

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**RIDE QUALITY ON NEW/RECONSTRUCTION  
AND MAJOR REHABILITATION PROJECTS**

SUP:DPD

1 of 7

09-11-00

C&amp;T:APPR:JTL:MF 09-28-00

**a. Description.-**This specification provides for an incentive payment to the Contractor for constructing the smoothest riding pavements possible. Two methods of measuring the ride quality of concrete and bituminous pavements are presented. The Contractor has the option of using either method. Once a method has been selected by the Contractor, it may not be changed without authorization from the Engineer. The ride quality of pavements will be determined on the finished surface only. Where Ride Quality applies, this special provision deletes paragraph four of Subsection 502.03A4, Subsection 502.03H, and paragraphs three, four, and five of Subsection 602.03 I of the 1996 Standard Specifications for Construction. However, where areas are excluded from ride quality, at the Point of Beginning (POB)/Point of Ending (POE) and other areas that connect to existing pavement, such as ramps, Subsection 502.03.H and 602.03I shall apply.

**b. Methods of Determining Pavement Smoothness.-**

1. California Type Profilograph

Ride quality of the pavement, expressed in mm/km, will be determined from a mechanically produced profilogram (trace) or from a computerized version of the California type profilograph in accordance with Michigan test Method MTM 725. If the computerized version is capable of storing the trace information in memory, a disc copy of all traces will be given to the Engineer.

2. GM Type Rapid Travel Profilometer

Ride quality of the pavement, expressed as RQI (Ride Quality Index) units, or mm/km will be determined by proper reduction of the true profile obtained by a GM Type of Rapid Travel Profilometer in accordance with Michigan Test Method 726. The Contractor has the option of using either unit of measurement.

**c. Equipment.-**The Contractor will certify in writing that the equipment, manufacturer's calibration procedures and visual inspections are in compliance with this special provision and the applicable Michigan Test Method.

**d. Method of Testing.**

1. Ride Quality Measurement Plan:

Testing will be done in accordance with Michigan Test Method MTM 725 or MTM 726. The Contractor will submit a written Ride Quality Measurement Plan to the Engineer for review and approval prior to the start of paving operations. The Contractor's plan will include, but not be limited to, the calibration schedule, the

length of the official test run, proposed excluded areas, method of traffic control, and the testing time frame in relation to paving operations. Areas of ramps, tapers, bridge decks, and railroad crossings are not included under the item of Ride Quality. (See Figure 1.) Major intersections (at grade) with part width or staged construction (traffic flow maintained), may be considered as excluded areas as listed in the Ride Quality Measurement Plan. The excluded area will extend between the approach and departure spring points of the intersection.

2. The Engineer will review and approve the Ride Quality Measurement Plan.

The Contractor will mark the limits for Ride Quality Measurement including the POB, POE, and any excluded area as specified in the approved Ride Quality Measurement Plan.

The Contractor will notify the Engineer a minimum of 24 hours prior to any pavement corrections and determination of ride quality.

The run will not be considered an official run until the pavement profile is in compliance with the requirements for this special provision.

Profiles will be taken 1 m from each side of each lane that is to be measured. Bridge decks will be excluded for payment of Ride Quality, but not for Ride Quality Measurement. All damage to the pavement surface caused by the profilometer will be repaired at no cost to the Department.

#### **e. Method of Interpretation.-**

Prior to paving bituminous top course, a copy of the official computer generated trace and printout for each measured course will be submitted for project records and to determine areas of correction. The official trace, bump & dip table, and printout for top course shall also be submitted to determine corrections and ride quality payment.

1. Profile Index (mm/km)

Data will be interpreted in accordance with Michigan Test Method 727.

The profile index, in mm/km, will be calculated for each 160 m segment. Segments less than 160 m shall be prorated to a 160 m segment. Each run will be reported by the Contractor to the nearest 0.5 mm as the average mm/km of the two runs for each lane.

Surface Pavement lanes constructed with 0 to less than 64 mm/km will result in payment of varying percentages based on Table 1. Surface Pavement lanes with 64 to 160 mm/km will not be eligible for any bonus payments for ride quality. Surface Pavement lanes with more than 160 mm/km will not be acceptable. All surface pavement areas with bumps or dips exceeding 8 mm/8 m must be corrected. All uppermost leveling courses with bumps or dips exceeding 12.5 mm in 8 m must be corrected prior to placing the surface course. All surface pavements will be corrected to achieve a value of 160 mm/km or less at no cost to the Department. Any surface 160 m segment with accumulated value greater than 25 mm will require correction .

## 2. Ride Quality Index (RQI )

RQI will be calculated for each 160 m segment. Segments less than 160 m will be computed as partial segments at the beginning and end of excluded sections and at the end of a run. The RQI for each run will be reported, to one decimal place (e.g., 48.6), as the average of the two runs for each lane.

Surface Pavement lanes constructed with an RQI from 22 to less than 45 will result in payment of varying percentages based on Table 2. Lanes with RQIs of 45 to 53 will not be eligible for any bonus payments for ride quality. Surface Pavement lanes with a RQI more than 53 are not acceptable. All surface pavement lanes will be corrected to achieve an RQI value of 53 or less at no cost to the Department.

All surface pavement area bumps or dips exceeding 8 mm in 8 m will be corrected. All uppermost leveling courses with bumps or dips exceeding 12.5 mm in 8 m must be corrected prior to placing the surface course.

### f. Methods of Correction.-

1. Surface drainage will not be impaired as a result of diamond grinding.
2. Bituminous Pavements.-Corrections to the pavement will be by one of the following methods:
  - a. Diamond Grinding
  - b. Cold Milling (Not allowed on surface courses)
  - c. Wedging (Not allowed on surface courses)
  - d. Removal and replacement of a minimum of 35 mm of bituminous a full lane width by the length required (a minimum of 30 m)

Bumps and dips which measure over 8 mm in 8 m must be corrected by the method(s) specified above. All corrections are at the Contractor's expense.

For Top course bituminous pavements, the entire ground area shall be covered with a fog seal when grinding is complete and cured before the pavement is open to traffic. The area of fog seal shall be a neat rectangular area of uniform application covering only the ground area.

3. Concrete Pavements.-Bumps or dips which measure over 8 mm in 8 m must be corrected. Restoration of the transverse grooves in these areas will not be necessary provided that the grinding equipment establishes a grooved surface in the longitudinal direction. The Contractor will determine those areas which need correction. All corrections to concrete pavements will be by diamond grinding in a workman-like manner and are at the Contractor's expense.

**g. Method of Measurement.**-The item of RIDE QUALITY MEASUREMENT-BITUMINOUS will be measured as Lane Kilometers for the uppermost leveling course and surface course. The limits for RIDE QUALITY MEASUREMENT-CONCRETE will be measured as Lane Kilometers for the surface course. The limits for Ride Quality Measurement will be based on 5 m before the POB and after the POE. (See Figure 1.)

Quantities for the item **Ride Quality-Bituminous** and **Ride Quality-Concrete** will be determined by the area in square meters based on plan quantities or known changes. The limits for Ride Quality will be based on 5 m after the POB and before the POE. The limits for any excluded area as approved in the approved Ride Quality Measurement Plan will be 5 m before and after the section.

Quantities for the item **Bump Grinding** will be determined by the area in square meters, outside the limits of **Ride Quality**, as directed by the Engineer. See Figure 1.

**h. Measurement and Payment.-**

<b>Contract Item (Pay Item)</b>	<b>Pay Unit</b>
Ride Quality Measurement-Bituminous . . . . .	lane kilometers
Ride Quality Measurement-Concrete . . . . .	lane kilometers
Ride Quality-Bituminous . . . . .	square meter
Ride Quality-Concrete . . . . .	square meter
Bump Grinding . . . . .	square meter

Payment for the item **Ride Quality Measurement** will include all costs of furnishing, calibrating, and operating the profilograph or rapid travel profilometer for the official run. If the Engineer requires excluded areas, ramps, tapers, approaches, or miscellaneous concrete pavement to be measured, they will be measured and paid for as **Ride Quality Measurement**.

No additional payment will be made for runs made by the Contractor to determine the smoothness prior to corrections for the official runs.

Payment will be determined by the Engineer for the item **Ride Quality** based on the mm/km or RQI for the final weighted average for all values within each lane. The limits for **Ride Quality** will be based on 5 m after the POB and before the POE and 5 m before and after any excluded area. Each lane will be determined individually.

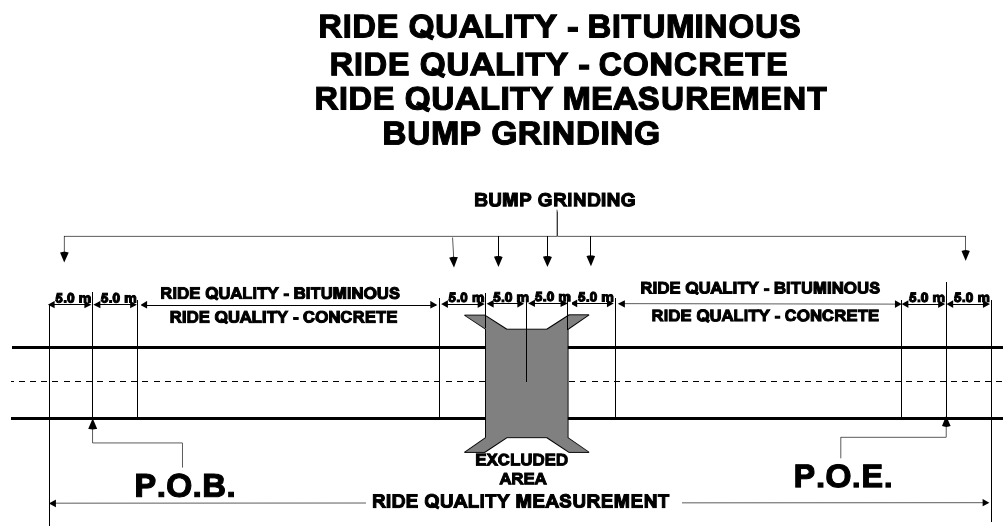
Payment will be made at the contract unit price for **Ride Quality-Concrete and Ride Quality-Bituminous** on the finished surface. The criteria for determining whether or not incentive payments will be made for this item will be:

1. **For the California Type Profilograph (Mechanical & Computerized).- Incentive Payments.-** A pavement lane having a range of 0 to less than 64 mm/km will receive payments for Ride Quality based on the product of the number of square meters in the pavement lane (minus excluded areas) times the contract unit price for Ride Quality, multiplied by the appropriate pay factor from Table 1.

**No Incentive Payment.**-A pavement lane having a range of 64 to 160 mm/km will not qualify nor receive any payment for Ride Quality.

## 2. For the GM Type Rapid Travel Profilometer.-

**Incentive Payment.**-A pavement lane having an RQI range of 22 (or less), to less than 45, or a range of 0 to less than 64 mm/km, will receive payments for Ride Quality based on the product of the number of lane km in the pavement lane (minus excluded areas) times the contract unit price for Ride Quality, multiplied by the appropriate pay factor from Tables 1 or 2.



**No Incentive Payment.**-A pavement lane having an RQI range of 45 to 53, or a range of more than 64 to 160 mm/km, will not qualify nor receive any payment for Ride Quality.

Payment for the item, **Bump Grinding** will be excluded within the limits of **Ride Quality-Bituminous** or **Ride Quality-Concrete**. Areas outside these ride qualities will meet the smoothness requirements. All new pavement will be eligible for payment of **Bump Grinding** if it meets the smoothness requirements in Section 502.03H and 602.03I of the 1996 Standard Specifications for Construction. Areas with bumps or dips exceeding 8 mm in 8 m will be diamond ground as directed by the Engineer.

**TABLE 1**  
**PAY SCHEDULE FOR RIDE QUALITY USING PROFILE INDEX (mm/km)**  
**(FACTOR TO BE MULTIPLIED BY CONTRACT UNIT PRICE)**

mm/km	%	mm/km	%	mm/km	%	mm/k	%	mm/km	%	mm/k	%	mm/k	%	mm/k	%
0.00	100.0	8.25	87.11	16.50	74.22	24.75	61.33	33.00	48.44	41.25	35.55	49.50	22.66	57.75	9.77
0.25	99.61	8.50	86.72	16.75	73.83	25.00	60.94	33.25	48.05	41.50	35.16	49.75	22.27	58.00	9.38
0.50	99.22	8.75	86.33	17.00	73.44	25.25	60.55	33.50	47.66	41.75	34.77	50.00	21.88	58.25	8.99
0.75	98.83	9.00	85.94	17.25	73.05	25.50	60.16	33.75	47.27	42.00	34.38	50.25	21.49	58.50	8.60
1.00	98.44	9.25	85.55	17.50	72.66	25.75	59.77	34.00	46.88	42.25	33.99	50.50	21.10	58.75	8.21
1.25	98.05	9.50	85.16	17.75	72.27	26.00	59.38	34.25	46.49	42.50	33.60	50.75	20.71	59.00	7.82
1.50	97.65	9.75	84.77	18.00	71.88	26.25	58.99	34.50	46.10	42.75	33.21	51.00	20.32	59.25	7.43
1.75	97.26	10.00	84.38	18.25	71.49	26.50	58.60	34.75	45.71	43.00	32.82	51.25	19.93	59.50	7.04
2.00	96.87	10.25	83.99	18.50	71.09	26.75	58.21	35.00	45.32	43.25	32.43	51.50	19.54	59.75	6.65
2.25	96.48	10.50	83.60	18.75	70.71	27.00	57.81	35.25	44.93	43.50	32.04	51.75	19.15	60.00	6.26
2.50	96.09	10.75	83.21	19.00	70.31	27.25	57.42	35.50	44.53	43.75	31.65	52.00	18.75	60.25	5.87
2.75	95.70	11.00	82.81	19.25	69.92	27.50	57.03	35.75	44.14	44.00	31.25	52.25	18.36	60.50	5.47
3.00	95.31	11.25	82.42	19.50	69.53	27.75	56.64	36.00	43.75	44.25	30.86	52.50	17.97	60.75	5.08
3.25	94.92	11.50	82.03	19.75	69.14	28.00	56.25	36.25	43.36	44.50	30.47	52.75	17.58	61.00	4.69
3.50	94.53	11.75	81.64	20.00	68.75	28.25	55.86	36.50	42.97	44.75	30.08	53.00	17.19	61.25	4.30
3.75	94.14	12.00	81.25	20.25	68.36	28.50	55.47	36.75	42.58	45.00	29.69	53.25	16.80	61.50	3.91
4.00	93.74	12.25	80.86	20.50	67.97	28.75	55.08	37.00	42.19	45.25	29.30	53.50	16.41	61.75	3.52
4.25	93.35	12.50	80.47	20.75	67.58	29.00	54.69	37.25	41.80	45.50	28.91	53.75	16.02	62.00	3.13
4.50	92.96	12.75	80.08	21.00	67.19	29.25	54.30	37.50	41.41	45.75	28.52	54.00	15.63	62.25	2.74
4.75	92.57	13.00	79.69	21.25	66.80	29.50	53.91	37.75	41.02	46.00	28.13	54.25	15.24	62.50	2.35
5.00	92.18	13.25	79.30	21.50	66.41	29.75	53.52	38.00	40.63	46.25	27.74	54.50	14.85	62.75	1.96
5.25	91.79	13.50	78.91	21.75	66.02	30.00	53.13	38.25	40.24	46.50	27.35	54.75	14.46	63.00	1.57
5.50	91.40	13.75	78.52	22.00	65.63	30.25	52.74	38.50	39.85	46.75	26.96	55.00	14.07	63.25	1.18
5.75	91.01	14.00	78.13	22.25	65.24	30.50	52.35	38.75	39.46	47.00	26.57	55.25	13.68	63.50	0.79
6.00	90.62	14.25	77.74	22.50	64.85	30.75	51.96	39.00	39.07	47.25	26.18	55.50	13.29	63.75	0.40
6.25	90.23	14.50	77.35	22.75	64.46	31.00	51.57	39.25	38.68	47.50	25.79	55.75	12.90	64.00	0.00
6.50	89.84	14.75	76.95	23.00	64.06	31.25	51.18	39.50	38.28	47.75	25.40	56.00	12.50		
6.75	89.45	15.00	76.56	23.25	63.67	31.50	50.78	39.75	37.89	48.00	25.00	56.25	12.12		
7.00	89.06	15.25	76.17	23.50	63.28	31.75	50.39	40.00	37.50	48.25	24.61	56.50	11.72		
7.25	88.67	15.50	75.78	23.75	62.89	32.00	50.00	40.25	37.11	48.50	24.22	56.75	11.33		
7.50	88.28	15.75	75.39	24.00	62.50	32.25	49.61	40.50	36.72	48.75	23.83	57.00	10.94		
7.75	87.89	16.00	75.00	24.25	62.11	32.50	49.22	40.75	36.33	49.00	23.44	57.25	10.55		
8.00	87.50	16.25	74.61	24.50	61.72	32.75	48.83	41.00	35.94	49.25	23.05	57.50	10.16		

**TABLE 2**  
**PAY SCHEDULE FOR RIDE QUALITY USING RIDE QUALITY INDEX (RQI)**  
**(FACTOR TO BE MULTIPLIED BY CONTRACT UNIT PRICE)**

Profile Pay		Profile Pay		Profile Pay		Profile Pay		Profile Pay		Profile Pay		Profile Pay		Profile Pay		Profile Pay	
Index Factor		Index Factor		Index Factor		Index Factor		Index Factor		Index Factor		Index Factor		Index Factor		Index Factor	
RQI	%	RQI	%	RQI	%	RQI	%	RQI	%	RQI	%	RQI	%	RQI	%	RQI	%
22.00	100.00	24.60	88.69	27.20	77.39	29.80	66.09	32.40	54.78	35.00	43.48	37.60	32.17	40.20	20.87	42.80	9.57
22.05	99.78	24.65	88.48	27.25	77.17	29.85	65.87	32.45	54.56	35.05	43.26	37.65	31.96	40.25	20.65	42.85	9.35
22.10	99.56	24.70	88.26	27.30	76.96	29.90	65.65	32.50	54.35	35.10	43.04	37.70	31.74	40.30	20.43	42.90	9.13
22.15	99.35	24.75	88.04	27.35	76.74	29.95	65.43	32.55	54.13	35.15	42.83	37.75	31.52	40.35	20.22	42.95	8.91
22.20	99.13	24.80	87.82	27.40	76.52	30.00	65.22	32.60	53.91	35.20	42.61	37.80	31.30	40.40	20.00	43.00	8.70
22.25	98.91	24.85	87.61	27.45	76.30	30.05	65.00	32.65	53.70	35.25	42.39	37.85	31.09	40.45	19.78	43.05	8.48
22.30	98.69	24.90	87.39	27.50	76.09	30.10	64.78	32.70	53.48	35.30	42.17	37.90	30.87	40.50	19.57	43.10	8.26
22.35	98.48	24.95	87.17	27.55	75.87	30.15	64.56	32.75	53.26	35.35	41.96	37.95	30.65	40.55	19.35	43.15	8.04
22.40	98.26	25.00	86.96	27.60	75.65	30.20	64.35	32.80	53.04	35.40	41.74	38.00	30.43	40.60	19.13	43.20	7.83
22.45	98.04	25.05	86.74	27.65	75.43	30.25	64.13	32.85	52.83	35.45	41.52	38.05	30.22	40.65	18.91	43.25	7.61
22.50	97.82	25.10	86.52	27.70	75.22	30.30	63.91	32.90	52.61	35.50	41.30	38.10	30.00	40.70	18.70	43.30	7.39
22.55	97.61	25.15	86.30	27.75	75.00	30.35	63.69	32.95	52.39	35.55	41.09	38.15	29.78	40.75	18.48	43.35	7.17
22.60	97.39	25.20	86.09	27.80	74.78	30.40	63.48	33.00	52.17	35.60	40.87	38.20	29.57	40.80	18.26	43.40	6.96
22.65	97.17	25.25	85.87	27.85	74.56	30.45	63.26	33.05	51.96	35.65	40.65	38.25	29.35	40.85	18.04	43.45	6.74
22.70	96.95	25.30	85.65	27.90	74.35	30.50	63.04	33.10	51.74	35.70	40.43	38.30	29.13	40.90	17.83	43.50	6.52
22.75	96.74	25.35	85.43	27.95	74.13	30.55	62.83	33.15	51.52	35.75	40.22	38.35	28.91	40.95	17.61	43.55	6.30
22.80	96.52	25.40	85.22	28.00	73.91	30.60	62.61	33.20	51.30	35.80	40.00	38.40	28.70	41.00	17.39	43.60	6.09
22.85	96.30	25.45	85.00	28.05	73.69	30.65	62.39	33.25	51.09	35.85	39.78	38.45	28.48	41.05	17.17	43.65	5.87
22.90	96.09	25.50	84.78	28.10	73.48	30.70	62.17	33.30	50.87	35.90	39.56	38.50	28.26	41.10	16.96	43.70	5.65
23.95	95.87	25.55	84.56	28.15	73.26	30.75	61.96	33.35	50.65	35.95	39.35	38.55	28.04	41.15	16.74	43.75	5.44
23.00	95.65	25.60	84.35	28.20	73.04	30.80	61.74	33.40	50.43	36.00	39.13	38.60	27.83	41.20	16.52	43.80	5.22
23.05	95.43	25.65	84.13	28.25	72.83	30.85	61.52	33.45	50.22	36.05	38.91	38.65	27.61	41.25	16.30	43.85	5.00
23.10	95.22	25.70	83.91	28.30	72.61	30.90	61.30	33.50	50.00	36.10	38.70	38.70	27.39	41.30	16.09	43.90	4.78
23.15	95.00	25.75	83.69	28.35	72.39	30.95	61.09	33.55	49.78	36.15	38.48	38.75	27.17	41.35	15.87	43.95	4.57
23.20	94.78	25.80	83.48	28.40	72.17	31.00	60.87	33.60	49.56	36.20	38.26	38.80	26.96	41.40	15.65	44.00	4.35
23.25	94.56	25.85	83.26	28.45	71.96	31.05	60.65	33.65	49.35	36.25	38.04	38.85	26.74	41.45	15.43	44.05	4.13
23.30	94.35	25.90	83.04	28.50	71.74	31.10	60.43	33.70	49.13	36.30	37.83	38.90	26.52	41.50	15.22	44.10	3.91
23.35	94.13	25.95	82.82	28.55	71.52	31.15	60.22	33.75	48.91	36.35	37.61	38.95	26.30	41.55	15.00	44.15	3.70
23.40	93.91	26.00	82.61	28.60	71.30	31.20	60.00	33.80	48.70	36.40	37.39	39.00	26.09	41.60	14.78	44.20	3.48
23.45	93.69	26.05	82.39	28.65	71.09	31.25	59.78	33.85	48.48	36.45	37.17	39.05	25.87	41.65	14.57	44.25	3.26
23.50	93.48	26.10	82.17	28.70	70.87	31.30	59.56	33.90	48.26	36.50	36.96	39.10	25.65	41.70	14.35	44.30	3.04
23.55	93.26	26.15	81.96	28.75	70.65	31.35	59.35	33.95	48.04	36.55	36.74	39.15	25.43	41.75	14.13	44.35	2.83
23.60	93.04	26.20	81.74	28.80	70.43	31.40	59.13	34.00	47.83	36.60	36.52	39.20	25.22	41.80	13.91	44.40	2.61
23.65	92.82	26.25	81.52	28.85	70.22	31.45	58.91	34.05	47.61	36.65	36.30	39.25	25.00	41.85	13.70	44.45	2.39
23.70	92.61	26.30	81.30	28.90	70.00	31.50	58.69	34.10	47.39	36.70	36.09	39.30	24.78	41.90	13.48	44.50	2.17
23.75	92.39	26.35	81.09	28.95	69.78	31.55	58.48	34.15	47.17	36.75	35.87	39.35	24.57	41.95	13.26	44.55	1.96
23.80	92.17	26.40	80.87	29.00	69.56	31.60	58.26	34.20	46.96	36.80	35.65	39.40	24.35	42.00	13.04	44.60	1.74
23.85	91.96	26.45	80.65	29.05	69.35	31.65	58.04	34.25	46.74	36.85	35.43	39.45	24.13	42.05	12.83	44.65	1.52
23.90	91.74	26.50	80.43	29.10	69.13	31.70	57.83	34.30	46.52	36.90	35.22	39.50	23.91	42.10	12.61	44.70	1.30
23.95	91.52	26.55	80.22	29.15	68.91	31.75	57.61	34.35	46.30	36.95	35.00	39.55	23.70	42.15	12.39	44.75	1.09
24.00	91.30	26.60	80.00	29.20	68.69	31.80	57.39	34.40	46.09	37.00	34.78	39.60	23.48	42.20	12.17	44.80	0.87
24.05	91.09	26.65	79.78	29.25	68.48	31.85	57.17	34.45	45.87	37.05	34.57	39.65	23.26	42.25	11.96	44.85	0.65
24.10	90.87	26.70	79.56	29.30	68.26	31.90	56.96	34.50	45.65	37.10	34.35	39.70	23.04	42.30	11.74	44.90	0.44
24.15	90.65	26.75	79.35	29.35	68.04	31.95	56.74	34.55	45.43	37.15	34.13	39.75	22.83	42.35	11.52	44.95	0.22
24.20	90.43	26.80	79.13	29.40	67.83	32.00	56.52	34.60	45.22	37.20	33.91	39.80	22.61	42.40	11.30	45.00	0.00
24.25	90.22	26.85	78.91	29.45	67.61	32.05	56.30	34.65	45.00	37.25	33.70	39.85	22.39	42.45	11.09		
24.30	90.00	26.90	78.69	29.50	67.39	32.10	56.09	34.70	44.78	37.30	33.48	39.90	22.17	42.50	10.87		
24.35	89.78	26.95	78.48	29.55	67.17	32.15	55.87	34.75	44.56	37.35	33.26	39.95	21.96	42.55	10.65		
24.40	89.56	27.00	78.26	29.60	66.96	32.20	55.65	34.80	44.35	37.40	33.04	40.00	21.74	42.60	10.44		
24.45	89.35	27.05	78.04	29.65	66.74	32.25	55.43	34.85	44.13	37.45	32.83	40.05	21.52	42.65	10.22		
24.50	89.13	27.10	77.82	29.70	66.52	32.30	55.22	34.90	43.91	37.50	32.61	40.10	21.30	42.70	10.00		
24.55	88.91	27.15	77.61	29.75	66.30	32.35	55.00	34.95	43.70	37.55	32.39	40.15	21.09	42.75	9.78		