	28.6731	1.7500	0.268438
151	8B-1	1	0.307	C	1.72215	49.8515	12.3	28.6731	2.7500	0.273590
152	8B-1	1	0.307	C	1.72215	49.8515	12.3	28.6731	3.7500	0.272450
153	8B-1	1	0.307	C	1.72215	49.8515	12.3	28.6731	4.7500	0.272499
154	8B-1	1	0.307	C	1.72215	49.8515	12.3	28.6731	5.7500	0.275912
155	1D-1	1	0.307	C	1.73550	52.2973	12.1	28.7960	0.0000	0.280730
156	1D-1	1	0.307	C	1.73550	52.2973	12.1	28.7960	1.1670	0.283852
157	1D-1	1	0.307	C	1.73550	52.2973	12.1	28.7960	2.1670	0.285555
158	1D-1	1	0.307	C	1.73550	52.2973	12.1	28.7960	3.1670	0.285011
159	1D-1	1	0.307	C	1.73550	52.2973	12.1	28.7960	4.1670	0.290063
160	1D-1	1	0.307	C	1.73550	52.2973	12.1	28.7960	5.1670	0.285711
161	1D-1	1	0.307	C	1.73550	52.2973	12.1	28.7960	6.1670	0.285723
162	1D-1	1	0.307	C	1.73550	52.2973	12.1	28.7960	7.3000	0.287869
163	9D-1	1	0.307	C	1.73192	61.8722	12.1	28.9626	0.0000	0.278036
164	9D-1	1	0.307	C	1.73192	61.8722	12.1	28.9626	1.0000	0.274668
165	9D-1	1	0.307	C	1.73192	61.8722	12.1	28.9626	2.0000	0.274605
166	9D-1	1	0.307	C	1.73192	61.8722	12.1	28.9626	3.0000	0.277956
167	9D-1	1	0.307	C	1.73192	61.8722	12.1	28.9626	4.0000	0.276167
168	9D-1	1	0.307	C	1.73192	61.8722	12.1	28.9626	5.0000	0.276183

OBS	TEST	BN	D	SURFACE	HOD	PO	MC	GM	TIMPASS	UK
169	9D-1	1	0.307	C	1.73192	61.8722	12.1	28.9626	6.0000	0.276195
170	9D-1	1	0.307	C	1.73192	61.8722	12.1	28.9626	7.0000	0.276261
171	8F-1	1	0.307	C	1.72117	53.3913	12.0	29.0976	0.0000	0.284414
172	8F-1	1	0.307	C	1.72117	53.3913	12.0	29.0976	0.7500	0.291274
173	8F-1	1	0.307	C	1.72117	53.3913	12.0	29.0976	3.2500	0.292759
174	8F-1	1	0.307	C	1.72117	53.3913	12.0	29.0976	3.7500	0.297711
175	8F-1	1	0.307	C	1.72117	53.3913	12.0	29.0976	4.7500	0.297523
176	8F-1	1	0.307	C	1.72117	53.3913	12.0	29.0976	5.7500	0.300020
177	8F-1	1	0.307	C	1.72117	53.3913	12.0	29.0976	6.7500	0.297804
178	8F-1	1	0.307	C	1.72117	53.3913	12.0	29.0976	7.2500	0.297612
179	2H-1	1	0.307	C	1.72215	54.3076	11.8	28.7959	0.0000	0.304051
180	2H-1	1	0.307	C	1.72215	54.3076	11.8	28.7959	0.5833	0.303641
181	2H-1	1	0.307	C	1.72215	54.3076	11.8	28.7959	1.8333	0.303993
182	2H-1	1	0.307	C	1.72215	54.3076	11.8	28.7959	2.9167	0.306087
183	2H-1	1	0.307	C	1.72215	54.3076	11.8	28.7959	3.5000	0.308394
184	2H-1	1	0.307	C	1.72215	54.3076	11.8	28.7959	4.5000	0.305969
185	2H-1	1	0.307	C	1.72215	54.3076	11.8	28.7959	5.5000	0.307888
186	2H-1	1	0.307	C	1.72215	54.3076	11.8	28.7959	7.0000	0.308309
187	7J-1	1	0.307	C	1.70945	56.8510	11.5	29.1047	0.0000	0.353758
188	7J-1	1	0.307	C	1.70945	56.8510	11.5	29.1047	0.5000	0.375868
189	7J-1	1	0.307	C	1.70945	56.8510	11.5	29.1047	1.5000	0.382785
190	7J-1	1	0.307	C	1.70945	56.8510	11.5	29.1047	2.5000	0.389657
191	7J-1	1	0.307	C	1.70945	56.8510	11.5	29.1047	3.5000	0.392833
192	7J-1	1	0.307	C	1.70945	56.8510	11.5	29.1047	4.5000	0.389781
193	7J-1	1	0.307	C	1.70945	56.8510	11.5	29.1047	5.5000	0.389432
194	7J-1	1	0.307	C	1.70945	56.8510	11.5	29.1047	7.0000	0.393173
195	5B-1	1	0.307	C	0.85928	63.5619	12.1	14.5612	0.0000	0.353456
196	5B-1	1	0.307	C	0.85928	63.5619	12.1	14.5612	0.3330	0.359606
197	5B-1	1	0.307	C	0.85928	63.5619	12.1	14.5612	1.3333	0.366310
198	5B-1	1	0.307	C	0.85928	63.5619	12.1	14.5612	2.3330	0.366427
199	5B-1	1	0.307	C	0.85928	63.5619	12.1	14.5612	3.3330	0.365818
200	5B-1	1	0.307	C	0.85928	63.5619	12.1	14.5612	4.3330	0.373224
201	5B-1	1	0.307	C	0.85928	63.5619	12.1	14.5612	5.8330	0.375140
202	3C-1	1	0.307	C	0.85570	62.6536	12.1	14.5228	0.0000	0.338592
203	3C-1	1	0.307	C	0.85570	62.6536	12.1	14.5228	0.1500	0.341524
204	3C-1	1	0.307	C	0.85570	62.6536	12.1	14.5228	0.7500	0.344382
205	3C-1	1	0.307	C	0.85570	62.6536	12.1	14.5228	1.7500	0.343838
206	3C-1	1	0.307	C	0.85570	62.6536	12.1	14.5228	2.7500	0.343960
207	3C-1	1	0.307	C	0.85570	62.6536	12.1	14.5228	3.7500	0.347469
208	3C-1	1	0.307	C	0.85570	62.6536	12.1	14.5228	6.2500	0.345117
209	9E-1	1	0.307	C	1.05831	65.0295	12.1	18.0356	0.0000	0.327757
210	9E-1	1	0.307	C	1.05831	65.0295	12.1	18.0356	3.0000	0.332315
211	9E-1	1	0.307	C	1.05831	65.0295	12.1	18.0356	4.0000	0.334001
212	9E-1	1	0.307	C	1.05831	65.0295	12.1	18.0356	5.0000	0.328239
213	9E-1	1	0.307	C	1.05831	65.0295	12.1	18.0356	6.0000	0.331251
214	9E-1	1	0.307	C	1.05831	65.0295	12.1	18.0356	7.2500	0.331275
215	7G-1	1	0.307	C	1.06124	64.5651	11.8	18.1333	0.0000	0.316978
216	7G-1	1	0.307	C	1.06124	64.5651	11.8	18.1333	0.7500	0.327434
217	7G-1	1	0.307	C	1.06124	64.5651	11.8	18.1333	1.8330	0.327007
218	7G-1	1	0.307	C	1.06124	64.5651	11.8	18.1333	2.8330	0.331739
219	7G-1	1	0.307	C	1.06124	64.5651	11.8	18.1333	3.6670	0.330436
220	7G-1	1	0.307	C	1.06124	64.5651	11.8	18.1333	4.6670	0.330174
221	7G-1	1	0.307	C	1.06124	64.5651	11.8	18.1333	5.8330	0.330197
222	7G-1	1	0.307	C	1.06124	64.5651	11.8	18.1333	7.1670	0.331589
223	12J-1	1	0.307	C	1.08208	67.0149	11.4	18.5586	0.0000	0.333706
224	12J-1	1	0.307	C	1.08208	67.0149	11.4	18.5586	0.5000	0.338892

OBS	TEST	BN	D	SURFACE	HOD	PD	MC	GM	TIMPASS	UK
225	12J-1	1	0.307	C	1.08208	67.0149	11.4	18.5586	1.58330	0.340466
226	12J-1	1	0.307	C	1.08208	67.0149	11.4	18.5586	2.66700	0.342452
227	12J-1	1	0.307	C	1.08208	67.0149	11.4	18.5586	3.58330	0.341988
228	12J-1	1	0.307	C	1.08208	67.0149	11.4	18.5586	4.58330	0.345665
229	12J-1	1	0.307	C	1.08208	67.0149	11.4	18.5586	5.50000	0.345951
230	12J-1	1	0.307	C	1.08208	67.0149	11.4	18.5586	7.25000	0.338779
231	3F-1	1	0.307	C	1.70098	63.4551	12.1	28.7650	0.00000	0.279446
232	3F-1	1	0.307	C	1.70098	63.4551	12.1	28.7650	0.50000	0.280861
233	3F-1	1	0.307	C	1.70098	63.4551	12.1	28.7650	1.50000	0.283997
234	3F-1	1	0.307	C	1.70098	63.4551	12.1	28.7650	2.50000	0.286780
235	3F-1	1	0.307	C	1.70098	63.4551	12.1	28.7650	3.50000	0.286665
236	3F-1	1	0.307	C	1.70098	63.4551	12.1	28.7650	5.50000	0.293715
237	3F-1	1	0.307	C	1.70098	63.4551	12.1	28.7650	7.00000	0.290047
238	3H-1	1	0.307	C	1.72801	68.5204	12.0	29.2714	0.00000	0.294743
239	3H-1	1	0.307	C	1.72801	68.5204	12.0	29.2714	0.58333	0.293125
240	3H-1	1	0.307	C	1.72801	68.5204	12.0	29.2714	1.58330	0.294566
241	3H-1	1	0.307	C	1.72801	68.5204	12.0	29.2714	2.58330	0.296338
242	3H-1	1	0.307	C	1.72801	68.5204	12.0	29.2714	3.58330	0.292900
243	3H-1	1	0.307	C	1.72801	68.5204	12.0	29.2714	4.58330	0.298041
244	3H-1	1	0.307	C	1.72801	68.5204	12.0	29.2714	5.58330	0.296172
245	3H-1	1	0.307	C	1.72801	68.5204	12.0	29.2714	7.08330	0.299695
246	6J-1	1	0.307	C	1.71824	66.2202	11.7	29.2303	0.00000	0.306534
247	6J-1	1	0.307	C	1.71824	66.2202	11.7	29.2303	0.50000	0.308206
248	6J-1	1	0.307	C	1.71824	66.2202	11.7	29.2303	1.50000	0.309942
249	6J-1	1	0.307	C	1.71824	66.2202	11.7	29.2303	2.58330	0.309848
250	6J-1	1	0.307	C	1.71824	66.2202	11.7	29.2303	3.75000	0.309886
251	6J-1	1	0.307	C	1.71824	66.2202	11.7	29.2303	4.91670	0.312008
252	6J-1	1	0.307	C	1.71824	66.2202	11.7	29.2303	5.91670	0.313996
253	6J-1	1	0.307	C	1.71824	66.2202	11.7	29.2303	7.25000	0.311628
254	8J-1	1	0.307	C	1.71010	67.2955	11.4	29.2783	0.00000	0.465517
255	8J-1	1	0.307	C	1.71010	67.2955	11.4	29.2783	0.50000	0.475270
256	8J-1	1	0.307	C	1.71010	67.2955	11.4	29.2783	1.66700	0.491712
257	8J-1	1	0.307	C	1.71010	67.2955	11.4	29.2783	2.08300	0.504693
258	8J-1	1	0.307	C	1.71010	67.2955	11.4	29.2783	3.50000	0.498540
259	8J-1	1	0.307	C	1.71010	67.2955	11.4	29.2783	4.75000	0.498489
260	8J-1	1	0.307	C	1.71010	67.2955	11.4	29.2783	5.41700	0.504335
261	8J-1	1	0.307	C	1.71010	67.2955	11.4	29.2783	7.33300	0.525155
262	13J-1	1	0.307	C	1.72736	66.7583	11.6	29.6381	0.00000	0.302451
263	13J-1	1	0.307	C	1.72736	66.7583	11.6	29.6381	0.58330	0.306297
264	13J-1	1	0.307	C	1.72736	66.7583	11.6	29.6381	1.50000	0.310176
265	13J-1	1	0.307	C	1.72736	66.7583	11.6	29.6381	2.08330	0.309783
266	13J-1	1	0.307	C	1.72736	66.7583	11.6	29.6381	3.08330	0.311429
267	13J-1	1	0.307	C	1.72736	66.7583	11.6	29.6381	3.58330	0.311467
268	13J-1	1	0.307	C	1.72736	66.7583	11.6	29.6381	4.58330	0.313439
269	13J-1	1	0.307	C	1.72736	66.7583	11.6	29.6381	5.41670	0.306363
270	13J-1	1	0.307	C	1.72736	66.7583	11.6	29.6381	7.16670	0.315301
271	14J-1	1	0.307	C	1.72866	67.1365	11.3	29.4419	0.00000	0.306314
272	14J-1	1	0.307	C	1.72866	67.1365	11.3	29.4419	0.50000	0.310211
273	14J-1	1	0.307	C	1.72866	67.1365	11.3	29.4419	1.50000	0.310347
274	14J-1	1	0.307	C	1.72866	67.1365	11.3	29.4419	2.50000	0.312322
275	14J-1	1	0.307	C	1.72866	67.1365	11.3	29.4419	4.33300	0.310035
276	14J-1	1	0.307	C	1.72866	67.1365	11.3	29.4419	5.50000	0.310366
277	14J-1	1	0.307	C	1.72866	67.1365	11.3	29.4419	6.50000	0.312336
278	14J-1	1	0.307	C	1.72866	67.1365	11.3	29.4419	7.25000	0.314305
279	4B-1	2	0.269	C	0.96952	41.1437	12.1	11.1902	0.00000	0.350218
280	4B-1	2	0.269	C	0.96952	41.1437	12.1	11.1902	0.75000	0.350830

OBS	TEST	BN	D	SURFACE	HOD	PD	MC	GM	TIMPASS	UK
281	4B-1	2	0.269	C	0.96952	41.1437	12.1	11.1902	1.7500	0.349738
282	4B-1	2	0.269	C	0.96952	41.1437	12.1	11.1902	2.7500	0.349791
283	4B-1	2	0.269	C	0.96952	41.1437	12.1	11.1902	3.7500	0.349836
284	4B-1	2	0.269	C	0.96952	41.1437	12.1	11.1902	4.7500	0.353452
285	4B-1	2	0.269	C	0.96952	41.1437	12.1	11.1902	6.0000	0.355849
286	2C-2	2	0.269	C	0.97732	38.9810	12.1	10.8991	0.0000	0.385431
287	2C-2	2	0.269	C	0.97732	38.9810	12.1	10.8991	0.5000	0.399625
288	2C-2	2	0.269	C	0.97732	38.9810	12.1	10.8991	1.5000	0.403122
289	2C-2	2	0.269	C	0.97732	38.9810	12.1	10.8991	2.5000	0.404797
290	2C-2	2	0.269	C	0.97732	38.9810	12.1	10.8991	3.5000	0.406977
291	2C-2	2	0.269	C	0.97732	38.9810	12.1	10.8991	4.5000	0.405741
292	2C-2	2	0.269	C	0.97732	38.9810	12.1	10.8991	6.2500	0.401911
293	4F-1	2	0.269	C	0.97212	42.8696	12.0	11.0164	0.0000	0.358866
294	4F-1	2	0.269	C	0.97212	42.8696	12.0	11.0164	1.0000	0.374956
295	4F-1	2	0.269	C	0.97212	42.8696	12.0	11.0164	2.0000	0.377612
296	4F-1	2	0.269	C	0.97212	42.8696	12.0	11.0164	3.0000	0.381438
297	4F-1	2	0.269	C	0.97212	42.8696	12.0	11.0164	4.0000	0.380284
298	4F-1	2	0.269	C	0.97212	42.8696	12.0	11.0164	5.0000	0.380313
299	4F-1	2	0.269	C	0.97212	42.8696	12.0	11.0164	6.0000	0.380346
300	4F-1	2	0.269	C	0.97212	42.8696	12.0	11.0164	7.0000	0.384212
301	6H-2	2	0.269	C	0.95353	45.3017	11.8	11.0974	0.0000	0.287233
302	6H-2	2	0.269	C	0.95353	45.3017	11.8	11.0974	0.6670	0.296854
303	6H-2	2	0.269	C	0.95353	45.3017	11.8	11.0974	1.6670	0.303967
304	6H-2	2	0.269	C	0.95353	45.3017	11.8	11.0974	2.5000	0.306918
305	6H-2	2	0.269	C	0.95353	45.3017	11.8	11.0974	3.6670	0.308975
306	6H-2	2	0.269	C	0.95353	45.3017	11.8	11.0974	4.5000	0.298775
307	6H-2	2	0.269	C	0.95353	45.3017	11.8	11.0974	5.5000	0.303910
308	6H-2	2	0.269	C	0.95353	45.3017	11.8	11.0974	6.5000	0.304813
309	8I-1	2	0.269	C	0.97807	44.1971	11.6	11.2593	0.0000	0.349122
310	8I-1	2	0.269	C	0.97807	44.1971	11.6	11.2593	0.5000	0.352783
311	8I-1	2	0.269	C	0.97807	44.1971	11.6	11.2593	1.6330	0.356260
312	8I-1	2	0.269	C	0.97807	44.1971	11.6	11.2593	2.5000	0.359195
313	8I-1	2	0.269	C	0.97807	44.1971	11.6	11.2593	3.7500	0.353021
314	8I-1	2	0.269	C	0.97807	44.1971	11.6	11.2593	4.3330	0.356399
315	8I-1	2	0.269	C	0.97807	44.1971	11.6	11.2593	5.5000	0.356428
316	8I-1	2	0.269	C	0.97807	44.1971	11.6	11.2593	7.0833	0.358727
317	4A-2	2	0.269	C	1.72602	35.7417	11.7	19.2377	0.0000	0.392245
318	4A-2	2	0.269	C	1.72602	35.7417	11.7	19.2377	0.0830	0.392703
319	4A-2	2	0.269	C	1.72602	35.7417	11.7	19.2377	1.2500	0.417605
320	4A-2	2	0.269	C	1.72602	35.7417	11.7	19.2377	4.6700	0.431604
321	8B-2	2	0.269	C	1.72342	42.9340	12.4	19.0869	0.0000	0.370954
322	8B-2	2	0.269	C	1.72342	42.9340	12.4	19.0869	0.5000	0.380551
323	8B-2	2	0.269	C	1.72342	42.9340	12.4	19.0869	1.5000	0.381622
324	8B-2	2	0.269	C	1.72342	42.9340	12.4	19.0869	2.5000	0.383439
325	8B-2	2	0.269	C	1.72342	42.9340	12.4	19.0869	3.5000	0.380241
326	8B-2	2	0.269	C	1.72342	42.9340	12.4	19.0869	4.5000	0.380268
327	8B-2	2	0.269	C	1.72342	42.9340	12.4	19.0869	5.7500	0.385620
328	2D-2	2	0.269	C	1.71004	36.0300	12.2	19.2579	0.0000	0.353030
329	2D-2	2	0.269	C	1.71004	36.0300	12.2	19.2579	0.5000	0.368424
330	2D-2	2	0.269	C	1.71004	36.0300	12.2	19.2579	1.5000	0.360954
331	2D-2	2	0.269	C	1.71004	36.0300	12.2	19.2579	2.5000	0.375539
332	2D-2	2	0.269	C	1.71004	36.0300	12.2	19.2579	3.5000	0.365116
333	2D-2	2	0.269	C	1.71004	36.0300	12.2	19.2579	4.5000	0.374860
334	2D-2	2	0.269	C	1.71004	36.0300	12.2	19.2579	5.5000	0.374144
335	2D-2	2	0.269	C	1.71004	36.0300	12.2	19.2579	6.5000	0.374160
336	4E-2	2	0.269	C	1.70855	46.1184	12.1	19.5323	0.0000	0.323386

OBS	TEST	BN	D	SURFACE	HOD	PO	MC	GM	TIMPASS	UK
337	4E-2	2	0.269	C	1.70855	46.1184	12.1	19.5323	1.0000	0.332531
338	4E-2	2	0.269	C	1.70855	46.1184	12.1	19.5323	2.0000	0.327357
339	4E-2	2	0.269	C	1.70855	46.1184	12.1	19.5323	2.7500	0.333373
340	4E-2	2	0.269	C	1.70855	46.1184	12.1	19.5323	4.0000	0.341668
341	4E-2	2	0.269	C	1.70855	46.1184	12.1	19.5323	5.0000	0.338464
342	4E-2	2	0.269	C	1.70855	46.1184	12.1	19.5323	6.0000	0.341691
343	4E-2	2	0.269	C	1.70855	46.1184	12.1	19.5323	7.0000	0.341705
344	4A-4	2	0.269	C	1.71933	31.4373	12.1	18.9484	0.0000	0.330629
345	4A-4	2	0.269	C	1.71933	31.4373	12.1	18.9484	0.1170	0.331035
346	4A-4	2	0.269	C	1.71933	31.4373	12.1	18.9484	1.9170	0.353990
347	4A-4	2	0.269	C	1.71933	31.4373	12.1	18.9484	2.6170	0.352439
348	4A-4	2	0.269	C	1.71933	31.4373	12.1	18.9484	6.2830	0.361994
349	3A-1	2	0.269	C	0.95725	53.7234	11.7	10.5807	0.0000	0.350362
350	3A-1	2	0.269	C	0.95725	53.7234	11.7	10.5807	0.1670	0.363299
351	3A-1	2	0.269	C	0.95725	53.7234	11.7	10.5807	0.6670	0.374464
352	3A-1	2	0.269	C	0.95725	53.7234	11.7	10.5807	3.1670	0.378486
353	3A-1	2	0.269	C	0.95725	53.7234	11.7	10.5807	6.1670	0.377206
354	1C-1	2	0.269	C	0.98439	58.2776	12.1	11.1648	0.0000	0.332954
355	1C-1	2	0.269	C	0.98439	58.2776	12.1	11.1648	0.7500	0.337087
356	1C-1	2	0.269	C	0.98439	58.2776	12.1	11.1648	1.7500	0.341196
357	1C-1	2	0.269	C	0.98439	58.2776	12.1	11.1648	2.7500	0.341262
358	1C-1	2	0.269	C	0.98439	58.2776	12.1	11.1648	3.7500	0.350403
359	1C-1	2	0.269	C	0.98439	58.2776	12.1	11.1648	4.7500	0.342501
360	1C-1	2	0.269	C	0.98439	58.2776	12.1	11.1648	6.1000	0.343417
361	3E-2	2	0.269	C	0.94052	57.5759	12.3	10.7271	0.0000	0.246962
362	3E-2	2	0.269	C	0.94052	57.5759	12.3	10.7271	0.5000	0.251949
363	3E-2	2	0.269	C	0.94052	57.5759	12.3	10.7271	1.5000	0.254691
364	3E-2	2	0.269	C	0.94052	57.5759	12.3	10.7271	2.9170	0.247044
365	3E-2	2	0.269	C	0.94052	57.5759	12.3	10.7271	3.5000	0.248555
366	3E-2	2	0.269	C	0.94052	57.5759	12.3	10.7271	4.5000	0.247282
367	3E-2	2	0.269	C	0.94052	57.5759	12.3	10.7271	5.5000	0.246351
368	3E-2	2	0.269	C	0.94052	57.5759	12.3	10.7271	6.5000	0.245411
369	5F-2	2	0.269	C	0.95242	57.7681	11.9	10.8518	0.0000	0.298549
370	5F-2	2	0.269	C	0.95242	57.7681	11.9	10.8518	0.7500	0.308380
371	5F-2	2	0.269	C	0.95242	57.7681	11.9	10.8518	1.7500	0.302391
372	5F-2	2	0.269	C	0.95242	57.7681	11.9	10.8518	3.0000	0.301550
373	5F-2	2	0.269	C	0.95242	57.7681	11.9	10.8518	3.7500	0.301558
374	5F-2	2	0.269	C	0.95242	57.7681	11.9	10.8518	5.0000	0.303889
375	5F-2	2	0.269	C	0.95242	57.7681	11.9	10.8518	5.7500	0.299764
376	5F-2	2	0.269	C	0.95242	57.7681	11.9	10.8518	7.0000	0.287413
377	7I-1	2	0.269	C	0.97584	57.4720	11.7	11.2850	0.0000	0.333048
378	7I-1	2	0.269	C	0.97584	57.4720	11.7	11.2850	0.6670	0.335002
379	7I-1	2	0.269	C	0.97584	57.4720	11.7	11.2850	1.5000	0.337514
380	7I-1	2	0.269	C	0.97584	57.4720	11.7	11.2850	2.3333	0.337555
381	7I-1	2	0.269	C	0.97584	57.4720	11.7	11.2850	3.5000	0.340116
382	7I-1	2	0.269	C	0.97584	57.4720	11.7	11.2850	4.8333	0.337691
383	7I-1	2	0.269	C	0.97584	57.4720	11.7	11.2850	5.5000	0.334382
384	7I-1	2	0.269	C	0.97584	57.4720	11.7	11.2850	7.3330	0.339755
385	6A-1	2	0.269	C	1.98030	47.8525	11.5	22.3605	0.0000	0.315458
386	6A-1	2	0.269	C	1.98030	47.8525	11.5	22.3605	0.4167	0.315446
387	6A-1	2	0.269	C	1.98030	47.8525	11.5	22.3605	0.8333	0.315569
388	6A-1	2	0.269	C	1.98030	47.8525	11.5	22.3605	2.4170	0.315208
389	6A-1	2	0.269	C	1.98030	47.8525	11.5	22.3605	3.2500	0.323893
390	6A-1	2	0.269	C	1.98030	47.8525	11.5	22.3605	5.5167	0.315417
391	6A-1	2	0.269	C	1.98030	47.8525	11.5	22.3605	6.2500	0.315460
392	4C-1	2	0.269	C	1.98290	58.4829	12.1	22.1791	0.0000	0.333132

OBS	TEST	BN	D	SURFACE	HOD	PO	MC	GM	TIMPASS	UK
393	4C-1	2	0.269	C	1.98290	58.4829	12.1	22.1791	0.83330	0.341808
394	4C-1	2	0.269	C	1.98290	58.4829	12.1	22.1791	1.83330	0.354598
395	4C-1	2	0.269	C	1.98290	58.4829	12.1	22.1791	2.83330	0.354626
396	4C-1	2	0.269	C	1.98290	58.4829	12.1	22.1791	3.83300	0.359328
397	4C-1	2	0.269	C	1.98290	58.4829	12.1	22.1791	4.83330	0.359349
398	4C-1	2	0.269	C	1.98290	58.4829	12.1	22.1791	5.83330	0.369189
399	4C-1	2	0.269	C	1.98290	58.4829	12.1	22.1791	6.08333	0.379355
400	3D-2	2	0.269	C	1.70855	60.6985	12.1	19.2678	0.00000	0.341738
401	3D-2	2	0.269	C	1.70855	60.6985	12.1	19.2678	0.15000	0.348919
402	3D-2	2	0.269	C	1.70855	60.6985	12.1	19.2678	1.15000	0.357056
403	3D-2	2	0.269	C	1.70855	60.6985	12.1	19.2678	2.23330	0.353196
404	3D-2	2	0.269	C	1.70855	60.6985	12.1	19.2678	3.15000	0.355449
405	3D-2	2	0.269	C	1.70855	60.6985	12.1	19.2678	4.15000	0.357731
406	3D-2	2	0.269	C	1.70855	60.6985	12.1	19.2678	5.15000	0.356839
407	3D-2	2	0.269	C	1.70855	60.6985	12.1	19.2678	6.40000	0.355585
408	5E-2	2	0.269	C	1.71933	56.1656	12.1	19.5223	0.00000	0.299811
409	5E-2	2	0.269	C	1.71933	56.1656	12.1	19.5223	1.00000	0.309149
410	5E-2	2	0.269	C	1.71933	56.1656	12.1	19.5223	2.00000	0.309909
411	5E-2	2	0.269	C	1.71933	56.1656	12.1	19.5223	3.00000	0.306188
412	5E-2	2	0.269	C	1.71933	56.1656	12.1	19.5223	4.00000	0.306202
413	5E-2	2	0.269	C	1.71933	56.1656	12.1	19.5223	5.41600	0.310563
414	5E-2	2	0.269	C	1.71933	56.1656	12.1	19.5223	6.41600	0.310569
415	4G-2	2	0.269	C	1.72602	50.2258	11.9	20.7206	0.00000	0.322366
416	4G-2	2	0.269	C	1.72602	50.2258	11.9	20.7206	0.50000	0.327969
417	4G-2	2	0.269	C	1.72602	50.2258	11.9	20.7206	1.50000	0.328117
418	4G-2	2	0.269	C	1.72602	50.2258	11.9	20.7206	2.50000	0.330898
419	4G-2	2	0.269	C	1.72602	50.2258	11.9	20.7206	3.58330	0.332658
420	4G-2	2	0.269	C	1.72602	50.2258	11.9	20.7206	4.50000	0.333742
421	4G-2	2	0.269	C	1.72602	50.2258	11.9	20.7206	5.50000	0.330452
422	4G-2	2	0.269	C	1.72602	50.2258	11.9	20.7206	7.16700	0.332741
423	8H-2	2	0.269	C	1.73234	56.5773	11.8	19.8744	0.00000	0.309636
424	8H-2	2	0.269	C	1.73234	56.5773	11.8	19.8744	0.50000	0.318389
425	8H-2	2	0.269	C	1.73234	56.5773	11.8	19.8744	1.50000	0.319926
426	8H-2	2	0.269	C	1.73234	56.5773	11.8	19.8744	2.50000	0.322341
427	8H-2	2	0.269	C	1.73234	56.5773	11.8	19.8744	3.50000	0.324277
428	8H-2	2	0.269	C	1.73234	56.5773	11.8	19.8744	4.50000	0.324771
429	8H-2	2	0.269	C	1.73234	56.5773	11.8	19.8744	7.00000	0.324408
430	2A-1	2	0.269	C	0.96022	86.2820	11.8	10.5708	0.00000	0.329830
431	2A-1	2	0.269	C	0.96022	86.2820	11.8	10.5708	0.16700	0.330208
432	2A-1	2	0.269	C	0.96022	86.2820	11.8	10.5708	1.08300	0.332691
433	2A-1	2	0.269	C	0.96022	86.2820	11.8	10.5708	2.75000	0.338852
434	2A-1	2	0.269	C	0.96022	86.2820	11.8	10.5708	3.75000	0.341619
435	2A-1	2	0.269	C	0.96022	86.2820	11.8	10.5708	6.25000	0.341783
436	2A-1	2	0.269	C	0.96022	86.2820	11.8	10.5708	7.46700	0.338893
437	9C-1	2	0.269	C	0.98959	65.6075	12.1	11.1332	0.00000	0.359441
438	9C-1	2	0.269	C	0.98959	65.6075	12.1	11.1332	0.86700	0.359876
439	9C-1	2	0.269	C	0.98959	65.6075	12.1	11.1332	1.86700	0.358460
440	9C-1	2	0.269	C	0.98959	65.6075	12.1	11.1332	2.86700	0.355418
441	9C-1	2	0.269	C	0.98959	65.6075	12.1	11.1332	3.86700	0.363262
442	9C-1	2	0.269	C	0.98959	65.6075	12.1	11.1332	4.86700	0.364071
443	9C-1	2	0.269	C	0.98959	65.6075	12.1	11.1332	5.86700	0.363710
444	9C-1	2	0.269	C	0.98959	65.6075	12.1	11.1332	6.86700	0.363743
445	8G-2	2	0.269	C	0.96097	62.7162	11.7	10.9971	0.00000	0.292996
446	8G-2	2	0.269	C	0.96097	62.7162	11.7	10.9971	0.50000	0.297383
447	8G-2	2	0.269	C	0.96097	62.7162	11.7	10.9971	1.50000	0.295848
448	8G-2	2	0.269	C	0.96097	62.7162	11.7	10.9971	2.50000	0.297921

OBS	TEST	BN	D	SURFACE	HOD	PD	MC	GM	TIMPASS	UK
449	8G-2	2	0.269	C	0.96097	62.7162	11.7	10.9971	3.5000	0.298787
450	8G-2	2	0.269	C	0.96097	62.7162	11.7	10.9971	4.5000	0.300868
451	8G-2	2	0.269	C	0.96097	62.7162	11.7	10.9971	5.5000	0.301517
452	8G-2	2	0.269	C	0.96097	62.7162	11.7	10.9971	6.0000	0.304000
453	7G-2	2	0.269	C	0.96357	69.7060	11.8	10.9817	0.0000	0.302149
454	7G-2	2	0.269	C	0.96357	69.7060	11.8	10.9817	0.7500	0.307062
455	7G-2	2	0.269	C	0.96357	69.7060	11.8	10.9817	1.8330	0.306097
456	7G-2	2	0.269	C	0.96357	69.7060	11.8	10.9817	2.8330	0.308831
457	7G-2	2	0.269	C	0.96357	69.7060	11.8	10.9817	3.6670	0.307514
458	7G-2	2	0.269	C	0.96357	69.7060	11.8	10.9817	4.6670	0.310235
459	7G-2	2	0.269	C	0.96357	69.7060	11.8	10.9817	5.8330	0.308753
460	7G-2	2	0.269	C	0.96357	69.7060	11.8	10.9817	7.1670	0.309381
461	3I-1	2	0.269	C	0.97918	64.3531	11.8	11.2122	0.0000	0.316043
462	3I-1	2	0.269	C	0.97918	64.3531	11.8	11.2122	0.4167	0.328936
463	3I-1	2	0.269	C	0.97918	64.3531	11.8	11.2122	1.5830	0.335523
464	3I-1	2	0.269	C	0.97918	64.3531	11.8	11.2122	2.0330	0.337732
465	3I-1	2	0.269	C	0.97918	64.3531	11.8	11.2122	3.5833	0.328837
466	3I-1	2	0.269	C	0.97918	64.3531	11.8	11.2122	4.7500	0.335314
467	3I-1	2	0.269	C	0.97918	64.3531	11.8	11.2122	5.5000	0.325319
468	3I-1	2	0.269	C	0.97918	64.3531	11.8	11.2122	7.0833	0.327585
469	6E-2	2	0.269	C	1.70818	73.3330	12.1	19.6108	0.0000	0.319764
470	6E-2	2	0.269	C	1.70818	73.3330	12.1	19.6108	1.0000	0.327175
471	6E-2	2	0.269	C	1.70818	73.3330	12.1	19.6108	2.0000	0.326926
472	6E-2	2	0.269	C	1.70818	73.3330	12.1	19.6108	3.1670	0.329937
473	6E-2	2	0.269	C	1.70818	73.3330	12.1	19.6108	4.0000	0.328412
474	6E-2	2	0.269	C	1.70818	73.3330	12.1	19.6108	5.0000	0.329202
475	6E-2	2	0.269	C	1.70818	73.3330	12.1	19.6108	6.0000	0.329219
476	6E-2	2	0.269	C	1.70818	73.3330	12.1	19.6108	7.0000	0.332301
477	6G-2	2	0.269	C	1.72379	69.9462	11.8	19.6892	0.0000	0.296450
478	6G-2	2	0.269	C	1.72379	69.9462	11.8	19.6892	0.5000	0.302178
479	6G-2	2	0.269	C	1.72379	69.9462	11.8	19.6892	1.5000	0.297857
480	6G-2	2	0.269	C	1.72379	69.9462	11.8	19.6892	2.5000	0.300006
481	6G-2	2	0.269	C	1.72379	69.9462	11.8	19.6892	3.5000	0.303405
482	6G-2	2	0.269	C	1.72379	69.9462	11.8	19.6892	4.5000	0.303054
483	6G-2	2	0.269	C	1.72379	69.9462	11.8	19.6892	5.5000	0.303984
484	6G-2	2	0.269	C	1.72379	69.9462	11.8	19.6892	6.9167	0.304521
485	2J-1	2	0.269	C	1.70037	67.2760	11.6	19.4984	0.0000	0.358222
486	2J-1	2	0.269	C	1.70037	67.2760	11.6	19.4984	0.5000	0.365073
487	2J-1	2	0.269	C	1.70037	67.2760	11.6	19.4984	1.5000	0.362218
488	2J-1	2	0.269	C	1.70037	67.2760	11.6	19.4984	2.5000	0.361830
489	2J-1	2	0.269	C	1.70037	67.2760	11.6	19.4984	3.3330	0.365315
490	2J-1	2	0.269	C	1.70037	67.2760	11.6	19.4984	4.5833	0.365341
491	2J-1	2	0.269	C	1.70037	67.2760	11.6	19.4984	5.5000	0.365358
492	2J-1	2	0.269	C	1.70037	67.2760	11.6	19.4984	7.0000	0.368912
493	3J-2	2	0.269	C	1.69665	76.8880	11.6	19.5463	0.0000	0.305831
494	3J-2	2	0.269	C	1.69665	76.8880	11.6	19.5463	0.5000	0.311663
495	3J-2	2	0.269	C	1.69665	76.8880	11.6	19.5463	1.5833	0.315476
496	3J-2	2	0.269	C	1.69665	76.8880	11.6	19.5463	2.5833	0.314863
497	3J-2	2	0.269	C	1.69665	76.8880	11.6	19.5463	4.5833	0.316540
498	3J-2	2	0.269	C	1.69665	76.8880	11.6	19.5463	5.5000	0.315821
499	3J-2	2	0.269	C	1.69665	76.8880	11.6	19.5463	6.5000	0.317882
500	3J-2	2	0.269	C	1.69665	76.8880	11.6	19.5463	7.0000	0.317584
501	8J-2	2	0.269	C	1.71896	69.0094	11.4	19.7975	0.0000	0.295423
502	8J-2	2	0.269	C	1.71896	69.0094	11.4	19.7975	0.5000	0.306323
503	8J-2	2	0.269	C	1.71896	69.0094	11.4	19.7975	1.6670	0.306906
504	8J-2	2	0.269	C	1.71896	69.0094	11.4	19.7975	2.0830	0.304909

OBS	TEST	BN	D	SURFACE	HOD	PD	MC	GM	TIMPASS	UK
505	8J-2	2	0.269	C	1.71896	69.0094	11.4	19.7975	3.5000	0.311095
506	8J-2	2	0.269	C	1.71896	69.0094	11.4	19.7975	4.7500	0.312127
507	8J-2	2	0.269	C	1.71896	69.0094	11.4	19.7975	5.4170	0.309783
508	8J-2	2	0.269	C	1.71896	69.0094	11.4	19.7975	7.3330	0.312213
509	15J-1	2	0.269	C	1.97584	67.9959	11.3	22.6336	0.0000	0.308546
510	15J-1	2	0.269	C	1.97584	67.9959	11.3	22.6336	0.5000	0.317391
511	15J-1	2	0.269	C	1.97584	67.9959	11.3	22.6336	1.5833	0.317443
512	15J-1	2	0.269	C	1.97584	67.9959	11.3	22.6336	2.7500	0.317541
513	15J-1	2	0.269	C	1.97584	67.9959	11.3	22.6336	3.5833	0.314715
514	15J-1	2	0.269	C	1.97584	67.9959	11.3	22.6336	4.5833	0.317213
515	15J-1	2	0.269	C	1.97584	67.9959	11.3	22.6336	5.5000	0.320308
516	15J-1	2	0.269	C	1.97584	67.9959	11.3	22.6336	6.5833	0.320673
517	15J-1	2	0.269	C	1.97584	67.9959	11.3	22.6336	9.5833	0.323909
518	1A-2	3	0.219	C	0.86895	35.8052	12.7	5.2374	0.0000	0.368393
519	1A-2	3	0.219	C	0.86895	35.8052	12.7	5.2374	0.2167	0.371608
520	1A-2	3	0.219	C	0.86895	35.8052	12.7	5.2374	0.4670	0.374328
521	1A-2	3	0.219	C	0.86895	35.8052	12.7	5.2374	5.7170	0.403427
522	5D-2	3	0.219	C	0.88721	36.6387	12.1	5.4758	0.0000	0.254522
523	5D-2	3	0.219	C	0.88721	36.6387	12.1	5.4758	0.3300	0.246512
524	5D-2	3	0.219	C	0.88721	36.6387	12.1	5.4758	1.3300	0.249737
525	5D-2	3	0.219	C	0.88721	36.6387	12.1	5.4758	2.8330	0.242916
526	5D-2	3	0.219	C	0.88721	36.6387	12.1	5.4758	3.3300	0.242930
527	5D-2	3	0.219	C	0.88721	36.6387	12.1	5.4758	4.3300	0.246836
528	5D-2	3	0.219	C	0.88721	36.6387	12.1	5.4758	5.3330	0.241396
529	5D-2	3	0.219	C	0.88721	36.6387	12.1	5.4758	7.3300	0.242184
530	7E-2	3	0.219	C	0.87671	42.6908	12.1	5.4468	0.0000	0.208266
531	7E-2	3	0.219	C	0.87671	42.6908	12.1	5.4468	1.0000	0.221439
532	7E-2	3	0.219	C	0.87671	42.6908	12.1	5.4468	2.0000	0.228784
533	7E-2	3	0.219	C	0.87671	42.6908	12.1	5.4468	3.1670	0.222916
534	7E-2	3	0.219	C	0.87671	42.6908	12.1	5.4468	4.0000	0.223401
535	7E-2	3	0.219	C	0.87671	42.6908	12.1	5.4468	5.0000	0.222479
536	7E-2	3	0.219	C	0.87671	42.6908	12.1	5.4468	6.0000	0.221406
537	7E-2	3	0.219	C	0.87671	42.6908	12.1	5.4468	7.0000	0.218545
538	3G-2	3	0.219	C	0.87123	41.3620	11.8	5.4672	0.0000	0.213814
539	3G-2	3	0.219	C	0.87123	41.3620	11.8	5.4672	0.3333	0.221667
540	3G-2	3	0.219	C	0.87123	41.3620	11.8	5.4672	1.3333	0.223879
541	3G-2	3	0.219	C	0.87123	41.3620	11.8	5.4672	2.3333	0.221847
542	3G-2	3	0.219	C	0.87123	41.3620	11.8	5.4672	3.3333	0.230148
543	3G-2	3	0.219	C	0.87123	41.3620	11.8	5.4672	4.3333	0.230168
544	3G-2	3	0.219	C	0.87123	41.3620	11.8	5.4672	5.3333	0.231271
545	3G-2	3	0.219	C	0.87123	41.3620	11.8	5.4672	6.3333	0.232233
546	3G-2	3	0.219	C	0.87123	41.3620	11.8	5.4672	7.3333	0.238255
547	2I-2	3	0.219	C	1.18082	43.8867	11.8	7.3983	0.0000	0.273128
548	2I-2	3	0.219	C	1.18082	43.8867	11.8	7.3983	0.5000	0.282194
549	2I-2	3	0.219	C	1.18082	43.8867	11.8	7.3983	2.0000	0.282498
550	2I-2	3	0.219	C	1.18082	43.8867	11.8	7.3983	2.5000	0.282512
551	2I-2	3	0.219	C	1.18082	43.8867	11.8	7.3983	3.2500	0.286385
552	2I-2	3	0.219	C	1.18082	43.8867	11.8	7.3983	4.5000	0.288637
553	2I-2	3	0.219	C	1.18082	43.8867	11.8	7.3983	5.5830	0.288637
554	2I-2	3	0.219	C	1.18082	43.8867	11.8	7.3983	6.8330	0.288650
555	7B-2	3	0.219	C	1.77215	32.1812	12.4	10.8136	0.0000	0.299187
556	7B-2	3	0.219	C	1.77215	32.1812	12.4	10.8136	0.1667	0.299655
557	7B-2	3	0.219	C	1.77215	32.1812	12.4	10.8136	1.1667	0.306142
558	7B-2	3	0.219	C	1.77215	32.1812	12.4	10.8136	2.1667	0.305082
559	7B-2	3	0.219	C	1.77215	32.1812	12.4	10.8136	4.1667	0.300346
560	7B-2	3	0.219	C	1.77215	32.1812	12.4	10.8136	5.1667	0.300361

OBS	TEST	BN	D	SURFACE	HOD	PD	MC	GM	TIMPASS	UK
561	7B-2	3	0.219	C	1.77215	32.1812	12.4	10.8136	6.16670	0.301561
562	5C-2	3	0.219	C	2.10639	39.4292	12.1	12.6552	0.00000	0.399440
563	5C-2	3	0.219	C	2.10639	39.4292	12.1	12.6552	1.00000	0.411895
564	5C-2	3	0.219	C	2.10639	39.4292	12.1	12.6552	2.00000	0.438057
565	5C-2	3	0.219	C	2.10639	39.4292	12.1	12.6552	3.00000	0.421372
566	5C-2	3	0.219	C	2.10639	39.4292	12.1	12.6552	4.00000	0.467696
567	5C-2	3	0.219	C	2.10639	39.4292	12.1	12.6552	5.16700	0.451485
568	5C-2	3	0.219	C	2.10639	39.4292	12.1	12.6552	6.00000	0.451497
569	7F-2	3	0.219	C	2.10046	47.0034	11.7	12.9245	0.00000	0.319123
570	7F-2	3	0.219	C	2.10046	47.0034	11.7	12.9245	0.50000	0.330580
571	7F-2	3	0.219	C	2.10046	47.0034	11.7	12.9245	1.50000	0.329984
572	7F-2	3	0.219	C	2.10046	47.0034	11.7	12.9245	2.50000	0.330042
573	7F-2	3	0.219	C	2.10046	47.0034	11.7	12.9245	3.50000	0.330050
574	7F-2	3	0.219	C	2.10046	47.0034	11.7	12.9245	4.50000	0.330044
575	7F-2	3	0.219	C	2.10046	47.0034	11.7	12.9245	5.50000	0.329365
576	7F-2	3	0.219	C	2.10046	47.0034	11.7	12.9245	7.00000	0.333954
577	7H-1	3	0.219	C	2.09452	37.5173	11.8	12.8636	0.00000	0.357467
578	7H-1	3	0.219	C	2.09452	37.5173	11.8	12.8636	0.58330	0.481283
579	7H-1	3	0.219	C	2.09452	37.5173	11.8	12.8636	1.08333	0.617356
580	7H-1	3	0.219	C	2.09452	37.5173	11.8	12.8636	2.33300	0.555901
581	7H-1	3	0.219	C	2.09452	37.5173	11.8	12.8636	3.50000	0.513336
582	7H-1	3	0.219	C	2.09452	37.5173	11.8	12.8636	4.08330	0.513721
583	7H-1	3	0.219	C	2.09452	37.5173	11.8	12.8636	5.08330	0.715889
584	7H-1	3	0.219	C	2.09452	37.5173	11.8	12.8636	6.00000	0.616709
585	7H-1	3	0.219	C	2.09452	37.5173	11.8	12.8636	7.33300	0.616723
586	11J-2	3	0.219	C	2.13105	42.1110	11.3	13.2111	0.00000	0.370000
587	11J-2	3	0.219	C	2.13105	42.1110	11.3	13.2111	0.50000	0.380410
588	11J-2	3	0.219	C	2.13105	42.1110	11.3	13.2111	1.66700	0.392087
589	11J-2	3	0.219	C	2.13105	42.1110	11.3	13.2111	2.50000	0.391390
590	11J-2	3	0.219	C	2.13105	42.1110	11.3	13.2111	3.58300	0.415029
591	11J-2	3	0.219	C	2.13105	42.1110	11.3	13.2111	4.75000	0.415048
592	11J-2	3	0.219	C	2.13105	42.1110	11.3	13.2111	5.50000	0.378456
593	11J-2	3	0.219	C	2.13105	42.1110	11.3	13.2111	7.50000	0.440611
594	9A-2	3	0.219	C	0.86347	56.5759	12.0	5.4698	0.00000	0.305128
595	9A-2	3	0.219	C	0.86347	56.5759	12.0	5.4698	0.23300	0.305569
596	9A-2	3	0.219	C	0.86347	56.5759	12.0	5.4698	1.06700	0.304747
597	9A-2	3	0.219	C	0.86347	56.5759	12.0	5.4698	2.23300	0.302485
598	9A-2	3	0.219	C	0.86347	56.5759	12.0	5.4698	3.51670	0.285713
599	9A-2	3	0.219	C	0.86347	56.5759	12.0	5.4698	4.23330	0.288146
600	9A-2	3	0.219	C	0.86347	56.5759	12.0	5.4698	5.73300	0.288193
601	1C-2	3	0.219	C	0.88630	50.9018	12.1	5.4810	0.00000	0.257937
602	1C-2	3	0.219	C	0.88630	50.9018	12.1	5.4810	0.50000	0.269446
603	1C-2	3	0.219	C	0.88630	50.9018	12.1	5.4810	1.50000	0.271123
604	1C-2	3	0.219	C	0.88630	50.9018	12.1	5.4810	2.50000	0.264747
605	1C-2	3	0.219	C	0.88630	50.9018	12.1	5.4810	3.50000	0.272791
606	1C-2	3	0.219	C	0.88630	50.9018	12.1	5.4810	4.50000	0.269610
607	1C-2	3	0.219	C	0.88630	50.9018	12.1	5.4810	6.00000	0.272851
608	8E-2	3	0.219	C	0.84749	50.0475	12.2	5.2940	0.00000	0.222636
609	8E-2	3	0.219	C	0.84749	50.0475	12.2	5.2940	1.00000	0.235421
610	8E-2	3	0.219	C	0.84749	50.0475	12.2	5.2940	2.00000	0.217015
611	8E-2	3	0.219	C	0.84749	50.0475	12.2	5.2940	3.00000	0.197800
612	8E-2	3	0.219	C	0.84749	50.0475	12.2	5.2940	4.00000	0.200056
613	8E-2	3	0.219	C	0.84749	50.0475	12.2	5.2940	5.00000	0.198221
614	8E-2	3	0.219	C	0.84749	50.0475	12.2	5.2940	6.00000	0.196758
615	8E-2	3	0.219	C	0.84749	50.0475	12.2	5.2940	7.00000	0.192661
616	2G-1	3	0.219	C	0.85616	59.6512	11.7	5.3705	0.00000	0.223785

OBS	TEST	BN	D	SURFACE	HOD	PD	MC	GM	TIMPASS	UK
617	2G-1	3	0.219	C	0.85616	59.6512	11.7	5.3705	0.5000	0.234806
618	2G-1	3	0.219	C	0.85616	59.6512	11.7	5.3705	1.5000	0.234936
619	2G-1	3	0.219	C	0.85616	59.6512	11.7	5.3705	2.5000	0.233169
620	2G-1	3	0.219	C	0.85616	59.6512	11.7	5.3705	3.5000	0.235040
621	2G-1	3	0.219	C	0.85616	59.6512	11.7	5.3705	4.5000	0.231378
622	2G-1	3	0.219	C	0.85616	59.6512	11.7	5.3705	5.5000	0.235107
623	2G-1	3	0.219	C	0.85616	59.6512	11.7	5.3705	6.7500	0.237372
624	1I-2	3	0.219	C	1.18128	54.8312	11.8	7.3766	0.0000	0.301142
625	1I-2	3	0.219	C	1.18128	54.8312	11.8	7.3766	0.5000	0.309482
626	1I-2	3	0.219	C	1.18128	54.8312	11.8	7.3766	1.5000	0.314579
627	1I-2	3	0.219	C	1.18128	54.8312	11.8	7.3766	2.7500	0.311250
628	1I-2	3	0.219	C	1.18128	54.8312	11.8	7.3766	4.0000	0.315608
629	1I-2	3	0.219	C	1.18128	54.8312	11.8	7.3766	4.7500	0.315635
630	1I-2	3	0.219	C	1.18128	54.8312	11.8	7.3766	5.5000	0.315635
631	1I-2	3	0.219	C	1.18128	54.8312	11.8	7.3766	7.7500	0.315725
632	9B-2	3	0.219	C	2.10959	51.1917	12.5	12.6958	0.0000	0.311013
633	9B-2	3	0.219	C	2.10959	51.1917	12.5	12.6958	0.3300	0.310089
634	9B-2	3	0.219	C	2.10959	51.1917	12.5	12.6958	1.3300	0.318415
635	9B-2	3	0.219	C	2.10959	51.1917	12.5	12.6958	2.3300	0.316607
636	9B-2	3	0.219	C	2.10959	51.1917	12.5	12.6958	3.3300	0.321640
637	9B-2	3	0.219	C	2.10959	51.1917	12.5	12.6958	4.3300	0.326221
638	9B-2	3	0.219	C	2.10959	51.1917	12.5	12.6958	5.8330	0.314796
639	1D-2	3	0.219	C	2.11096	49.6489	12.0	12.8079	0.0000	0.328996
640	1D-2	3	0.219	C	2.11096	49.6489	12.0	12.8079	1.0000	0.348974
641	1D-2	3	0.219	C	2.11096	49.6489	12.0	12.8079	2.0000	0.349085
642	1D-2	3	0.219	C	2.11096	49.6489	12.0	12.8079	3.0000	0.348458
643	1D-2	3	0.219	C	2.11096	49.6489	12.0	12.8079	4.0000	0.347828
644	1D-2	3	0.219	C	2.11096	49.6489	12.0	12.8079	5.0000	0.347954
645	1D-2	3	0.219	C	2.11096	49.6489	12.0	12.8079	6.0000	0.346642
646	1D-2	3	0.219	C	2.11096	49.6489	12.0	12.8079	7.1830	0.341071
647	8F-2	3	0.219	C	2.11050	58.3827	12.0	13.0282	0.0000	0.307208
648	8F-2	3	0.219	C	2.11050	58.3827	12.0	13.0282	0.7500	0.320278
649	8F-2	3	0.219	C	2.11050	58.3827	12.0	13.0282	3.2500	0.319294
650	8F-2	3	0.219	C	2.11050	58.3827	12.0	13.0282	3.7500	0.323223
651	8F-2	3	0.219	C	2.11050	58.3827	12.0	13.0282	4.7500	0.328457
652	8F-2	3	0.219	C	2.11050	58.3827	12.0	13.0282	5.7500	0.322662
653	8F-2	3	0.219	C	2.11050	58.3827	12.0	13.0282	6.7500	0.318283
654	8F-2	3	0.219	C	2.11050	58.3827	12.0	13.0282	7.2500	0.322787
655	5G-2	3	0.219	C	2.09589	62.1155	11.7	12.8774	0.0000	0.301763
656	5G-2	3	0.219	C	2.09589	62.1155	11.7	12.8774	0.5000	0.301573
657	5G-2	3	0.219	C	2.09589	62.1155	11.7	12.8774	1.5000	0.301683
658	5G-2	3	0.219	C	2.09589	62.1155	11.7	12.8774	2.5000	0.304831
659	5G-2	3	0.219	C	2.09589	62.1155	11.7	12.8774	3.5000	0.308027
660	5G-2	3	0.219	C	2.09589	62.1155	11.7	12.8774	4.6670	0.308584
661	5G-2	3	0.219	C	2.09589	62.1155	11.7	12.8774	5.5000	0.308119
662	5G-2	3	0.219	C	2.09589	62.1155	11.7	12.8774	7.0000	0.308675
663	4I-2	3	0.219	C	2.11872	55.7010	11.8	13.1660	0.0000	0.299292
664	4I-2	3	0.219	C	2.11872	55.7010	11.8	13.1660	0.5833	0.304082
665	4I-2	3	0.219	C	2.11872	55.7010	11.8	13.1660	1.5000	0.307748
666	4I-2	3	0.219	C	2.11872	55.7010	11.8	13.1660	2.5000	0.307838
667	4I-2	3	0.219	C	2.11872	55.7010	11.8	13.1660	3.5000	0.307852
668	4I-2	3	0.219	C	2.11872	55.7010	11.8	13.1660	4.6670	0.307894
669	4I-2	3	0.219	C	2.11872	55.7010	11.8	13.1660	5.5000	0.304308
670	4I-2	3	0.219	C	2.11872	55.7010	11.8	13.1660	7.3330	0.307909
671	2A-2	3	0.219	C	0.87991	76.1525	11.8	5.3004	0.0000	0.287585
672	2A-2	3	0.219	C	0.87991	76.1525	11.8	5.3004	0.7167	0.292270

OBS	TEST	BN	D	SURFACE	HOD	PO	MC	GM	TIMPASS	UK
673	2A-2	3	0.219	C	0.87991	76.1525	11.8	5.3004	2.3830	0.293853
674	2A-2	3	0.219	C	0.87991	76.1525	11.8	5.3004	3.3830	0.292771
675	2A-2	3	0.219	C	0.87991	76.1525	11.8	5.3004	5.8800	0.296467
676	2A-2	3	0.219	C	0.87991	76.1525	11.8	5.3004	7.1000	0.296513
677	9C-2	3	0.219	C	0.88676	63.7463	12.1	5.4626	0.0000	0.233944
678	9C-2	3	0.219	C	0.88676	63.7463	12.1	5.4626	0.8670	0.234392
679	9C-2	3	0.219	C	0.88676	63.7463	12.1	5.4626	1.8670	0.231865
680	9C-2	3	0.219	C	0.88676	63.7463	12.1	5.4626	2.8670	0.230218
681	9C-2	3	0.219	C	0.88676	63.7463	12.1	5.4626	3.8670	0.234799
682	9C-2	3	0.219	C	0.88676	63.7463	12.1	5.4626	4.8670	0.234826
683	9C-2	3	0.219	C	0.88676	63.7463	12.1	5.4626	5.8670	0.232106
684	9C-2	3	0.219	C	0.88676	63.7463	12.1	5.4626	6.8670	0.223906
685	4H-2	3	0.219	C	0.86895	68.6025	11.8	5.4700	0.0000	0.263765
686	4H-2	3	0.219	C	0.86895	68.6025	11.8	5.4700	0.5000	0.269098
687	4H-2	3	0.219	C	0.86895	68.6025	11.8	5.4700	1.5000	0.267962
688	4H-2	3	0.219	C	0.86895	68.6025	11.8	5.4700	2.5000	0.266746
689	4H-2	3	0.219	C	0.86895	68.6025	11.8	5.4700	3.5000	0.265803
690	4H-2	3	0.219	C	0.86895	68.6025	11.8	5.4700	4.5000	0.266836
691	4H-2	3	0.219	C	0.86895	68.6025	11.8	5.4700	5.5000	0.265075
692	4H-2	3	0.219	C	0.86895	68.6025	11.8	5.4700	7.0000	0.267397
693	9I-2	3	0.219	C	1.18995	76.6477	11.5	7.4706	0.0000	0.256727
694	9I-2	3	0.219	C	1.18995	76.6477	11.5	7.4706	0.5000	0.261666
695	9I-2	3	0.219	C	1.18995	76.6477	11.5	7.4706	2.4167	0.259371
696	9I-2	3	0.219	C	1.18995	76.6477	11.5	7.4706	3.6670	0.261920
697	9I-2	3	0.219	C	1.18995	76.6477	11.5	7.4706	4.5833	0.261850
698	9I-2	3	0.219	C	1.18995	76.6477	11.5	7.4706	5.5000	0.264273
699	9I-2	3	0.219	C	1.18995	76.6477	11.5	7.4706	6.5000	0.262829
700	9I-2	3	0.219	C	1.18995	76.6477	11.5	7.4706	7.0000	0.260363
701	12J-2	3	0.219	C	1.18128	69.5085	11.4	7.4069	0.0000	0.236881
702	12J-2	3	0.219	C	1.18128	69.5085	11.4	7.4069	0.5000	0.246489
703	12J-2	3	0.219	C	1.18128	69.5085	11.4	7.4069	1.5833	0.248423
704	12J-2	3	0.219	C	1.18128	69.5085	11.4	7.4069	2.6670	0.250071
705	12J-2	3	0.219	C	1.18128	69.5085	11.4	7.4069	3.5833	0.251575
706	12J-2	3	0.219	C	1.18128	69.5085	11.4	7.4069	4.5833	0.250489
707	12J-2	3	0.219	C	1.18128	69.5085	11.4	7.4069	5.5000	0.251421
708	12J-2	3	0.219	C	1.18128	69.5085	11.4	7.4069	7.2500	0.245667
709	2B-2	3	0.219	C	1.80365	69.8708	12.1	11.0643	0.0000	0.283942
710	2B-2	3	0.219	C	1.80365	69.8708	12.1	11.0643	0.5833	0.288737
711	2B-2	3	0.219	C	1.80365	69.8708	12.1	11.0643	1.2500	0.293780
712	2B-2	3	0.219	C	1.80365	69.8708	12.1	11.0643	2.7500	0.291581
713	2B-2	3	0.219	C	1.80365	69.8708	12.1	11.0643	3.2000	0.290445
714	2B-2	3	0.219	C	1.80365	69.8708	12.1	11.0643	4.5330	0.290552
715	2B-2	3	0.219	C	1.80365	69.8708	12.1	11.0643	5.5330	0.290559
716	6C-2	3	0.219	C	2.09269	68.3488	12.1	12.5253	0.0000	0.362045
717	6C-2	3	0.219	C	2.09269	68.3488	12.1	12.5253	0.6670	0.369937
718	6C-2	3	0.219	C	2.09269	68.3488	12.1	12.5253	1.5000	0.379818
719	6C-2	3	0.219	C	2.09269	68.3488	12.1	12.5253	2.6670	0.386415
720	6C-2	3	0.219	C	2.09269	68.3488	12.1	12.5253	3.6670	0.384047
721	6C-2	3	0.219	C	2.09269	68.3488	12.1	12.5253	4.5000	0.383566
722	6C-2	3	0.219	C	2.09269	68.3488	12.1	12.5253	5.5000	0.388841
723	6C-2	3	0.219	C	2.09269	68.3488	12.1	12.5253	5.9330	0.388849
724	3F-2	3	0.219	C	1.77763	73.2671	12.1	11.0026	0.0000	0.285706
725	3F-2	3	0.219	C	1.77763	73.2671	12.1	11.0026	0.5000	0.289459
726	3F-2	3	0.219	C	1.77763	73.2671	12.1	11.0026	1.5000	0.293153
727	3F-2	3	0.219	C	1.77763	73.2671	12.1	11.0026	2.5000	0.293473
728	3F-2	3	0.219	C	1.77763	73.2671	12.1	11.0026	3.5000	0.287648

OBS	TEST	BN	D	SURFACE	HOD	PO	MC	GM	TIMPASS	UK
729	3F-2	3	0.21900	C	1.77763	73.2671	12.1	11.0026	5.5000	0.291862
730	3F-2	3	0.21900	C	1.77763	73.2671	12.1	11.0026	7.0000	0.287742
731	9H-1	3	0.21900	C	2.11872	70.0631	11.8	13.0861	0.0000	0.321646
732	9H-1	3	0.21900	C	2.11872	70.0631	11.8	13.0861	0.5000	0.384493
733	9H-1	3	0.21900	C	2.11872	70.0631	11.8	13.0861	1.5000	0.384209
734	9H-1	3	0.21900	C	2.11872	70.0631	11.8	13.0861	2.5000	0.383998
735	9H-1	3	0.21900	C	2.11872	70.0631	11.8	13.0861	3.6670	0.384129
736	9H-1	3	0.21900	C	2.11872	70.0631	11.8	13.0861	4.5833	0.392809
737	9H-1	3	0.21900	C	2.11872	70.0631	11.8	13.0861	5.6670	0.383917
738	9H-1	3	0.21900	C	2.11872	70.0631	11.8	13.0861	7.5000	0.383061
739	5I-2	3	0.21900	C	2.11872	70.1245	11.8	13.1789	0.0000	0.281167
740	5I-2	3	0.21900	C	2.11872	70.1245	11.8	13.1789	0.5000	0.287875
741	5I-2	3	0.21900	C	2.11872	70.1245	11.8	13.1789	1.5000	0.287033
742	5I-2	3	0.21900	C	2.11872	70.1245	11.8	13.1789	2.5833	0.287072
743	5I-2	3	0.21900	C	2.11872	70.1245	11.8	13.1789	4.4167	0.281977
744	5I-2	3	0.21900	C	2.11872	70.1245	11.8	13.1789	5.5000	0.284808
745	5I-2	3	0.21900	C	2.11872	70.1245	11.8	13.1789	6.4167	0.284328
746	5I-2	3	0.21900	C	2.11872	70.1245	11.8	13.1789	7.0000	0.283855
747	G-G	7	0.26165	G	1.06593	52.7008	12.1	11.5994	0.0000	0.364164
748	G-G	7	0.26165	G	1.06593	52.7008	12.1	11.5994	1.0000	0.375259
749	G-G	7	0.26165	G	1.06593	52.7008	12.1	11.5994	2.2500	0.379204
750	G-G	7	0.26165	G	1.06593	52.7008	12.1	11.5994	3.0000	0.382206
751	G-G	7	0.26165	G	1.06593	52.7008	12.1	11.5994	4.0000	0.381316
752	G-G	7	0.26165	G	1.06593	52.7008	12.1	11.5994	5.0000	0.381344
753	G-G	7	0.26165	G	1.06593	52.7008	12.1	11.5994	6.0000	0.381388
754	G-G	7	0.26165	G	1.06593	52.7008	12.1	11.5994	7.0000	0.378006
755	1A-1	4	0.30700	S	0.99739	44.9073	12.7	16.4045	0.0000	0.189031
756	1A-1	4	0.30700	S	0.99739	44.9073	12.7	16.4045	0.0670	0.180510
757	1A-1	4	0.30700	S	0.99739	44.9073	12.7	16.4045	5.3330	0.158180
758	8C-1	4	0.30700	S	1.04886	40.1229	12.0	17.5016	0.0000	0.161627
759	8C-1	4	0.30700	S	1.04886	40.1229	12.0	17.5016	0.7830	0.142337
760	8C-1	4	0.30700	S	1.04886	40.1229	12.0	17.5016	1.7830	0.136566
761	8C-1	4	0.30700	S	1.04886	40.1229	12.0	17.5016	2.7830	0.136622
762	8C-1	4	0.30700	S	1.04886	40.1229	12.0	17.5016	3.7830	0.135437
763	8C-1	4	0.30700	S	1.04886	40.1229	12.0	17.5016	4.7830	0.132584
764	8C-1	4	0.30700	S	1.04886	40.1229	12.0	17.5016	5.7830	0.133825
765	8C-1	4	0.30700	S	1.04886	40.1229	12.0	17.5016	6.2830	0.130663
766	1E-1	4	0.30700	S	1.01042	39.9266	12.1	17.1607	0.0000	0.152338
767	1E-1	4	0.30700	S	1.01042	39.9266	12.1	17.1607	1.0000	0.134097
768	1E-1	4	0.30700	S	1.01042	39.9266	12.1	17.1607	2.0000	0.133258
769	1E-1	4	0.30700	S	1.01042	39.9266	12.1	17.1607	3.0000	0.133310
770	1E-1	4	0.30700	S	1.01042	39.9266	12.1	17.1607	4.0000	0.132382
771	1E-1	4	0.30700	S	1.01042	39.9266	12.1	17.1607	5.0000	0.129947
772	1E-1	4	0.30700	S	1.01042	39.9266	12.1	17.1607	6.0000	0.127534
773	1E-1	4	0.30700	S	1.01042	39.9266	12.1	17.1607	7.0000	0.125131
774	9G-1	4	0.30700	S	1.03062	38.7391	11.8	17.7096	0.0000	0.151383
775	9G-1	4	0.30700	S	1.03062	38.7391	11.8	17.7096	0.5000	0.140252
776	9G-1	4	0.30700	S	1.03062	38.7391	11.8	17.7096	1.5000	0.135563
777	9G-1	4	0.30700	S	1.03062	38.7391	11.8	17.7096	2.5000	0.131825
778	9G-1	4	0.30700	S	1.03062	38.7391	11.8	17.7096	3.5000	0.131860
779	9G-1	4	0.30700	S	1.03062	38.7391	11.8	17.7096	4.8330	0.129117
780	9G-1	4	0.30700	S	1.03062	38.7391	11.8	17.7096	5.5000	0.129890
781	9G-1	4	0.30700	S	1.03062	38.7391	11.8	17.7096	7.0000	0.127166
782	2I-1	4	0.30700	S	1.00945	40.9271	11.8	17.3683	0.0000	0.145803
783	2I-1	4	0.30700	S	1.00945	40.9271	11.8	17.3683	0.5000	0.134116
784	2I-1	4	0.30700	S	1.00945	40.9271	11.8	17.3683	2.0000	0.129445

OBS	TEST	BN	D	SURFACE	HOD	PO	MC	GM	TIMPASS	UK
785	2I-1	4	0.307	S	1.00945	40.9271	11.8	17.3683	2.5000	0.132326
786	2I-1	4	0.307	S	1.00945	40.9271	11.8	17.3683	3.2500	0.130157
787	2I-1	4	0.307	S	1.00945	40.9271	11.8	17.3683	4.5000	0.129993
788	2I-1	4	0.307	S	1.00945	40.9271	11.8	17.3683	5.5830	0.126710
789	2I-1	4	0.307	S	1.00945	40.9271	11.8	17.3683	6.8830	0.128148
790	5J-1	4	0.307	S	0.99414	42.4138	11.7	17.1010	0.0000	0.148731
791	5J-1	4	0.307	S	0.99414	42.4138	11.7	17.1010	0.5833	0.138290
792	5J-1	4	0.307	S	0.99414	42.4138	11.7	17.1010	1.5000	0.131314
793	5J-1	4	0.307	S	0.99414	42.4138	11.7	17.1010	2.4670	0.131357
794	5J-1	4	0.307	S	0.99414	42.4138	11.7	17.1010	3.7500	0.128626
795	5J-1	4	0.307	S	0.99414	42.4138	11.7	17.1010	4.6670	0.129352
796	5J-1	4	0.307	S	0.99414	42.4138	11.7	17.1010	5.8330	0.128672
797	5J-1	4	0.307	S	0.99414	42.4138	11.7	17.1010	7.0833	0.127534
798	7B-1	4	0.307	S	1.97264	40.3407	12.4	31.5065	0.0000	0.167300
799	7B-1	4	0.307	S	1.97264	40.3407	12.4	31.5065	0.5833	0.141794
800	7B-1	4	0.307	S	1.97264	40.3407	12.4	31.5065	1.5833	0.135830
801	7B-1	4	0.307	S	1.97264	40.3407	12.4	31.5065	2.5833	0.133689
802	7B-1	4	0.307	S	1.97264	40.3407	12.4	31.5065	4.5833	0.127759
803	7B-1	4	0.307	S	1.97264	40.3407	12.4	31.5065	5.5833	0.128274
804	7B-1	4	0.307	S	1.97264	40.3407	12.4	31.5065	6.0833	0.122215
805	2D-1	4	0.307	S	1.83713	41.2086	12.2	30.8557	0.0000	0.157027
806	2D-1	4	0.307	S	1.83713	41.2086	12.2	30.8557	0.2300	0.140859
807	2D-1	4	0.307	S	1.83713	41.2086	12.2	30.8557	0.6500	0.134090
808	2D-1	4	0.307	S	1.83713	41.2086	12.2	30.8557	1.6500	0.128511
809	2D-1	4	0.307	S	1.83713	41.2086	12.2	30.8557	2.6500	0.126236
810	2D-1	4	0.307	S	1.83713	41.2086	12.2	30.8557	3.6500	0.122639
811	2D-1	4	0.307	S	1.83713	41.2086	12.2	30.8557	4.6500	0.122681
812	2D-1	4	0.307	S	1.83713	41.2086	12.2	30.8557	5.6500	0.121566
813	2D-1	4	0.307	S	1.83713	41.2086	12.2	30.8557	6.6500	0.120702
814	4E-1	4	0.307	S	1.83941	38.9728	12.1	32.1611	0.0000	0.136132
815	4E-1	4	0.307	S	1.83941	38.9728	12.1	32.1611	1.0000	0.115502
816	4E-1	4	0.307	S	1.83941	38.9728	12.1	32.1611	2.0000	0.110907
817	4E-1	4	0.307	S	1.83941	38.9728	12.1	32.1611	2.7500	0.111195
818	4E-1	4	0.307	S	1.83941	38.9728	12.1	32.1611	4.0000	0.107534
819	4E-1	4	0.307	S	1.83941	38.9728	12.1	32.1611	5.0000	0.105613
820	4E-1	4	0.307	S	1.83941	38.9728	12.1	32.1611	6.0000	0.105630
821	4E-1	4	0.307	S	1.83941	38.9728	12.1	32.1611	7.0000	0.105641
822	1H-1	4	0.307	S	1.83778	41.7967	11.8	31.2807	0.0000	0.142084
823	1H-1	4	0.307	S	1.83778	41.7967	11.8	31.2807	0.5000	0.124386
824	1H-1	4	0.307	S	1.83778	41.7967	11.8	31.2807	1.5000	0.119439
825	1H-1	4	0.307	S	1.83778	41.7967	11.8	31.2807	2.5000	0.118001
826	1H-1	4	0.307	S	1.83778	41.7967	11.8	31.2807	3.5000	0.115493
827	1H-1	4	0.307	S	1.83778	41.7967	11.8	31.2807	4.5000	0.114462
828	1H-1	4	0.307	S	1.83778	41.7967	11.8	31.2807	5.5000	0.112584
829	1H-1	4	0.307	S	1.83778	41.7967	11.8	31.2807	6.5000	0.113429
830	6I-1	4	0.307	S	1.72476	43.1805	11.4	29.7295	0.0000	0.135882
831	6I-1	4	0.307	S	1.72476	43.1805	11.4	29.7295	0.5000	0.118664
832	6I-1	4	0.307	S	1.72476	43.1805	11.4	29.7295	1.5000	0.113888
833	6I-1	4	0.307	S	1.72476	43.1805	11.4	29.7295	2.5000	0.112291
834	6I-1	4	0.307	S	1.72476	43.1805	11.4	29.7295	3.8330	0.109112
835	6I-1	4	0.307	S	1.72476	43.1805	11.4	29.7295	4.5000	0.109122
836	6I-1	4	0.307	S	1.72476	43.1805	11.4	29.7295	5.3330	0.109136
837	6I-1	4	0.307	S	1.72476	43.1805	11.4	29.7295	7.0000	0.106789
838	6B-2	4	0.307	S	0.83453	54.2712	12.2	14.1391	0.0000	0.134509
839	6B-2	4	0.307	S	0.83453	54.2712	12.2	14.1391	0.6670	0.107564
840	6B-2	4	0.307	S	0.83453	54.2712	12.2	14.1391	1.6670	0.100758

OBS	TEST	BN	D	SURFACE	HOD	PO	MC	GM	TIMPASS	UK
841	6B-2	4	0.307	S	0.83453	54.2712	12.2	14.1391	2.6670	0.097746
842	6B-2	4	0.307	S	0.83453	54.2712	12.2	14.1391	3.6670	0.093352
843	6B-2	4	0.307	S	0.83453	54.2712	12.2	14.1391	4.6670	0.086325
844	6B-2	4	0.307	S	0.83453	54.2712	12.2	14.1391	5.7500	0.088100
845	4D-1	4	0.307	S	1.00293	51.9233	12.1	16.9419	0.0000	0.160157
846	4D-1	4	0.307	S	1.00293	51.9233	12.1	16.9419	0.6670	0.148389
847	4D-1	4	0.307	S	1.00293	51.9233	12.1	16.9419	1.6670	0.139531
848	4D-1	4	0.307	S	1.00293	51.9233	12.1	16.9419	2.6670	0.137147
849	4D-1	4	0.307	S	1.00293	51.9233	12.1	16.9419	3.6670	0.137198
850	4D-1	4	0.307	S	1.00293	51.9233	12.1	16.9419	4.6670	0.135282
851	4D-1	4	0.307	S	1.00293	51.9233	12.1	16.9419	5.6670	0.135320
852	4D-1	4	0.307	S	1.00293	51.9233	12.1	16.9419	6.8330	0.136327
853	6D-1	4	0.307	S	1.06026	61.8161	12.2	17.9695	0.0000	0.152811
854	6D-1	4	0.307	S	1.06026	61.8161	12.2	17.9695	1.0833	0.124175
855	6D-1	4	0.307	S	1.06026	61.8161	12.2	17.9695	2.1666	0.120001
856	6D-1	4	0.307	S	1.06026	61.8161	12.2	17.9695	3.0830	0.114366
857	6D-1	4	0.307	S	1.06026	61.8161	12.2	17.9695	4.0833	0.112080
858	6D-1	4	0.307	S	1.06026	61.8161	12.2	17.9695	5.0830	0.112994
859	6D-1	4	0.307	S	1.06026	61.8161	12.2	17.9695	6.0830	0.113012
860	6D-1	4	0.307	S	1.06026	61.8161	12.2	17.9695	6.3330	0.110829
861	2E-1	4	0.307	S	0.99674	52.3520	12.0	16.9485	0.0000	0.146553
862	2E-1	4	0.307	S	0.99674	52.3520	12.0	16.9485	1.0000	0.122175
863	2E-1	4	0.307	S	0.99674	52.3520	12.0	16.9485	2.2500	0.122859
864	2E-1	4	0.307	S	0.99674	52.3520	12.0	16.9485	4.0000	0.120470
865	2E-1	4	0.307	S	0.99674	52.3520	12.0	16.9485	5.0000	0.121252
866	2E-1	4	0.307	S	0.99674	52.3520	12.0	16.9485	6.0000	0.116118
867	2E-1	4	0.307	S	0.99674	52.3520	12.0	16.9485	7.0000	0.114797
868	5H-1	4	0.307	S	1.00130	52.4282	11.7	17.1865	0.0000	0.142721
869	5H-1	4	0.307	S	1.00130	52.4282	11.7	17.1865	0.5000	0.127384
870	5H-1	4	0.307	S	1.00130	52.4282	11.7	17.1865	1.8330	0.122320
871	5H-1	4	0.307	S	1.00130	52.4282	11.7	17.1865	2.5000	0.120521
872	5H-1	4	0.307	S	1.00130	52.4282	11.7	17.1865	3.5000	0.120554
873	5H-1	4	0.307	S	1.00130	52.4282	11.7	17.1865	4.5000	0.116198
874	5H-1	4	0.307	S	1.00130	52.4282	11.7	17.1865	5.5000	0.121346
875	5H-1	4	0.307	S	1.00130	52.4282	11.7	17.1865	7.2500	0.119884
876	9B-1	4	0.307	S	1.80912	53.9015	12.3	30.5275	0.0000	0.159185
877	9B-1	4	0.307	S	1.80912	53.9015	12.3	30.5275	0.7500	0.137107
878	9B-1	4	0.307	S	1.80912	53.9015	12.3	30.5275	1.7500	0.132511
879	9B-1	4	0.307	S	1.80912	53.9015	12.3	30.5275	2.7500	0.129630
880	9B-1	4	0.307	S	1.80912	53.9015	12.3	30.5275	3.7500	0.126785
881	9B-1	4	0.307	S	1.80912	53.9015	12.3	30.5275	4.7500	0.126813
882	9B-1	4	0.307	S	1.80912	53.9015	12.3	30.5275	6.0000	0.124007
883	6C-1	4	0.307	S	1.83616	61.2270	12.1	30.6728	0.0000	0.157765
884	6C-1	4	0.307	S	1.83616	61.2270	12.1	30.6728	0.6670	0.137219
885	6C-1	4	0.307	S	1.83616	61.2270	12.1	30.6728	1.5000	0.131331
886	6C-1	4	0.307	S	1.83616	61.2270	12.1	30.6728	2.6670	0.128506
887	6C-1	4	0.307	S	1.83616	61.2270	12.1	30.6728	3.6670	0.127281
888	6C-1	4	0.307	S	1.83616	61.2270	12.1	30.6728	4.5000	0.125862
889	6C-1	4	0.307	S	1.83616	61.2270	12.1	30.6728	5.5000	0.124632
890	6C-1	4	0.307	S	1.83616	61.2270	12.1	30.6728	5.9330	0.124477
891	7D-1	4	0.307	S	1.84430	52.0635	12.1	31.0856	0.0000	0.139400
892	7D-1	4	0.307	S	1.84430	52.0635	12.1	31.0856	1.0000	0.118055
893	7D-1	4	0.307	S	1.84430	52.0635	12.1	31.0856	2.0000	0.112047
894	7D-1	4	0.307	S	1.84430	52.0635	12.1	31.0856	3.0000	0.109323
895	7D-1	4	0.307	S	1.84430	52.0635	12.1	31.0856	4.0000	0.109089
896	7D-1	4	0.307	S	1.84430	52.0635	12.1	31.0856	5.0000	0.106379

OBS	TEST	BN	D	SURFACE	HOD	PO	MC	GM	TIMPASS	UK
897	7D-1	4	0.307	S	1.84430	52.0635	12.1	31.0856	6.0000	0.105555
898	7D-1	4	0.307	S	1.84430	52.0635	12.1	31.0856	7.0000	0.105721
899	2F-1	4	0.307	S	1.86710	53.6437	12.2	31.6626	0.0000	0.142208
900	2F-1	4	0.307	S	1.86710	53.6437	12.2	31.6626	0.7500	0.120081
901	2F-1	4	0.307	S	1.86710	53.6437	12.2	31.6626	1.7500	0.115940
902	2F-1	4	0.307	S	1.86710	53.6437	12.2	31.6626	2.7500	0.113165
903	2F-1	4	0.307	S	1.86710	53.6437	12.2	31.6626	3.7500	0.113202
904	2F-1	4	0.307	S	1.86710	53.6437	12.2	31.6626	4.7500	0.113040
905	2F-1	4	0.307	S	1.86710	53.6437	12.2	31.6626	5.7500	0.110464
906	2F-1	4	0.307	S	1.86710	53.6437	12.2	31.6626	8.0000	0.108583
907	5G-1	4	0.307	S	1.82736	54.1954	12.8	31.2733	0.0000	0.134488
908	5G-1	4	0.307	S	1.82736	54.1954	12.8	31.2733	0.5000	0.120189
909	5G-1	4	0.307	S	1.82736	54.1954	12.8	31.2733	1.5000	0.114952
910	5G-1	4	0.307	S	1.82736	54.1954	12.8	31.2733	2.5000	0.111110
911	5G-1	4	0.307	S	1.82736	54.1954	12.8	31.2733	3.5000	0.113729
912	5G-1	4	0.307	S	1.82736	54.1954	12.8	31.2733	4.6670	0.109258
913	5G-1	4	0.307	S	1.82736	54.1954	12.8	31.2733	5.5000	0.110286
914	5G-1	4	0.307	S	1.82736	54.1954	12.8	31.2733	7.0000	0.108042
915	3H-2	4	0.307	S	1.61531	57.8146	12.1	27.6585	0.0000	0.099303
916	3H-2	4	0.307	S	1.61531	57.8146	12.1	27.6585	0.5833	0.082528
917	3H-2	4	0.307	S	1.61531	57.8146	12.1	27.6585	1.5833	0.077987
918	3H-2	4	0.307	S	1.61531	57.8146	12.1	27.6585	2.5833	0.073047
919	3H-2	4	0.307	S	1.61531	57.8146	12.1	27.6585	3.5833	0.073883
920	3H-2	4	0.307	S	1.61531	57.8146	12.1	27.6585	4.5833	0.071616
921	3H-2	4	0.307	S	1.61531	57.8146	12.1	27.6585	5.5833	0.072363
922	3H-2	4	0.307	S	1.61531	57.8146	12.1	27.6585	7.0833	0.070908
923	1J-2	4	0.307	S	1.72378	60.0092	11.4	29.5393	0.0000	0.090848
924	1J-2	4	0.307	S	1.72378	60.0092	11.4	29.5393	0.5833	0.072351
925	1J-2	4	0.307	S	1.72378	60.0092	11.4	29.5393	1.5000	0.069011
926	1J-2	4	0.307	S	1.72378	60.0092	11.4	29.5393	1.9167	0.066688
927	1J-2	4	0.307	S	1.72378	60.0092	11.4	29.5393	3.2500	0.064741
928	1J-2	4	0.307	S	1.72378	60.0092	11.4	29.5393	4.0833	0.063125
929	1J-2	4	0.307	S	1.72378	60.0092	11.4	29.5393	5.5833	0.063467
930	1J-2	4	0.307	S	1.72378	60.0092	11.4	29.5393	7.0833	0.066278
931	7J-2	4	0.307	S	1.62052	52.1531	11.5	27.9160	0.0000	0.085201
932	7J-2	4	0.307	S	1.62052	52.1531	11.5	27.9160	0.5000	0.067606
933	7J-2	4	0.307	S	1.62052	52.1531	11.5	27.9160	1.5000	0.065364
934	7J-2	4	0.307	S	1.62052	52.1531	11.5	27.9160	2.5000	0.062706
935	7J-2	4	0.307	S	1.62052	52.1531	11.5	27.9160	3.5000	0.061076
936	7J-2	4	0.307	S	1.62052	52.1531	11.5	27.9160	4.5000	0.057562
937	7J-2	4	0.307	S	1.62052	52.1531	11.5	27.9160	5.5000	0.058907
938	7J-2	4	0.307	S	1.62052	52.1531	11.5	27.9160	7.0000	0.058474
939	8A-1	4	0.307	S	1.05147	66.7157	12.2	17.9208	0.0000	0.187453
940	8A-1	4	0.307	S	1.05147	66.7157	12.2	17.9208	0.4000	0.157271
941	8A-1	4	0.307	S	1.05147	66.7157	12.2	17.9208	0.9000	0.151078
942	8A-1	4	0.307	S	1.05147	66.7157	12.2	17.9208	1.5670	0.142313
943	8A-1	4	0.307	S	1.05147	66.7157	12.2	17.9208	2.5670	0.139653
944	8A-1	4	0.307	S	1.05147	66.7157	12.2	17.9208	4.0670	0.132556
945	8A-1	4	0.307	S	1.05147	66.7157	12.2	17.9208	5.0670	0.136495
946	8A-1	4	0.307	S	1.05147	66.7157	12.2	17.9208	6.0670	0.136547
947	3E-1	4	0.307	S	0.97850	63.6207	12.2	16.6278	0.0000	0.144824
948	3E-1	4	0.307	S	0.97850	63.6207	12.2	16.6278	0.5000	0.125520
949	3E-1	4	0.307	S	0.97850	63.6207	12.2	16.6278	1.5000	0.117135
950	3E-1	4	0.307	S	0.97850	63.6207	12.2	16.6278	2.9170	0.116451
951	3E-1	4	0.307	S	0.97850	63.6207	12.2	16.6278	3.5000	0.114211
952	3E-1	4	0.307	S	0.97850	63.6207	12.2	16.6278	4.5000	0.112970

OBS	TEST	BN	D	SURFACE	HOD	PO	MC	GM	TIMPASS	UK
953	3E-1	4	0.307	S	0.97850	63.6207	12.2	16.6278	5.5000	0.113748
954	3E-1	4	0.307	S	0.97850	63.6207	12.2	16.6278	6.5000	0.112371
955	1G-1	4	0.307	S	1.02443	64.3955	11.8	17.6713	0.0000	0.135441
956	1G-1	4	0.307	S	1.02443	64.3955	11.8	17.6713	0.5000	0.120929
957	1G-1	4	0.307	S	1.02443	64.3955	11.8	17.6713	1.5000	0.117106
958	1G-1	4	0.307	S	1.02443	64.3955	11.8	17.6713	2.5000	0.112225
959	1G-1	4	0.307	S	1.02443	64.3955	11.8	17.6713	3.5000	0.111541
960	1G-1	4	0.307	S	1.02443	64.3955	11.8	17.6713	4.5000	0.112282
961	1G-1	4	0.307	S	1.02443	64.3955	11.8	17.6713	6.1667	0.110886
962	3I-2	4	0.307	S	0.99739	68.5477	11.8	17.2167	0.0000	0.107808
963	3I-2	4	0.307	S	0.99739	68.5477	11.8	17.2167	0.4167	0.083758
964	3I-2	4	0.307	S	0.99739	68.5477	11.8	17.2167	1.5830	0.072984
965	3I-2	4	0.307	S	0.99739	68.5477	11.8	17.2167	2.0330	0.074202
966	3I-2	4	0.307	S	0.99739	68.5477	11.8	17.2167	3.5833	0.068398
967	3I-2	4	0.307	S	0.99739	68.5477	11.8	17.2167	4.7500	0.069292
968	3I-2	4	0.307	S	0.99739	68.5477	11.8	17.2167	5.5000	0.067859
969	3I-2	4	0.307	S	0.99739	68.5477	11.8	17.2167	7.0833	0.068014
970	16J-1	4	0.307	S	0.97785	66.4446	11.4	16.9431	0.0000	0.118057
971	16J-1	4	0.307	S	0.97785	66.4446	11.4	16.9431	0.5833	0.105644
972	16J-1	4	0.307	S	0.97785	66.4446	11.4	16.9431	1.5000	0.103039
973	16J-1	4	0.307	S	0.97785	66.4446	11.4	16.9431	2.3330	0.099203
974	16J-1	4	0.307	S	0.97785	66.4446	11.4	16.9431	3.5833	0.101962
975	16J-1	4	0.307	S	0.97785	66.4446	11.4	16.9431	4.5000	0.099259
976	16J-1	4	0.307	S	0.97785	66.4446	11.4	16.9431	5.5000	0.098603
977	16J-1	4	0.307	S	0.97785	66.4446	11.4	16.9431	7.3333	0.094424
978	5A-1	4	0.307	S	1.93127	66.2976	12.1	32.4379	0.0000	0.139960
979	5A-1	4	0.307	S	1.93127	66.2976	12.1	32.4379	0.2500	0.141686
980	5A-1	4	0.307	S	1.93127	66.2976	12.1	32.4379	0.4333	0.138093
981	5A-1	4	0.307	S	1.93127	66.2976	12.1	32.4379	0.7500	0.134455
982	5A-1	4	0.307	S	1.93127	66.2976	12.1	32.4379	1.3000	0.130881
983	5A-1	4	0.307	S	1.93127	66.2976	12.1	32.4379	2.3300	0.125171
984	5A-1	4	0.307	S	1.93127	66.2976	12.1	32.4379	4.7500	0.120208
985	9F-1	4	0.307	S	1.84528	65.3973	11.7	31.5100	0.0000	0.140400
986	9F-1	4	0.307	S	1.84528	65.3973	11.7	31.5100	0.5000	0.123798
987	9F-1	4	0.307	S	1.84528	65.3973	11.7	31.5100	1.5000	0.116795
988	9F-1	4	0.307	S	1.84528	65.3973	11.7	31.5100	2.5000	0.112874
989	9F-1	4	0.307	S	1.84528	65.3973	11.7	31.5100	3.5000	0.111455
990	9F-1	4	0.307	S	1.84528	65.3973	11.7	31.5100	4.5000	0.110255
991	9F-1	4	0.307	S	1.84528	65.3973	11.7	31.5100	5.5000	0.109377
992	9F-1	4	0.307	S	1.84528	65.3973	11.7	31.5100	7.5000	0.105651
993	5I-1	4	0.307	S	1.72280	66.6503	11.8	29.8218	0.0000	0.127698
994	5I-1	4	0.307	S	1.72280	66.6503	11.8	29.8218	0.5000	0.106707
995	5I-1	4	0.307	S	1.72280	66.6503	11.8	29.8218	1.5000	0.099198
996	5I-1	4	0.307	S	1.72280	66.6503	11.8	29.8218	2.5830	0.089717
997	5I-1	4	0.307	S	1.72280	66.6503	11.8	29.8218	4.4167	0.093260
998	5I-1	4	0.307	S	1.72280	66.6503	11.8	29.8218	5.5000	0.089918
999	5I-1	4	0.307	S	1.72280	66.6503	11.8	29.8218	6.4167	0.088456
1000	5I-1	4	0.307	S	1.72280	66.6503	11.8	29.8218	7.0000	0.091433
1001	14J-2	4	0.307	S	1.62508	71.9225	11.3	28.1601	0.0000	0.094511
1002	14J-2	4	0.307	S	1.62508	71.9225	11.3	28.1601	0.5000	0.078385
1003	14J-2	4	0.307	S	1.62508	71.9225	11.3	28.1601	1.5000	0.076324
1004	14J-2	4	0.307	S	1.62508	71.9225	11.3	28.1601	2.5000	0.074218
1005	14J-2	4	0.307	S	1.62508	71.9225	11.3	28.1601	4.3330	0.072126
1006	14J-2	4	0.307	S	1.62508	71.9225	11.3	28.1601	5.5000	0.072141
1007	14J-2	4	0.307	S	1.62508	71.9225	11.3	28.1601	6.5000	0.069824
1008	14J-2	4	0.307	S	1.62508	71.9225	11.3	28.1601	7.2500	0.071569

OBS	TEST	BN	D	SURFACE	HOD	PO	MC	GM	TIMPASS	UK
1009	15J-2	4	0.307	S	1.63257	70.3079	11.3	28.2086	0.0000	0.080476
1010	15J-2	4	0.307	S	1.63257	70.3079	11.3	28.2086	0.5000	0.068793
1011	15J-2	4	0.307	S	1.63257	70.3079	11.3	28.2086	1.5833	0.067686
1012	15J-2	4	0.307	S	1.63257	70.3079	11.3	28.2086	2.7500	0.064221
1013	15J-2	4	0.307	S	1.63257	70.3079	11.3	28.2086	3.5833	0.064941
1014	15J-2	4	0.307	S	1.63257	70.3079	11.3	28.2086	4.5833	0.064828
1015	15J-2	4	0.307	S	1.63257	70.3079	11.3	28.2086	5.5000	0.061973
1016	15J-2	4	0.307	S	1.63257	70.3079	11.3	28.2086	6.5833	0.063502
1017	15J-2	4	0.307	S	1.63257	70.3079	11.3	28.2086	9.5833	0.061771
1018	7A-2	5	0.270	S	0.94519	33.8153	12.1	10.8974	0.0000	0.118018
1019	7A-2	5	0.270	S	0.94519	33.8153	12.1	10.8974	0.1167	0.107990
1020	7A-2	5	0.270	S	0.94519	33.8153	12.1	10.8974	0.9330	0.080169
1021	7A-2	5	0.270	S	0.94519	33.8153	12.1	10.8974	1.8500	0.081021
1022	7A-2	5	0.270	S	0.94519	33.8153	12.1	10.8974	3.2170	0.074071
1023	7A-2	5	0.270	S	0.94519	33.8153	12.1	10.8974	4.3500	0.058597
1024	7A-2	5	0.270	S	0.94519	33.8153	12.1	10.8974	6.1000	0.065778
1025	5D-1	5	0.270	S	1.10741	41.2833	12.1	12.6914	0.0000	0.158524
1026	5D-1	5	0.270	S	1.10741	41.2833	12.1	12.6914	0.5000	0.137595
1027	5D-1	5	0.270	S	1.10741	41.2833	12.1	12.6914	1.5000	0.129380
1028	5D-1	5	0.270	S	1.10741	41.2833	12.1	12.6914	3.0000	0.128371
1029	5D-1	5	0.270	S	1.10741	41.2833	12.1	12.6914	3.5000	0.128392
1030	5D-1	5	0.270	S	1.10741	41.2833	12.1	12.6914	4.5000	0.124985
1031	5D-1	5	0.270	S	1.10741	41.2833	12.1	12.6914	5.5000	0.125557
1032	5D-1	5	0.270	S	1.10741	41.2833	12.1	12.6914	7.5000	0.122167
1033	9E-2	5	0.270	S	0.93222	46.9218	12.1	10.8003	0.0000	0.082966
1034	9E-2	5	0.270	S	0.93222	46.9218	12.1	10.8003	3.0000	0.046114
1035	9E-2	5	0.270	S	0.93222	46.9218	12.1	10.8003	4.0000	0.045339
1036	9E-2	5	0.270	S	0.93222	46.9218	12.1	10.8003	5.0000	0.042987
1037	9E-2	5	0.270	S	0.93222	46.9218	12.1	10.8003	6.0000	0.039897
1038	9E-2	5	0.270	S	0.93222	46.9218	12.1	10.8003	7.2500	0.042999
1039	4F-2	5	0.270	S	0.96370	44.7760	12.0	11.1076	0.0000	0.088903
1040	4F-2	5	0.270	S	0.96370	44.7760	12.0	11.1076	1.0000	0.055318
1041	4F-2	5	0.270	S	0.96370	44.7760	12.0	11.1076	2.0000	0.051404
1042	4F-2	5	0.270	S	0.96370	44.7760	12.0	11.1076	3.0000	0.045385
1043	4F-2	5	0.270	S	0.96370	44.7760	12.0	11.1076	4.0000	0.046204
1044	4F-2	5	0.270	S	0.96370	44.7760	12.0	11.1076	5.0000	0.044602
1045	4F-2	5	0.270	S	0.96370	44.7760	12.0	11.1076	6.0000	0.043007
1046	4F-2	5	0.270	S	0.96370	44.7760	12.0	11.1076	7.0000	0.040247
1047	3G-1	5	0.270	S	1.00000	42.4075	11.7	11.5338	0.0000	0.150421
1048	3G-1	5	0.270	S	1.00000	42.4075	11.7	11.5338	0.7500	0.133175
1049	3G-1	5	0.270	S	1.00000	42.4075	11.7	11.5338	1.7500	0.128153
1050	3G-1	5	0.270	S	1.00000	42.4075	11.7	11.5338	2.7500	0.127597
1051	3G-1	5	0.270	S	1.00000	42.4075	11.7	11.5338	3.7500	0.123192
1052	3G-1	5	0.270	S	1.00000	42.4075	11.7	11.5338	4.7500	0.123790
1053	3G-1	5	0.270	S	1.00000	42.4075	11.7	11.5338	5.7500	0.123234
1054	3G-1	5	0.270	S	1.00000	42.4075	11.7	11.5338	7.2500	0.123254
1055	6A-2	5	0.270	S	1.86667	39.0061	11.8	21.3419	0.0000	0.175303
1056	6A-2	5	0.270	S	1.86667	39.0061	11.8	21.3419	0.4167	0.145246
1057	6A-2	5	0.270	S	1.86667	39.0061	11.8	21.3419	2.0000	0.130728
1058	6A-2	5	0.270	S	1.86667	39.0061	11.8	21.3419	2.8330	0.122721
1059	6A-2	5	0.270	S	1.86667	39.0061	11.8	21.3419	5.1000	0.119248
1060	6A-2	5	0.270	S	1.86667	39.0061	11.8	21.3419	6.0833	0.116644
1061	1B-1	5	0.270	S	2.06074	41.9033	11.9	23.6811	0.0000	0.168175
1062	1B-1	5	0.270	S	2.06074	41.9033	11.9	23.6811	0.4000	0.139909
1063	1B-1	5	0.270	S	2.06074	41.9033	11.9	23.6811	0.7343	0.131754
1064	1B-1	5	0.270	S	2.06074	41.9033	11.9	23.6811	2.2330	0.122630

OBS	TEST	BN	D	SURFACE	HOD	PO	MC	GM	TIMPASS	UK
1065	1B-1	5	0.27	S	2.06074	41.9033	11.9	23.6811	3.6330	0.113945
1066	1B-1	5	0.27	S	2.06074	41.9033	11.9	23.6811	4.2330	0.113935
1067	1B-1	5	0.27	S	2.06074	41.9033	11.9	23.6811	5.6330	0.112415
1068	5C-1	5	0.27	S	1.99333	42.7184	12.1	22.6108	0.0000	0.164783
1069	5C-1	5	0.27	S	1.99333	42.7184	12.1	22.6108	1.0000	0.119954
1070	5C-1	5	0.27	S	1.99333	42.7184	12.1	22.6108	2.0000	0.118150
1071	5C-1	5	0.27	S	1.99333	42.7184	12.1	22.6108	3.0000	0.116069
1072	5C-1	5	0.27	S	1.99333	42.7184	12.1	22.6108	4.0000	0.113739
1073	5C-1	5	0.27	S	1.99333	42.7184	12.1	22.6108	5.1670	0.111418
1074	5C-1	5	0.27	S	1.99333	42.7184	12.1	22.6108	6.0000	0.111438
1075	7F-1	5	0.27	S	1.96370	42.2141	11.7	22.6281	0.0000	0.144638
1076	7F-1	5	0.27	S	1.96370	42.2141	11.7	22.6281	0.5000	0.122078
1077	7F-1	5	0.27	S	1.96370	42.2141	11.7	22.6281	1.5000	0.119944
1078	7F-1	5	0.27	S	1.96370	42.2141	11.7	22.6281	2.5000	0.112932
1079	7F-1	5	0.27	S	1.96370	42.2141	11.7	22.6281	3.5000	0.112009
1080	7F-1	5	0.27	S	1.96370	42.2141	11.7	22.6281	4.5000	0.109403
1081	7F-1	5	0.27	S	1.96370	42.2141	11.7	22.6281	5.5000	0.107378
1082	7F-1	5	0.27	S	1.96370	42.2141	11.7	22.6281	7.0000	0.109440
1083	11J-1	5	0.27	S	1.94778	43.8340	11.3	22.7742	0.0000	0.131208
1084	11J-1	5	0.27	S	1.94778	43.8340	11.3	22.7742	0.5000	0.117163
1085	11J-1	5	0.27	S	1.94778	43.8340	11.3	22.7742	1.6670	0.114411
1086	11J-1	5	0.27	S	1.94778	43.8340	11.3	22.7742	2.5000	0.110948
1087	11J-1	5	0.27	S	1.94778	43.8340	11.3	22.7742	3.5830	0.110975
1088	11J-1	5	0.27	S	1.94778	43.8340	11.3	22.7742	4.7500	0.109016
1089	11J-1	5	0.27	S	1.94778	43.8340	11.3	22.7742	5.5000	0.106248
1090	11J-1	5	0.27	S	1.94778	43.8340	11.3	22.7742	7.5000	0.108495
1091	9A-1	5	0.27	S	1.10704	55.7881	12.0	12.8235	0.0000	0.170851
1092	9A-1	5	0.27	S	1.10704	55.7881	12.0	12.8235	0.5833	0.152423
1093	9A-1	5	0.27	S	1.10704	55.7881	12.0	12.8235	1.4167	0.144051
1094	9A-1	5	0.27	S	1.10704	55.7881	12.0	12.8235	2.5830	0.138366
1095	9A-1	5	0.27	S	1.10704	55.7881	12.0	12.8235	3.8670	0.136199
1096	9A-1	5	0.27	S	1.10704	55.7881	12.0	12.8235	4.5830	0.133183
1097	9A-1	5	0.27	S	1.10704	55.7881	12.0	12.8235	6.0830	0.133241
1098	7C-2	5	0.27	S	0.96222	50.9546	12.1	10.8789	0.0000	0.101571
1099	7C-2	5	0.27	S	0.96222	50.9546	12.1	10.8789	0.7500	0.082987
1100	7C-2	5	0.27	S	0.96222	50.9546	12.1	10.8789	1.7500	0.069148
1101	7C-2	5	0.27	S	0.96222	50.9546	12.1	10.8789	2.7500	0.072028
1102	7C-2	5	0.27	S	0.96222	50.9546	12.1	10.8789	3.7500	0.063289
1103	7C-2	5	0.27	S	0.96222	50.9546	12.1	10.8789	4.7500	0.065378
1104	7C-2	5	0.27	S	0.96222	50.9546	12.1	10.8789	6.0000	0.063112
1105	6D-2	5	0.27	S	0.97370	59.4152	12.2	11.2205	0.0000	0.103223
1106	6D-2	5	0.27	S	0.97370	59.4152	12.2	11.2205	1.0000	0.075826
1107	6D-2	5	0.27	S	0.97370	59.4152	12.2	11.2205	2.0833	0.077063
1108	6D-2	5	0.27	S	0.97370	59.4152	12.2	11.2205	3.0000	0.072712
1109	6D-2	5	0.27	S	0.97370	59.4152	12.2	11.2205	4.0000	0.066165
1110	6D-2	5	0.27	S	0.97370	59.4152	12.2	11.2205	5.0000	0.067055
1111	6D-2	5	0.27	S	0.97370	59.4152	12.2	11.2205	6.0000	0.068814
1112	6D-2	5	0.27	S	0.97370	59.4152	12.2	11.2205	6.3330	0.062519
1113	8E-1	5	0.27	S	0.99296	55.3667	12.2	11.5347	0.0000	0.163126
1114	8E-1	5	0.27	S	0.99296	55.3667	12.2	11.5347	1.0000	0.139495
1115	8E-1	5	0.27	S	0.99296	55.3667	12.2	11.5347	2.0000	0.141073
1116	8E-1	5	0.27	S	0.99296	55.3667	12.2	11.5347	3.0000	0.137488
1117	8E-1	5	0.27	S	0.99296	55.3667	12.2	11.5347	4.0000	0.135408
1118	8E-1	5	0.27	S	0.99296	55.3667	12.2	11.5347	5.0000	0.130691
1119	8E-1	5	0.27	S	0.99296	55.3667	12.2	11.5347	6.0000	0.130715
1120	8E-1	5	0.27	S	0.99296	55.3667	12.2	11.5347	7.0000	0.131914

OBS	TEST	BN	D	SURFACE	HOD	PO	MC	GM	TIMPASS	UK
1121	2G-2	5	0.27	S	0.99815	55.8879	11.8	11.5788	0.0000	0.153927
1122	2G-2	5	0.27	S	0.99815	55.8879	11.8	11.5788	0.3333	0.139515
1123	2G-2	5	0.27	S	0.99815	55.8879	11.8	11.5788	1.3333	0.134922
1124	2G-2	5	0.27	S	0.99815	55.8879	11.8	11.5788	2.3333	0.133813
1125	2G-2	5	0.27	S	0.99815	55.8879	11.8	11.5788	3.3333	0.129207
1126	2G-2	5	0.27	S	0.99815	55.8879	11.8	11.5788	4.3333	0.129673
1127	2G-2	5	0.27	S	0.99815	55.8879	11.8	11.5788	5.3333	0.128107
1128	2G-2	5	0.27	S	0.99815	55.8879	11.8	11.5788	6.3333	0.124029
1129	2G-2	5	0.27	S	0.99815	55.8879	11.8	11.5788	7.3333	0.127205
1130	7I-2	5	0.27	S	0.96370	55.6004	11.7	11.3436	0.0000	0.073396
1131	7I-2	5	0.27	S	0.96370	55.6004	11.7	11.3436	0.6670	0.057551
1132	7I-2	5	0.27	S	0.96370	55.6004	11.7	11.3436	1.5000	0.051437
1133	7I-2	5	0.27	S	0.96370	55.6004	11.7	11.3436	2.3330	0.052392
1134	7I-2	5	0.27	S	0.96370	55.6004	11.7	11.3436	3.5000	0.053616
1135	7I-2	5	0.27	S	0.96370	55.6004	11.7	11.3436	4.8330	0.054168
1136	7I-2	5	0.27	S	0.96370	55.6004	11.7	11.3436	5.5000	0.050996
1137	7I-2	5	0.27	S	0.96370	55.6004	11.7	11.3436	7.3330	0.047823
1138	4J-2	5	0.27	S	0.96259	54.4798	11.4	11.2427	0.0000	0.074533
1139	4J-2	5	0.27	S	0.96259	54.4798	11.4	11.2427	0.5000	0.059165
1140	4J-2	5	0.27	S	0.96259	54.4798	11.4	11.2427	1.5000	0.053851
1141	4J-2	5	0.27	S	0.96259	54.4798	11.4	11.2427	2.5000	0.052380
1142	4J-2	5	0.27	S	0.96259	54.4798	11.4	11.2427	3.5000	0.055252
1143	4J-2	5	0.27	S	0.96259	54.4798	11.4	11.2427	4.6670	0.048075
1144	4J-2	5	0.27	S	0.96259	54.4798	11.4	11.2427	5.5000	0.050098
1145	4J-2	5	0.27	S	0.96259	54.4798	11.4	11.2427	7.1670	0.049146
1146	4C-2	5	0.27	S	1.80259	50.4505	12.1	20.6194	0.0000	0.134658
1147	4C-2	5	0.27	S	1.80259	50.4505	12.1	20.6194	0.4167	0.107689
1148	4C-2	5	0.27	S	1.80259	50.4505	12.1	20.6194	1.4167	0.095890
1149	4C-2	5	0.27	S	1.80259	50.4505	12.1	20.6194	2.4167	0.094038
1150	4C-2	5	0.27	S	1.80259	50.4505	12.1	20.6194	3.4160	0.091391
1151	4C-2	5	0.27	S	1.80259	50.4505	12.1	20.6194	4.4167	0.089673
1152	4C-2	5	0.27	S	1.80259	50.4505	12.1	20.6194	5.4167	0.085143
1153	4C-2	5	0.27	S	1.80259	50.4505	12.1	20.6194	5.9167	0.083481
1154	5E-1	5	0.27	S	2.07407	56.1750	12.1	23.8375	0.0000	0.136631
1155	5E-1	5	0.27	S	2.07407	56.1750	12.1	23.8375	1.0000	0.111795
1156	5E-1	5	0.27	S	2.07407	56.1750	12.1	23.8375	2.0000	0.106837
1157	5E-1	5	0.27	S	2.07407	56.1750	12.1	23.8375	3.0000	0.105382
1158	5E-1	5	0.27	S	2.07407	56.1750	12.1	23.8375	4.0000	0.103184
1159	5E-1	5	0.27	S	2.07407	56.1750	12.1	23.8375	5.4160	0.099588
1160	5E-1	5	0.27	S	2.07407	56.1750	12.1	23.8375	6.4160	0.101044
1161	1H-2	5	0.27	S	1.82963	48.4000	11.8	21.4334	0.0000	0.105042
1162	1H-2	5	0.27	S	1.82963	48.4000	11.8	21.4334	0.5000	0.085220
1163	1H-2	5	0.27	S	1.82963	48.4000	11.8	21.4334	1.5000	0.080255
1164	1H-2	5	0.27	S	1.82963	48.4000	11.8	21.4334	2.5000	0.077552
1165	1H-2	5	0.27	S	1.82963	48.4000	11.8	21.4334	3.5000	0.075968
1166	1H-2	5	0.27	S	1.82963	48.4000	11.8	21.4334	4.5000	0.073311
1167	1H-2	5	0.27	S	1.82963	48.4000	11.8	21.4334	5.5000	0.071723
1168	1H-2	5	0.27	S	1.82963	48.4000	11.8	21.4334	6.5000	0.068557
1169	8H-1	5	0.27	S	1.94889	55.2355	11.8	22.5947	0.0000	0.133478
1170	8H-1	5	0.27	S	1.94889	55.2355	11.8	22.5947	0.5000	0.115266
1171	8H-1	5	0.27	S	1.94889	55.2355	11.8	22.5947	1.5000	0.110691
1172	8H-1	5	0.27	S	1.94889	55.2355	11.8	22.5947	2.5000	0.108919
1173	8H-1	5	0.27	S	1.94889	55.2355	11.8	22.5947	3.5000	0.106816
1174	8H-1	5	0.27	S	1.94889	55.2355	11.8	22.5947	4.5000	0.105289
1175	8H-1	5	0.27	S	1.94889	55.2355	11.8	22.5947	7.0000	0.101524
1176	4I-1	5	0.27	S	1.96148	56.6119	11.8	22.8730	0.0000	0.125862

OBS	TEST	BN	D	SURFACE	HOD	PO	MC	GM	TIMPASS	UK
1177	4I-1	5	0.27	S	1.96148	56.6119	11.8	22.8730	0.5833	0.107675
1178	4I-1	5	0.27	S	1.96148	56.6119	11.8	22.8730	1.5000	0.101769
1179	4I-1	5	0.27	S	1.96148	56.6119	11.8	22.8730	2.5000	0.101299
1180	4I-1	5	0.27	S	1.96148	56.6119	11.8	22.8730	3.5000	0.095614
1181	4I-1	5	0.27	S	1.96148	56.6119	11.8	22.8730	4.6670	0.093793
1182	4I-1	5	0.27	S	1.96148	56.6119	11.8	22.8730	5.5000	0.095210
1183	4I-1	5	0.27	S	1.96148	56.6119	11.8	22.8730	7.3330	0.093375
1184	6F-1	5	0.27	S	0.97481	65.8961	11.6	11.2919	0.0000	0.158051
1185	6F-1	5	0.27	S	0.97481	65.8961	11.6	11.2919	1.0000	0.137389
1186	6F-1	5	0.27	S	0.97481	65.8961	11.6	11.2919	2.0000	0.136067
1187	6F-1	5	0.27	S	0.97481	65.8961	11.6	11.2919	2.7500	0.130262
1188	6F-1	5	0.27	S	0.97481	65.8961	11.6	11.2919	4.2500	0.133521
1189	6F-1	5	0.27	S	0.97481	65.8961	11.6	11.2919	5.0000	0.130740
1190	6F-1	5	0.27	S	0.97481	65.8961	11.6	11.2919	6.0000	0.128775
1191	6F-1	5	0.27	S	0.97481	65.8961	11.6	11.2919	7.0000	0.126810
1192	4H-1	5	0.27	S	0.98148	68.5073	12.0	11.4952	0.0000	0.162154
1193	4H-1	5	0.27	S	0.98148	68.5073	12.0	11.4952	0.5000	0.145287
1194	4H-1	5	0.27	S	0.98148	68.5073	12.0	11.4952	1.5000	0.142774
1195	4H-1	5	0.27	S	0.98148	68.5073	12.0	11.4952	2.5000	0.138135
1196	4H-1	5	0.27	S	0.98148	68.5073	12.0	11.4952	3.5000	0.135453
1197	4H-1	5	0.27	S	0.98148	68.5073	12.0	11.4952	4.5000	0.137822
1198	4H-1	5	0.27	S	0.98148	68.5073	12.0	11.4952	5.5000	0.139058
1199	4H-1	5	0.27	S	0.98148	68.5073	12.0	11.4952	7.0000	0.137270
1200	5J-2	5	0.27	S	0.97963	79.2998	11.7	11.5028	0.0000	0.109057
1201	5J-2	5	0.27	S	0.97963	79.2998	11.7	11.5028	0.5833	0.093323
1202	5J-2	5	0.27	S	0.97963	79.2998	11.7	11.5028	1.5000	0.092211
1203	5J-2	5	0.27	S	0.97963	79.2998	11.7	11.5028	2.4670	0.090654
1204	5J-2	5	0.27	S	0.97963	79.2998	11.7	11.5028	3.7500	0.089508
1205	5J-2	5	0.27	S	0.97963	79.2998	11.7	11.5028	4.6670	0.088997
1206	5J-2	5	0.27	S	0.97963	79.2998	11.7	11.5028	5.8333	0.088363
1207	5J-2	5	0.27	S	0.97963	79.2998	11.7	11.5028	7.0833	0.086142
1208	6J-2	5	0.27	S	0.97889	70.5496	11.7	11.5189	0.0000	0.074553
1209	6J-2	5	0.27	S	0.97889	70.5496	11.7	11.5189	0.5000	0.064270
1210	6J-2	5	0.27	S	0.97889	70.5496	11.7	11.5189	1.5000	0.059289
1211	6J-2	5	0.27	S	0.97889	70.5496	11.7	11.5189	2.5833	0.053010
1212	6J-2	5	0.27	S	0.97889	70.5496	11.7	11.5189	3.7500	0.053863
1213	6J-2	5	0.27	S	0.97889	70.5496	11.7	11.5189	4.9167	0.051573
1214	6J-2	5	0.27	S	0.97889	70.5496	11.7	11.5189	5.9167	0.053670
1215	6J-2	5	0.27	S	0.97889	70.5496	11.7	11.5189	7.2500	0.055256
1216	10J-2	5	0.27	S	0.99259	70.2397	11.3	11.7013	0.0000	0.075892
1217	10J-2	5	0.27	S	0.99259	70.2397	11.3	11.7013	0.5833	0.063660
1218	10J-2	5	0.27	S	0.99259	70.2397	11.3	11.7013	1.5833	0.058786
1219	10J-2	5	0.27	S	0.99259	70.2397	11.3	11.7013	2.5833	0.056450
1220	10J-2	5	0.27	S	0.99259	70.2397	11.3	11.7013	3.5000	0.059301
1221	10J-2	5	0.27	S	0.99259	70.2397	11.3	11.7013	4.5833	0.055433
1222	10J-2	5	0.27	S	0.99259	70.2397	11.3	11.7013	5.4167	0.055128
1223	10J-2	5	0.27	S	0.99259	70.2397	11.3	11.7013	7.0833	0.053266
1224	2B-1	5	0.27	S	2.08593	65.4837	12.1	24.0956	0.0000	0.148624
1225	2B-1	5	0.27	S	2.08593	65.4837	12.1	24.0956	0.1667	0.130767
1226	2B-1	5	0.27	S	2.08593	65.4837	12.1	24.0956	0.5000	0.124787
1227	2B-1	5	0.27	S	2.08593	65.4837	12.1	24.0956	1.0500	0.120510
1228	2B-1	5	0.27	S	2.08593	65.4837	12.1	24.0956	1.7167	0.116294
1229	2B-1	5	0.27	S	2.08593	65.4837	12.1	24.0956	2.7500	0.113237
1230	2B-1	5	0.27	S	2.08593	65.4837	12.1	24.0956	3.6670	0.110563
1231	2B-1	5	0.27	S	2.08593	65.4837	12.1	24.0956	5.0000	0.105287
1232	2B-1	5	0.27	S	2.08593	65.4837	12.1	24.0956	6.0000	0.105370

OBS	TEST	BN	D	SURFACE	HOD	PD	MC	GM	TIMPASS	UK
1233	3D-1	5	0.27	S	1.93481	66.3313	12.1	22.2305	0.0000	0.147458
1234	3D-1	5	0.27	S	1.93481	66.3313	12.1	22.2305	0.3330	0.126476
1235	3D-1	5	0.27	S	1.93481	66.3313	12.1	22.2305	1.3330	0.117709
1236	3D-1	5	0.27	S	1.93481	66.3313	12.1	22.2305	2.4167	0.114102
1237	3D-1	5	0.27	S	1.93481	66.3313	12.1	22.2305	3.3330	0.111896
1238	3D-1	5	0.27	S	1.93481	66.3313	12.1	22.2305	4.3300	0.109994
1239	3D-1	5	0.27	S	1.93481	66.3313	12.1	22.2305	5.3330	0.109255
1240	3D-1	5	0.27	S	1.93481	66.3313	12.1	22.2305	6.4830	0.107768
1241	9F-2	5	0.27	S	1.86556	73.8160	11.7	21.8127	0.0000	0.109955
1242	9F-2	5	0.27	S	1.86556	73.8160	11.7	21.8127	0.5000	0.088742
1243	9F-2	5	0.27	S	1.86556	73.8160	11.7	21.8127	1.5000	0.082025
1244	9F-2	5	0.27	S	1.86556	73.8160	11.7	21.8127	2.5000	0.074143
1245	9F-2	5	0.27	S	1.86556	73.8160	11.7	21.8127	3.5000	0.072765
1246	9F-2	5	0.27	S	1.86556	73.8160	11.7	21.8127	4.5000	0.072436
1247	9F-2	5	0.27	S	1.86556	73.8160	11.7	21.8127	5.5000	0.070357
1248	9F-2	5	0.27	S	1.86556	73.8160	11.7	21.8127	7.5000	0.069352
1249	6G-1	5	0.27	S	1.97963	68.8820	11.8	22.9469	0.0000	0.135157
1250	6G-1	5	0.27	S	1.97963	68.8820	11.8	22.9469	0.5000	0.118325
1251	6G-1	5	0.27	S	1.97963	68.8820	11.8	22.9469	1.5000	0.113410
1252	6G-1	5	0.27	S	1.97963	68.8820	11.8	22.9469	2.5000	0.109745
1253	6G-1	5	0.27	S	1.97963	68.8820	11.8	22.9469	3.5000	0.107053
1254	6G-1	5	0.27	S	1.97963	68.8820	11.8	22.9469	4.5000	0.106013
1255	6G-1	5	0.27	S	1.97963	68.8820	11.8	22.9469	5.5000	0.106913
1256	6G-1	5	0.27	S	1.97963	68.8820	11.8	22.9469	6.9167	0.108023
1257	1J-1	5	0.27	S	1.94630	65.2917	11.4	22.5336	0.0000	0.125611
1258	1J-1	5	0.27	S	1.94630	65.2917	11.4	22.5336	0.5833	0.108441
1259	1J-1	5	0.27	S	1.94630	65.2917	11.4	22.5336	1.5000	0.103895
1260	1J-1	5	0.27	S	1.94630	65.2917	11.4	22.5336	1.9167	0.102620
1261	1J-1	5	0.27	S	1.94630	65.2917	11.4	22.5336	3.2500	0.100745
1262	1J-1	5	0.27	S	1.94630	65.2917	11.4	22.5336	4.0833	0.100768
1263	1J-1	5	0.27	S	1.94630	65.2917	11.4	22.5336	5.5833	0.097025
1264	1J-1	5	0.27	S	1.94630	65.2917	11.4	22.5336	7.0833	0.094337
1265	3A-2	6	0.22	S	1.00227	46.3257	11.7	6.1223	0.0000	0.141575
1266	3A-2	6	0.22	S	1.00227	46.3257	11.7	6.1223	0.3330	0.112592
1267	3A-2	6	0.22	S	1.00227	46.3257	11.7	6.1223	2.8330	0.091262
1268	3A-2	6	0.22	S	1.00227	46.3257	11.7	6.1223	5.8333	0.102061
1269	8C-2	6	0.22	S	0.96091	38.2815	12.0	5.9381	0.0000	0.102168
1270	8C-2	6	0.22	S	0.96091	38.2815	12.0	5.9381	0.7830	0.073134
1271	8C-2	6	0.22	S	0.96091	38.2815	12.0	5.9381	1.7830	0.066135
1272	8C-2	6	0.22	S	0.96091	38.2815	12.0	5.9381	2.7830	0.061130
1273	8C-2	6	0.22	S	0.96091	38.2815	12.0	5.9381	3.7830	0.059095
1274	8C-2	6	0.22	S	0.96091	38.2815	12.0	5.9381	4.7830	0.049669
1275	8C-2	6	0.22	S	0.96091	38.2815	12.0	5.9381	5.7830	0.048229
1276	8C-2	6	0.22	S	0.96091	38.2815	12.0	5.9381	6.2830	0.048236
1277	2E-2	6	0.22	S	0.98364	45.3509	12.1	6.1790	0.0000	0.056819
1278	2E-2	6	0.22	S	0.98364	45.3509	12.1	6.1790	1.0000	0.040941
1279	2E-2	6	0.22	S	0.98364	45.3509	12.1	6.1790	1.2500	0.023243
1280	2E-2	6	0.22	S	0.98364	45.3509	12.1	6.1790	4.0000	0.016157
1281	2E-2	6	0.22	S	0.98364	45.3509	12.1	6.1790	5.0000	0.022169
1282	2E-2	6	0.22	S	0.98364	45.3509	12.1	6.1790	6.0000	0.018942
1283	2E-2	6	0.22	S	0.98364	45.3509	12.1	6.1790	7.0000	0.023405
1284	1E-3	6	0.22	S	0.97727	41.9804	11.7	6.1793	0.0000	0.050868
1285	1E-3	6	0.22	S	0.97727	41.9804	11.7	6.1793	0.7500	0.031914
1286	1E-3	6	0.22	S	0.97727	41.9804	11.7	6.1793	1.7500	0.028443
1287	1E-3	6	0.22	S	0.97727	41.9804	11.7	6.1793	2.7500	0.026016
1288	1E-3	6	0.22	S	0.97727	41.9804	11.7	6.1793	3.7500	0.023029

SAS 1:01 WEDNESDAY, MARCH 6, 1985 24

OBS	TEST	BN	D	SURFACE	HOD	PD	MC	GM	TIMPASS	UK
1289	1E-3	6	0.22	S	0.97727	41.9804	11.7	6.1793	4.7500	0.020222
1290	1E-3	6	0.22	S	0.97727	41.9804	11.7	6.1793	5.7500	0.018403
1291	1E-3	6	0.22	S	0.97727	41.9804	11.7	6.1793	7.2500	0.017939
1292	9G-2	6	0.22	S	0.96909	39.1434	11.8	6.1381	0.0000	0.064493
1293	9G-2	6	0.22	S	0.96909	39.1434	11.8	6.1381	0.5000	0.022327
1294	9G-2	6	0.22	S	0.96909	39.1434	11.8	6.1381	1.5000	0.015361
1295	9G-2	6	0.22	S	0.96909	39.1434	11.8	6.1381	2.5000	0.015366
1296	9G-2	6	0.22	S	0.96909	39.1434	11.8	6.1381	3.5000	0.000002
1297	9G-2	6	0.22	S	0.96909	39.1434	11.8	6.1381	4.8330	0.000002
1298	9G-2	6	0.22	S	0.96909	39.1434	11.8	6.1381	5.5000	0.000002
1299	9G-2	6	0.22	S	0.96909	39.1434	11.8	6.1381	7.0000	0.016642
1300	8I-2	6	0.22	S	0.98409	45.2124	11.6	6.2845	0.0000	0.054198
1301	8I-2	6	0.22	S	0.98409	45.2124	11.6	6.2845	0.5000	0.041042
1302	8I-2	6	0.22	S	0.98409	45.2124	11.6	6.2845	1.6333	0.041075
1303	8I-2	6	0.22	S	0.98409	45.2124	11.6	6.2845	2.5000	0.033203
1304	8I-2	6	0.22	S	0.98409	45.2124	11.6	6.2845	3.7500	0.032663
1305	8I-2	6	0.22	S	0.98409	45.2124	11.6	6.2845	4.3330	0.030447
1306	8I-2	6	0.22	S	0.98409	45.2124	11.6	6.2845	5.5000	0.031028
1307	8I-2	6	0.22	S	0.98409	45.2124	11.6	6.2845	7.0833	0.030991
1308	1B-2	6	0.22	S	1.90591	40.2686	11.9	11.8215	0.0000	0.139230
1309	1B-2	6	0.22	S	1.90591	40.2686	11.9	11.8215	0.5167	0.098026
1310	1B-2	6	0.22	S	1.90591	40.2686	11.9	11.8215	1.9167	0.085330
1311	1B-2	6	0.22	S	1.90591	40.2686	11.9	11.8215	3.3167	0.074547
1312	1B-2	6	0.22	S	1.90591	40.2686	11.9	11.8215	4.2500	0.072678
1313	1B-2	6	0.22	S	1.90591	40.2686	11.9	11.8215	5.5830	0.072721
1314	3B-2	6	0.22	S	1.90409	47.2041	12.2	11.8248	0.0000	0.130150
1315	3B-2	6	0.22	S	1.90409	47.2041	12.2	11.8248	0.1670	0.110245
1316	3B-2	6	0.22	S	1.90409	47.2041	12.2	11.8248	1.0000	0.088249
1317	3B-2	6	0.22	S	1.90409	47.2041	12.2	11.8248	2.0000	0.082322
1318	3B-2	6	0.22	S	1.90409	47.2041	12.2	11.8248	3.0000	0.075721
1319	3B-2	6	0.22	S	1.90409	47.2041	12.2	11.8248	4.0000	0.073284
1320	3B-2	6	0.22	S	1.90409	47.2041	12.2	11.8248	5.0000	0.070029
1321	3B-2	6	0.22	S	1.90409	47.2041	12.2	11.8248	8.1830	0.069242
1322	3B-2	6	0.22	S	1.90409	47.2041	12.2	11.8248	22.3000	0.061486
1323	3B-2	6	0.22	S	1.90409	47.2041	12.2	11.8248	27.6167	0.060304
1324	3B-2	6	0.22	S	1.90409	47.2041	12.2	11.8248	29.2330	0.060151
1325	3B-2	6	0.22	S	1.90409	47.2041	12.2	11.8248	30.6000	0.060915
1326	3B-2	6	0.22	S	1.90409	47.2041	12.2	11.8248	46.2167	0.052892
1327	8D-2	6	0.22	S	2.07045	37.8506	12.1	12.8561	0.0000	0.116385
1328	8D-2	6	0.22	S	2.07045	37.8506	12.1	12.8561	1.0000	0.078544
1329	8D-2	6	0.22	S	2.07045	37.8506	12.1	12.8561	2.0000	0.071946
1330	8D-2	6	0.22	S	2.07045	37.8506	12.1	12.8561	3.0000	0.069220
1331	8D-2	6	0.22	S	2.07045	37.8506	12.1	12.8561	4.0000	0.063809
1332	8D-2	6	0.22	S	2.07045	37.8506	12.1	12.8561	5.0000	0.064755
1333	8D-2	6	0.22	S	2.07045	37.8506	12.1	12.8561	6.0000	0.060193
1334	8D-2	6	0.22	S	2.07045	37.8506	12.1	12.8561	7.0000	0.057578
1335	1F-2	6	0.22	S	2.05227	38.7843	12.1	12.8836	0.0000	0.096445
1336	1F-2	6	0.22	S	2.05227	38.7843	12.1	12.8836	0.7500	0.064200
1337	1F-2	6	0.22	S	2.05227	38.7843	12.1	12.8836	1.7500	0.049038
1338	1F-2	6	0.22	S	2.05227	38.7843	12.1	12.8836	2.7500	0.044130
1339	1F-2	6	0.22	S	2.05227	38.7843	12.1	12.8836	3.7500	0.041696
1340	1F-2	6	0.22	S	2.05227	38.7843	12.1	12.8836	4.7500	0.039266
1341	1F-2	6	0.22	S	2.05227	38.7843	12.1	12.8836	5.7500	0.038526
1342	1F-2	6	0.22	S	2.05227	38.7843	12.1	12.8836	7.0000	0.038531
1343	7H-2	6	0.22	S	2.04500	36.9328	11.8	13.0310	0.0000	0.071303
1344	7H-2	6	0.22	S	2.04500	36.9328	11.8	13.0310	0.5833	0.048274

OBS	TEST	BN	D	SURFACE	HOD	PO	MC	GM	TIMPASS	UK
1345	7H-2	6	0.22	S	2.04500	36.9328	11.8	13.0310	1.0833	0.042539
1346	7H-2	6	0.22	S	2.04500	36.9328	11.8	13.0310	2.3330	0.037633
1347	7H-2	6	0.22	S	2.04500	36.9328	11.8	13.0310	3.5000	0.034675
1348	7H-2	6	0.22	S	2.04500	36.9328	11.8	13.0310	4.0833	0.032989
1349	7H-2	6	0.22	S	2.04500	36.9328	11.8	13.0310	5.0833	0.033224
1350	7H-2	6	0.22	S	2.04500	36.9328	11.8	13.0310	6.0000	0.029860
1351	7H-2	6	0.22	S	2.04500	36.9328	11.8	13.0310	7.3330	0.026751
1352	6I-2	6	0.22	S	2.05091	41.5494	11.4	13.0615	0.0000	0.084541
1353	6I-2	6	0.22	S	2.05091	41.5494	11.4	13.0615	0.5000	0.059470
1354	6I-2	8	0.22	S	2.05091	41.5494	11.4	13.0615	1.5000	0.051839
1355	6I-2	6	0.22	S	2.05091	41.5494	11.4	13.0615	2.5000	0.049028
1356	6I-2	6	0.22	S	2.05091	41.5494	11.4	13.0615	3.8330	0.050500
1357	6I-2	6	0.22	S	2.05091	41.5494	11.4	13.0615	4.5000	0.047732
1358	6I-2	6	0.22	S	2.05091	41.5494	11.4	13.0615	5.3330	0.048333
1359	6I-2	6	0.22	S	2.05091	41.5494	11.4	13.0615	7.0000	0.045488
1360	4B-2	6	0.22	S	0.99545	50.3990	12.1	6.2226	0.0000	0.095209
1361	4B-2	6	0.22	S	0.99545	50.3990	12.1	6.2226	0.5000	0.071563
1362	4B-2	6	0.22	S	0.99545	50.3990	12.1	6.2226	1.5000	0.059824
1363	4B-2	6	0.22	S	0.99545	50.3990	12.1	6.2226	2.5000	0.058766
1364	4B-2	6	0.22	S	0.99545	50.3990	12.1	6.2226	3.5000	0.054711
1365	4B-2	6	0.22	S	0.99545	50.3990	12.1	6.2226	4.5000	0.046353
1366	4B-2	6	0.22	S	0.99545	50.3990	12.1	6.2226	5.7500	0.047420
1367	4D-2	6	0.22	S	1.01909	48.8394	12.1	6.3161	0.0000	0.075722
1368	4D-2	6	0.22	S	1.01909	48.8394	12.1	6.3161	0.5000	0.055742
1369	4D-2	6	0.22	S	1.01909	48.8394	12.1	6.3161	1.5000	0.036705
1370	4D-2	6	0.22	S	1.01909	48.8394	12.1	6.3161	2.5000	0.030572
1371	4D-2	6	0.22	S	1.01909	48.8394	12.1	6.3161	3.5000	0.030585
1372	4D-2	6	0.22	S	1.01909	48.8394	12.1	6.3161	4.5000	0.029534
1373	4D-2	6	0.22	S	1.01909	48.8394	12.1	6.3161	5.5000	0.029541
1374	4D-2	6	0.22	S	1.01909	48.8394	12.1	6.3161	6.7000	0.028447
1375	2E-3	6	0.22	S	0.99591	57.0097	11.7	6.1979	0.0000	0.128876
1376	2E-3	6	0.22	S	0.99591	57.0097	11.7	6.1979	0.5000	0.112007
1377	2E-3	6	0.22	S	0.99591	57.0097	11.7	6.1979	1.5000	0.108906
1378	2E-3	6	0.22	S	0.99591	57.0097	11.7	6.1979	2.5000	0.107365
1379	2E-3	6	0.22	S	0.99591	57.0097	11.7	6.1979	3.5000	0.106495
1380	2E-3	6	0.22	S	0.99591	57.0097	11.7	6.1979	4.5000	0.105163
1381	2E-3	6	0.22	S	0.99591	57.0097	11.7	6.1979	5.5000	0.108113
1382	2E-3	6	0.22	S	0.99591	57.0097	11.7	6.1979	6.7500	0.106552
1383	5H-2	6	0.22	S	0.98955	53.3643	11.8	6.2658	0.0000	0.042787
1384	5H-2	6	0.22	S	0.98955	53.3643	11.8	6.2658	0.5000	0.041505
1385	5H-2	6	0.22	S	0.98955	53.3643	11.8	6.2658	1.8330	0.030145
1386	5H-2	6	0.22	S	0.98955	53.3643	11.8	6.2658	2.5000	0.027802
1387	5H-2	6	0.22	S	0.98955	53.3643	11.8	6.2658	3.5000	0.025456
1388	5H-2	6	0.22	S	0.98955	53.3643	11.8	6.2658	4.5000	0.022179
1389	5H-2	6	0.22	S	0.98955	53.3643	11.8	6.2658	5.5000	0.025462
1390	5H-2	6	0.22	S	0.98955	53.3643	11.8	6.2658	7.2500	0.022189
1391	13J-2	6	0.22	S	1.00773	57.8412	11.4	6.3462	0.0000	0.021877
1392	13J-2	6	0.22	S	1.00773	57.8412	11.4	6.3462	0.6667	0.027510
1393	13J-2	6	0.22	S	1.00773	57.8412	11.4	6.3462	1.9167	0.027530
1394	13J-2	6	0.22	S	1.00773	57.8412	11.4	6.3462	2.8333	0.028836
1395	13J-2	6	0.22	S	1.00773	57.8412	11.4	6.3462	3.8333	0.027154
1396	13J-2	6	0.22	S	1.00773	57.8412	11.4	6.3462	5.6667	0.023092
1397	5A-2	6	0.22	S	2.08045	57.1709	12.4	12.7332	0.0000	0.130598
1398	5A-2	6	0.22	S	2.08045	57.1709	12.4	12.7332	0.3167	0.103232
1399	5A-2	6	0.22	S	2.08045	57.1709	12.4	12.7332	0.8670	0.099350
1400	5A-2	6	0.22	S	2.08045	57.1709	12.4	12.7332	2.6170	0.086371

OBS	TEST	BN	D	SURFACE	HOD	PO	MC	GM	TIMPASS	UK
1401	5A-2	6	0.22	S	2.08045	57.1709	12.4	12.7332	4.3170	0.088861
1402	7D-2	6	0.22	S	2.05409	49.3063	12.1	12.7688	0.0000	0.117452
1403	7D-2	6	0.22	S	2.05409	49.3063	12.1	12.7688	0.9167	0.085065
1404	7D-2	6	0.22	S	2.05409	49.3063	12.1	12.7688	1.9167	0.077273
1405	7D-2	6	0.22	S	2.05409	49.3063	12.1	12.7688	2.9167	0.075051
1406	7D-2	6	0.22	S	2.05409	49.3063	12.1	12.7688	3.9167	0.069210
1407	7D-2	6	0.22	S	2.05409	49.3063	12.1	12.7688	4.9167	0.069237
1408	7D-2	6	0.22	S	2.05409	49.3063	12.1	12.7688	5.9167	0.068522
1409	7D-2	6	0.22	S	2.05409	49.3063	12.1	12.7688	6.9167	0.066377
1410	9D-2	6	0.22	S	2.04545	58.7869	12.0	12.7415	0.0000	0.084699
1411	9D-2	6	0.22	S	2.04545	58.7869	12.0	12.7415	1.0000	0.059371
1412	9D-2	6	0.22	S	2.04545	58.7869	12.0	12.7415	2.0000	0.054748
1413	9D-2	6	0.22	S	2.04545	58.7869	12.0	12.7415	3.0000	0.050886
1414	9D-2	6	0.22	S	2.04545	58.7869	12.0	12.7415	4.0000	0.051979
1415	9D-2	6	0.22	S	2.04545	58.7869	12.0	12.7415	5.0000	0.048776
1416	9D-2	6	0.22	S	2.04545	58.7869	12.0	12.7415	6.0000	0.046163
1417	9D-2	6	0.22	S	2.04545	58.7869	12.0	12.7415	7.0000	0.047741
1418	2F-2	6	0.22	S	2.05000	55.3035	12.1	12.8898	0.0000	0.136859
1419	2F-2	6	0.22	S	2.05000	55.3035	12.1	12.8898	0.7500	0.104375
1420	2F-2	6	0.22	S	2.05000	55.3035	12.1	12.8898	1.7500	0.091804
1421	2F-2	6	0.22	S	2.05000	55.3035	12.1	12.8898	2.7500	0.089007
1422	2F-2	6	0.22	S	2.05000	55.3035	12.1	12.8898	3.7500	0.083791
1423	2F-2	6	0.22	S	2.05000	55.3035	12.1	12.8898	4.7500	0.083964
1424	2F-2	6	0.22	S	2.05000	55.3035	12.1	12.8898	5.7500	0.081041
1425	2F-2	6	0.22	S	2.05000	55.3035	12.1	12.8898	8.0000	0.078289
1426	2H-2	6	0.22	S	2.04500	58.2482	12.0	12.7795	0.0000	0.084168
1427	2H-2	6	0.22	S	2.04500	58.2482	12.0	12.7795	0.5833	0.061877
1428	2H-2	6	0.22	S	2.04500	58.2482	12.0	12.7795	1.8333	0.055111
1429	2H-2	6	0.22	S	2.04500	58.2482	12.0	12.7795	2.9167	0.052862
1430	2H-2	6	0.22	S	2.04500	58.2482	12.0	12.7795	3.5000	0.052867
1431	2H-2	6	0.22	S	2.04500	58.2482	12.0	12.7795	4.5000	0.051244
1432	2H-2	6	0.22	S	2.04500	58.2482	12.0	12.7795	5.5000	0.049639
1433	2H-2	6	0.22	S	2.04500	58.2482	12.0	12.7795	7.0000	0.049115
1434	8A-2	6	0.22	S	1.07136	78.3073	12.1	6.6822	0.0000	0.125415
1435	8A-2	6	0.22	S	1.07136	78.3073	12.1	6.6822	0.5000	0.100836
1436	8A-2	6	0.22	S	1.07136	78.3073	12.1	6.6822	1.1670	0.094639
1437	8A-2	6	0.22	S	1.07136	78.3073	12.1	6.6822	2.1670	0.085535
1438	8A-2	6	0.22	S	1.07136	78.3073	12.1	6.6822	3.6670	0.081681
1439	8A-2	6	0.22	S	1.07136	78.3073	12.1	6.6822	4.6670	0.166396
1440	8A-2	6	0.22	S	1.07136	78.3073	12.1	6.6822	6.1670	0.079153
1441	5B-2	6	0.22	S	0.98136	64.9688	12.0	6.2051	0.0000	0.101426
1442	5B-2	6	0.22	S	0.98136	64.9688	12.0	6.2051	0.3330	0.084189
1443	5B-2	6	0.22	S	0.98136	64.9688	12.0	6.2051	1.3330	0.073554
1444	5B-2	6	0.22	S	0.98136	64.9688	12.0	6.2051	2.3330	0.070355
1445	5B-2	6	0.22	S	0.98136	64.9688	12.0	6.2051	3.3330	0.065349
1446	5B-2	6	0.22	S	0.98136	64.9688	12.0	6.2051	4.3330	0.061210
1447	5B-2	6	0.22	S	0.98136	64.9688	12.0	6.2051	5.8333	0.052885
1448	3C-2	6	0.22	S	1.00773	64.8798	11.8	6.2533	0.0000	0.092101
1449	3C-2	6	0.22	S	1.00773	64.8798	11.8	6.2533	0.5000	0.065581
1450	3C-2	6	0.22	S	1.00773	64.8798	11.8	6.2533	1.5000	0.058018
1451	3C-2	6	0.22	S	1.00773	64.8798	11.8	6.2533	2.5000	0.052100
1452	3C-2	6	0.22	S	1.00773	64.8798	11.8	6.2533	3.5000	0.051099
1453	3C-2	6	0.22	S	1.00773	64.8798	11.8	6.2533	6.0000	0.043076
1454	6F-2	6	0.22	S	0.98727	67.7288	11.6	6.2101	0.0000	0.058330
1455	6F-2	6	0.22	S	0.98727	67.7288	11.6	6.2101	1.0000	0.033945
1456	6F-2	6	0.22	S	0.98727	67.7288	11.6	6.2101	2.0000	0.027967

OBS	TEST	BN	D	SURFACE	HOD	PO	MC	GM	TIMPASS	UK
1457	6F-2	6	0.22	S	0.98727	67.7288	11.6	6.2101	2.7500	0.029017
1458	6F-2	6	0.22	S	0.98727	67.7288	11.6	6.2101	4.2500	0.027868
1459	6F-2	6	0.22	S	0.98727	67.7288	11.6	6.2101	5.0000	0.024872
1460	6F-2	6	0.22	S	0.98727	67.7288	11.6	6.2101	6.0000	0.022545
1461	6F-2	6	0.22	S	0.98727	67.7288	11.6	6.2101	7.0000	0.025929
1462	1G-2	6	0.22	S	0.98864	68.8267	11.8	6.1522	0.0000	0.060955
1463	1G-2	6	0.22	S	0.98864	68.8267	11.8	6.1522	0.5000	0.051200
1464	1G-2	6	0.22	S	0.98864	68.8267	11.8	6.1522	1.5000	0.029998
1465	1G-2	6	0.22	S	0.98864	68.8267	11.8	6.1522	2.5000	0.021078
1466	1G-2	6	0.22	S	0.98864	68.8267	11.8	6.1522	3.5000	0.024737
1467	1G-2	6	0.22	S	0.98864	68.8267	11.8	6.1522	4.5000	0.021397
1468	1G-2	6	0.22	S	0.98864	68.8267	11.8	6.1522	6.1670	0.021095
1469	6E-1	6	0.22	S	2.06227	73.6701	12.1	12.8893	0.0000	0.126130
1470	6E-1	6	0.22	S	2.06227	73.6701	12.1	12.8893	1.0000	0.095517
1471	6E-1	6	0.22	S	2.06227	73.6701	12.1	12.8893	2.0000	0.091841
1472	6E-1	6	0.22	S	2.06227	73.6701	12.1	12.8893	3.1670	0.090587
1473	6E-1	6	0.22	S	2.06227	73.6701	12.1	12.8893	4.0000	0.090129
1474	6E-1	6	0.22	S	2.06227	73.6701	12.1	12.8893	5.0000	0.090396
1475	6E-1	6	0.22	S	2.06227	73.6701	12.1	12.8893	6.0000	0.088610
1476	6E-1	6	0.22	S	2.06227	73.6701	12.1	12.8893	7.0000	0.087082
1477	9H-2	6	0.22	S	2.03364	69.9912	11.8	12.9069	0.0000	0.081365
1478	9H-2	6	0.22	S	2.03364	69.9912	11.8	12.9069	0.5000	0.057754
1479	9H-2	6	0.22	S	2.03364	69.9912	11.8	12.9069	1.5000	0.049793
1480	9H-2	6	0.22	S	2.03364	69.9912	11.8	12.9069	2.5000	0.046087
1481	9H-2	6	0.22	S	2.03364	69.9912	11.8	12.9069	3.6670	0.045221
1482	9H-2	6	0.22	S	2.03364	69.9912	11.8	12.9069	4.5830	0.041866
1483	9H-2	6	0.22	S	2.03364	69.9912	11.8	12.9069	5.6667	0.039429
1484	9H-2	6	0.22	S	2.03364	69.9912	11.8	12.9069	7.5000	0.039130
1485	9I-1	6	0.22	S	2.06136	74.3438	11.5	13.1172	0.0000	0.117556
1486	9I-1	6	0.22	S	2.06136	74.3438	11.5	13.1172	0.5000	0.099481
1487	9I-1	6	0.22	S	2.06136	74.3438	11.5	13.1172	2.4167	0.094696
1488	9I-1	6	0.22	S	2.06136	74.3438	11.5	13.1172	3.6670	0.092358
1489	9I-1	6	0.22	S	2.06136	74.3438	11.5	13.1172	4.5830	0.093158
1490	9I-1	6	0.22	S	2.06136	74.3438	11.5	13.1172	6.5000	0.091117
1491	9I-1	6	0.22	S	2.06136	74.3438	11.5	13.1172	6.5000	0.092104
1492	9I-1	6	0.22	S	2.06136	74.3438	11.5	13.1172	7.0000	0.089298
1493	2J-2	6	0.22	S	2.04318	74.8752	11.6	12.8932	0.0000	0.084016
1494	2J-2	6	0.22	S	2.04318	74.8752	11.6	12.8932	0.5000	0.066340
1495	2J-2	6	0.22	S	2.04318	74.8752	11.6	12.8932	1.5000	0.063144
1496	2J-2	6	0.22	S	2.04318	74.8752	11.6	12.8932	2.5000	0.059493
1497	2J-2	6	0.22	S	2.04318	74.8752	11.6	12.8932	3.3333	0.057716
1498	2J-2	6	0.22	S	2.04318	74.8752	11.6	12.8932	4.5833	0.057729
1499	2J-2	6	0.22	S	2.04318	74.8752	11.6	12.8932	5.5000	0.057249
1500	2J-2	6	0.22	S	2.04318	74.8752	11.6	12.8932	7.0000	0.057749
1501	9J-2	6	0.22	S	2.06091	68.2675	11.5	13.0983	0.0000	0.066927
1502	9J-2	6	0.22	S	2.06091	68.2675	11.5	13.0983	0.5833	0.051985
1503	9J-2	6	0.22	S	2.06091	68.2675	11.5	13.0983	1.5833	0.046443
1504	9J-2	6	0.22	S	2.06091	68.2675	11.5	13.0983	2.4167	0.043994
1505	9J-2	6	0.22	S	2.06091	68.2675	11.5	13.0983	3.5833	0.042714
1506	9J-2	6	0.22	S	2.06091	68.2675	11.5	13.0983	4.5000	0.043489
1507	9J-2	6	0.22	S	2.06091	68.2675	11.5	13.0983	5.4167	0.040817
1508	9J-2	6	0.22	S	2.06091	68.2675	11.5	13.0983	7.0833	0.038596