Center for Inclusive Design and Environmental Access
State University of New York at Buffalo

RESNA, June 28, 2010 Workshop Schedule

Time	Learning Objective	Presenter(s)	Activities Planned
9:00	Introduction	E. Steinfeld	Overview
9:05	Learn about the Anthropometry Research Study and Data	E. Steinfeld	Powerpoint presentation reviewing the methods and findings of the anthropometry research
9:20	**1.** Identify limitations in existing building regulations in meeting the needs of end users **2.** Identify technical and policy issues in building design and transportation related to the research evidence **3.** List and describe various conditions (obstacles) that may impede users of wheeled mobility devices	J. White and E. Steinfeld	This presentation will discuss the significance of the research findings for architectural and transportation design. It will identify the obstacles that wheeled mobility users might encounter due to larger sized devices. It will then identify issues of device design, clinical practice, policy, and consumer education that are related to removing those obstacles, including changes to building standards and procurement practices. Participants will view a brief PowerPoint presentation and receive handout materials.
9:40	Discussion period to help participants be able to list and identify potential strategies for removing those obstacles	J. Lenker facilitates	Discussion will address how obstacles can be removed through device design, building and transportation design, policy, rehabilitation services and consumer education. The panel will offer a few example strategies and open the floor to discussion and suggestions for further strategies.
10:05	Discussion period on the implications for stakeholders where participants will identify the relevance and implications of wheeled mobility anthropometry to their respective fields	J. Lenker facilitates	This discussion period will provide an opportunity for the participants to consider the role of their profession in improving accessibility, and, in particular, what concrete actions each stakeholder group can take to implement solutions to the identified problems.

All of our design resources can be found on-line at:
http://www.udeworld.com/dissemination/design-resources.html

A copy of the slideshow presentation can be found on-line at:
http://www.udeworld.com/pdfs/resna2010.pdf

Thank you for participating

Clear Floor Areas

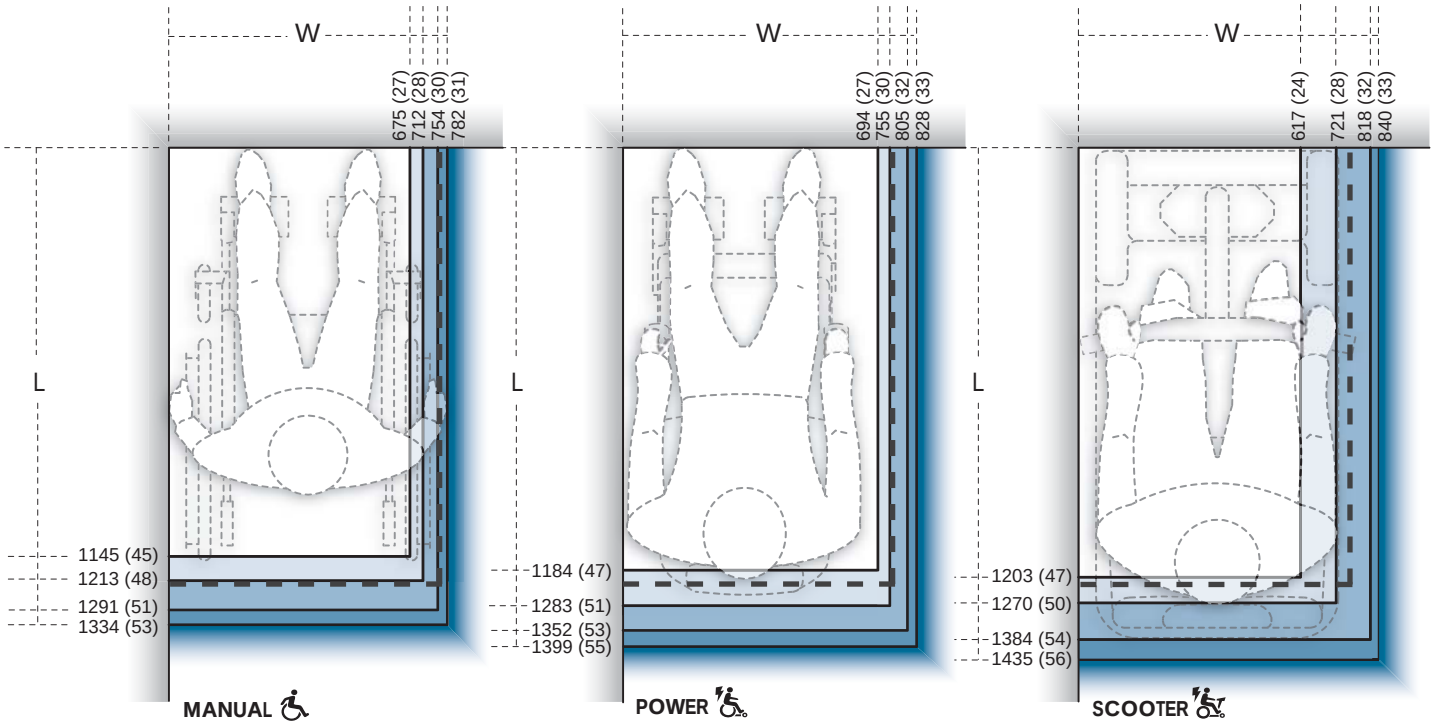
Design Guidelines for People Using Wheeled Mobility Devices

MINIMUM CLEAR FLOOR SPACE REQUIRED

MANUAL, POWER, & SCOOTER

W = floor space width, units: mm (in.), L = floor space length, units: mm (in.)

percent accommodated	MANUAL	POWER	SCOOTER
	195 participants	146 participants	28 participants
< 50%			
50%	W: 675 (27) | L: 1145 (45)	W: 694 (27) | L: 1184 (47)	W: 617 (24) | L: 1203 (47)
≥ 50% & < 75%			
75%	W: 712 (28) | L: 1213 (48)	W: 755 (30) | L: 1283 (51)	W: 721 (28) | L: 1270 (50)
≥ 75% & < 90%			
90%	W: 754 (30) | L: 1291 (51)	W: 805 (32) | L: 1352 (53)	W: 818 (32) | L: 1384 (54)
≥ 90% & < 95%			
95%	W: 782 (31) | L: 1334 (53)	W: 828 (33) | L: 1399 (55)	W: 840 (33) | L: 1435 (56)
≥ 95%			
	= ADAAG requirement of 1220 (48) x 760 (30)		



This data provides the minimum dimensions for the rectangular floor area required by occupied wheeled mobility devices (i.e., with the occupant seated in their own wheeled mobility device) when stationary. Clear floor area dimensions are used for determining the size of spaces designated for wheeled mobility users (such as on buses, in movie theaters, sports stadiums). The clear floor area width dimension also informs the minimum clearance width for successful passage through corridors, doorways and wheelchair ramps. Currently, the ADA accessibility guidelines prescribe a minimum floor area of 760 x 1220 mm (30 x 48 in.) for wheeled mobility access. Dimensions are based on length and width measurements obtained from occupied wheeled mobility devices as part of the Anthropometry of Wheeled Mobility Study. These data suggest minimum clear floor area dimensions of 780 x 1337 mm (31 x 53 in.) for manual chairs, 822 x 1398 mm (32 x 55 in.) for powered chairs, and 840 x 1435 mm (33 x 56 in.) for scooters when needing to accommodate 95% of users. For more details, see Design Resource 15 (http://www.udeworld.com/clear-floor-area-for-wheeled-mobility).

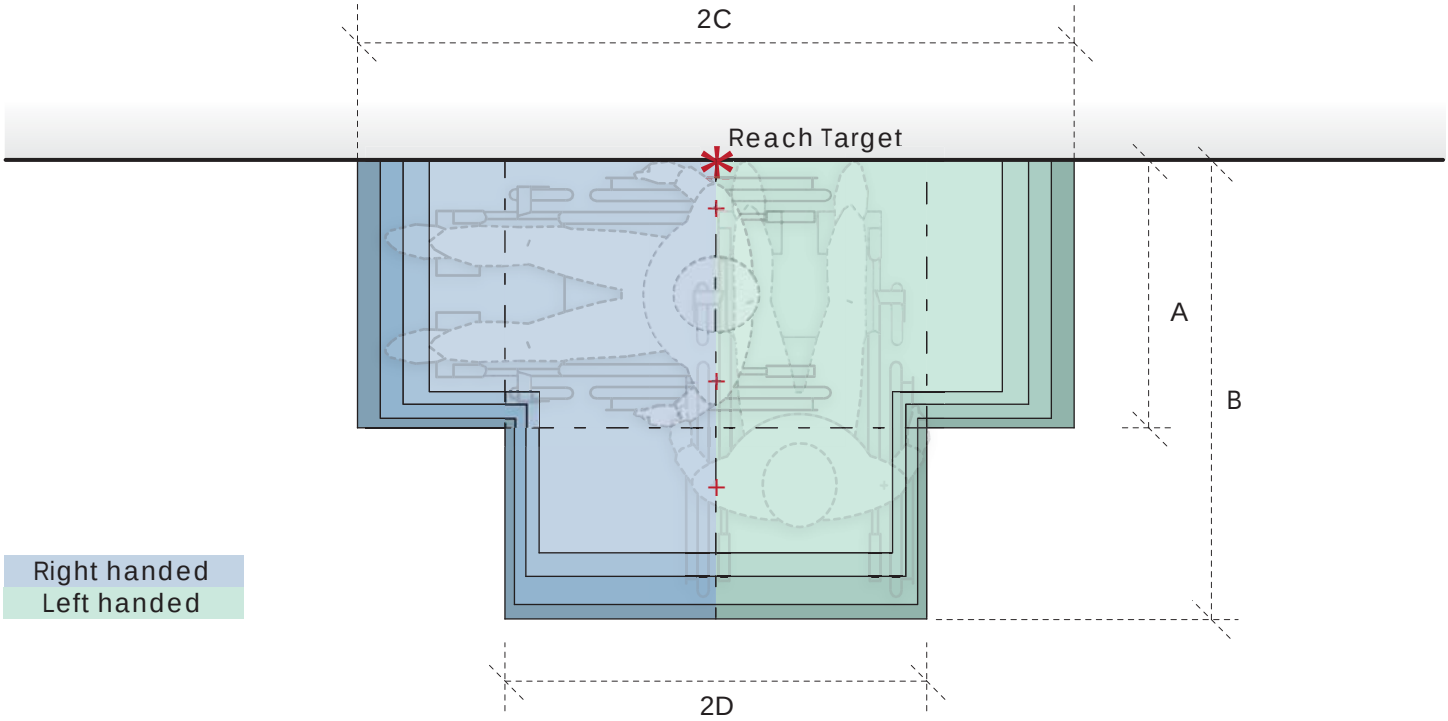
Clear Floor Areas

Design Guidelines for People Using Manual Wheelchairs

MANUAL

MINIMUM CLEAR FLOOR SPACE REQUIRED FOR FORWARD AND SIDE APPROACH

Manual (% accomodated) *n*=194					Power *n*=147	Scooters *n*=28
mm [in]	50%	75%	90%	95%	95%	95%
A	675 [27]	712 [28]	753 [30]	780 [31]	822 [32]	840 [33]
B	1145 [45]	1213 [48]	1295 [51]	1337 [53]	1398 [55]	1435 [56]
2C	1671 [66]	1823 [72]	1955 [77]	2088 [82]	2127 [84]	2304 [91]
2D	1030 [41]	1108 [44]	1175 [46]	1229 [48]	1272 [50]	1274 [50]



This data depicts the amount of clear floor area required by persons using wheeled mobility devices when performing a forward or side reach to a target location (e.g., reaching to a light switch on the wall) with either the right or left hand. The accompanying table provides dimensions values for clear floor area to accommodate 95% of manual chair (n=194), power chair (n=147), and scooter (n=28) users that were measured as part of the Anthropometry of Wheeled Mobility study. The dimensions of clear floor area are based on four anthropometry dimensions. These dimensions are: (A) occupied width, the horizontal distance between the side-most (lateral-most) points of the wheelchair or occupant on the right and left side; (B) occupied length, the horizontal distance from the front-most (anterior-most) point of the wheelchair or occupant to the rear-most (posterior-most) point of the wheelchair or occupant; (C)the horizontal distance from the reaching shoulder to the front-most (anterior-most) point of the wheelchair or occupant; (D) the horizontal distance from the reaching shoulder to the side-most (lateral-most) point on the opposite (contra-lateral) side of the wheelchair or occupant. For more details, see Design Resource 16 (http://www.udeworld.com/clear-floor-area-for-wheeled-mobility-when-reaching-or-grasping).

Accessible Pathway & Corridor

Design Guidelines for People Using Wheeled Mobility Devices

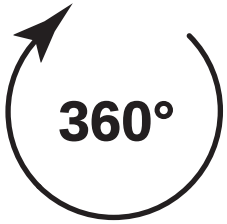
MANUAL, POWER, & SCOOTER

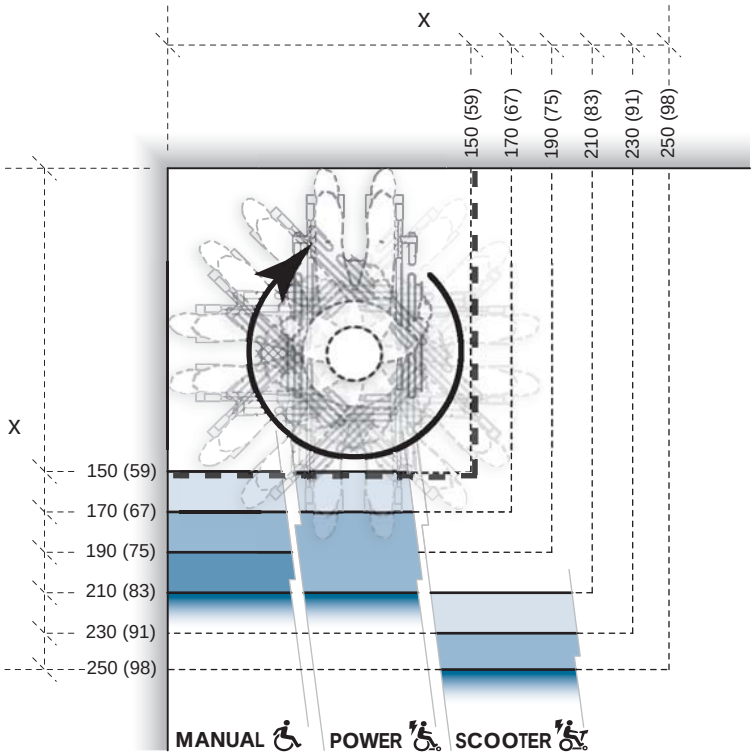
MINIMUM CLEAR FLOOR SPACE REQUIRED FOR 360-DEGREE TURN

percent accommodated (fixed wall)	x = floor space dimension, units: cm (in.) MANUAL	POWER	SCOOTER
	109 participants	96 participants	10 participants
< 50%			
50%	150 (59)	150 (59)	210 (83)
≥ 50% & < 75%			
75%	170 (67)	170 (67)	230 (91)
≥ 75% & < 90%			
90%	190 (75)	210 (83)	250 (98)
≥ 90% & < 95%			
95%	210 (83)	210 (83)	250 (98)*
≥ 95%			

* due to small sample size, x = maximum value observed

= ADA § 304.3.1 specification of 152.5 cm (60 in.)





This data depicts the amount of space required by users of wheeled mobility devices to perform a 360-degree turn. The bold dashed line in the table and figure indicates the current ADA requirement of a 60 in. turn space. Findings from the Anthropometry of Wheeled Mobility Study indicate that a square space of at least 59 x 59 in. was required for 50% of the manual and power wheelchair users measured in this study to perform a 360-degree turn. A space of 67 x 67 in. was required in order for 75% of manual wheelchair and power chair users to complete the turn, with 75% of scooter users needing a space of at least 91 x 91 in. These data are based on measurements of wheeled mobility users performing 360-degree turns within an enclosed square space built with mock walls. The enclosed space was incrementally varied from a size of 51 x 51 in. to 91 x 91 in. The minimum space required to perform a complete 360-degree turn within moving or knocking down any of the walls was recorded. Use of multiple short turns was allowed in contrast to a single continuous turn. For more details, see Design Resource 21 at (http://www.udeworld.com/turning-space-for-wheeled-mobility-users-the-360-deg-turn).

Locating Controls & Devices

Design Guidelines for Forward Approach of People Using Manual Wheelchairs

FWD
0lb
MANUAL

% OF PEOPLE WHO CAN REACH THE MATRIX CELL INDICATED WHILE HOLDING NO WEIGHT

Graphics Key:

- 0-24% Very Bad Design
- 25-49% Poor Design
- 50-74% Fair Design
- 75-100% Good Design
- = Current ANSI Standard

174 participants	300 11.9	200 7.9	100 3.9	0 0	(-) 100 3.9	(-) 200 7.9	(-) 300 11.9	(-) 400 15.8	(-) 500 19.7
1900-1999 [74.9-78.7]	0	0	0	0	1	1	1	1	1
1800-1899 [70.9-74.8]	0	0	0	1	1	2	2	2	2
1700-1799 [67.0-70.8]	0	0	2	5	7	9	9	10	10
1600-1699 [63.1-66.9]	1	5	10	18	23	30	40	44	47
1500-1599 [59.1-63.0]	3	10	22	29	41	56	67	73	75
1400-1499 [55.2-59.0]	9	20	32	45	61	74	84	90	93
1300-1399 [51.2-55.1]	17	25	42	55	72	87	94	98	99
1200-1299 [47.3-51.1]	21	32	47	64	76	92	97	99	99
1100-1199 [43.4-47.2]	24	37	54	70	84	93	98	99	99
1000-1099 [39.4-43.3]	25	43	59	72	88	94	99	100	100
900-999 [35.5-39.3]	29	44	62	76	91	94	99	100	100
800-899 [31.6-35.4]	33	46	62	76	92	96	99	100	100
700-799 [27.6-31.5]	33	47	61	76	91	95	98	98	98
600-699 [23.7-27.5]	31	44	58	72	84	89	90	91	91
500-599 [19.7-23.6]	16	24	31	34	40	45	45	46	46
400-499 [15.8-19.6]	1	2	3	5	5	7	7	7	7
300-399 [11.9-15.8]	0	0	0	0	0	0	0	1	1

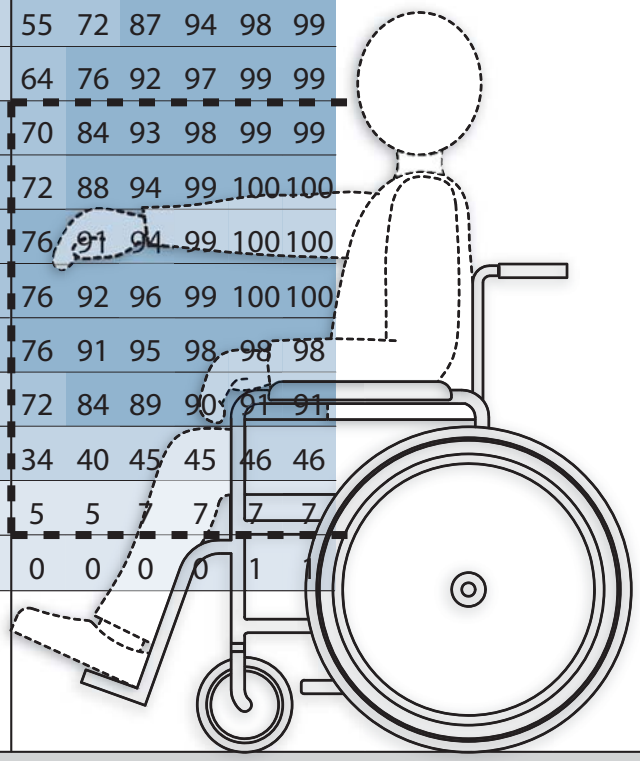
mm | [in]

vertical distance (from floor)

mm / in

horizontal distance (from forward-most point)

Data for some or all participants was not collected for reach ranges below points considered unsafe to attempt reaching.



These data depict the reaching abilities of manual chair users represented as the percentage of users expected to reach to a target location in the forward reach direction for a given (a) height from the floor (shown the vertical axis) and (b) offset distance (shown on the horizontal axis) from the forward-most point of the person or wheelchair (e.g., toe, footrest). Horizontal distances in the positive range represent offset distance away from the body (or barrier depth) when reaching over an obstruction in relation to the forward-most point, and the negative range implying that the reach target is brought closer to the person (such as on a table with knee clearance). The percentages are color coded to differentiate regions in reach performance. The dashed lines indicate the current ADAAG requirement. For more details, see Design Resource 20 (http://www.udeworld.com/functional-reach-capability-for-wheeled-mobility-users).

Locating Controls & Devices

Design Guidelines for Side Approach of People Using Manual Wheelchairs

SIDE
0lb
MANUAL

% OF PEOPLE WHO CAN REACH THE MATRIX CELL INDICATED WHILE HOLDING NO WEIGHT

Graphics Key:

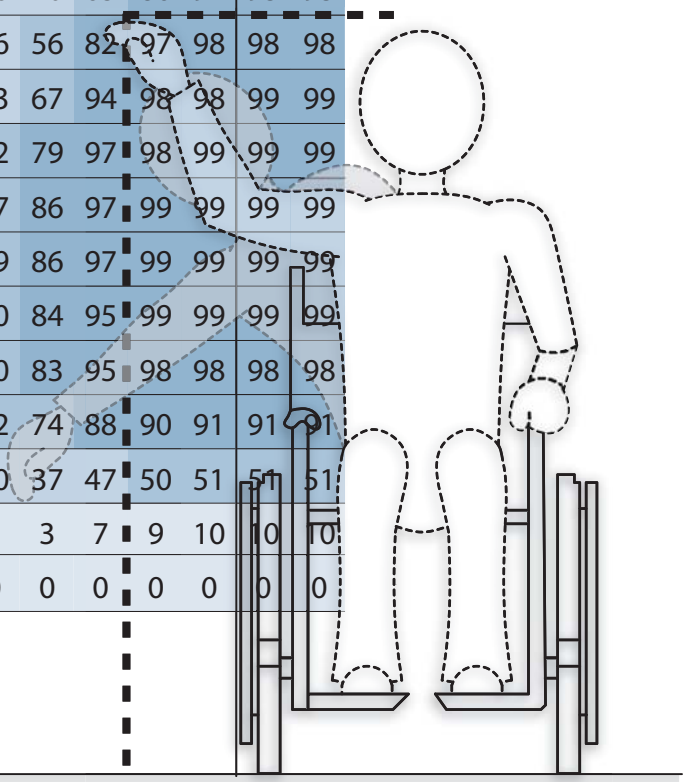
- 0-24% Very Bad Design
- 25-49% Poor Design
- 50-74% Fair Design
- 75-100% Good Design
- = Current ANSI Standard

174 participants	900 35.4	800 31.5	700 27.6	600 23.7	500 19.7	400 15.8	300 11.9	200 7.9	100 3.9	0 0	-100 -3.9
1900-1999 [74.9-78.7]	0	0	0	0	0	0	1	1	1	1	1
1800-1899 [70.9-74.8]	0	0	0	0	1	2	2	2	2	2	2
1700-1799 [67.0-70.8]	0	0	0	1	1	2	6	7	7	7	7
1600-1699 [63.1-66.9]	1	1	1	2	4	17	28	37	45	48	48
1500-1599 [59.1-63.0]	1	1	1	5	14	29	44	63	74	76	76
1400-1499 [55.2-59.0]	1	1	3	12	26	40	65	86	92	93	93
1300-1399 [51.2-55.1]	1	1	6	18	36	56	82	97	98	98	98
1200-1299 [47.3-51.1]	1	3	11	23	43	67	94	98	98	99	99
1100-1199 [43.4-47.2]	1	4	15	32	52	79	97	98	99	99	99
1000-1099 [39.4-43.3]	1	5	15	34	57	86	97	99	99	99	99
900-999 [35.5-39.3]	2	6	18	38	59	86	97	99	99	99	99
800-899 [31.6-35.4]	2	6	18	40	60	84	95	99	99	99	99
700-799 [27.6-31.5]	2	7	18	39	60	83	95	98	98	98	98
600-699 [23.7-27.5]	2	7	18	33	52	74	88	90	91	91	91
500-599 [19.7-23.6]	1	4	9	18	30	37	47	50	51	51	51
400-499 [15.8-19.6]	0	0	0	1	3	3	7	9	10	10	10
300-399 [11.9-15.7]	0	0	0	0	0	0	0	0	0	0	0

mm | [in]
vertical distance (from floor)

mm / in
horizontal distance (from chair edge)

Data for some or all participants was not collected for reach ranges below points considered unsafe to attempt reaching.



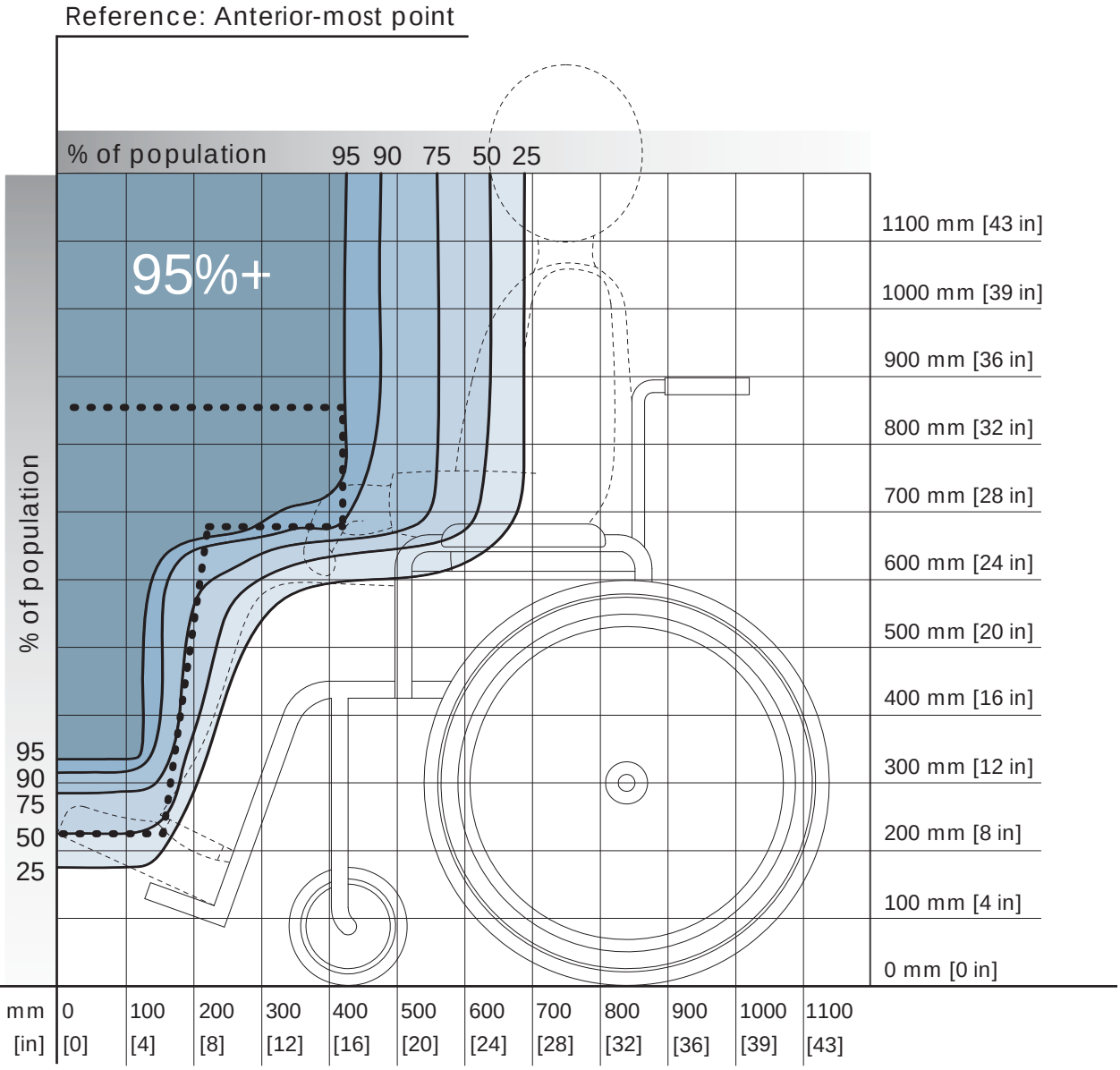
These data depict the reaching abilities of manual chair users represented as the percentage of users expected to reach to a target location in the lateral or sideways reach direction for a given (a) height from the floor (shown the vertical axis) and (b) offset distance (shown on the horizontal axis) from the lateral-most point of the person or wheelchair (e.g., elbow, armrest). Horizontal distances in the positive range represent offset distance away from the body (or barrier depth) in relation to the lateral-most point, and the negative range implying that the reach target is brought closer to the person. The dashed lines indicate the current ADAAG requirement. For more details, see Design Resource 20 (http://www.udeworld.com/functional-reach-capability-for-wheeled-mobility-users).

Knee Clearances

Design Guidelines for People Using Manual Wheelchairs

CLEARANCES AS MEASURED FROM ANTERIOR-MOST POINT

MANUAL



This depicts knee and toe clearance required by manual chair users for forward approach to elements in the built environment (e.g., lavatories, workstations). It references dimensions of clearance height and depth to the forward-most point on the person or mobility device (e.g., toe, footrest). Shaded areas depict the envelope of space required by the specified percentage of people if positioned with the forward-most point touching the wall. Hence, to accommodate a particular percentage of users, the side profile of a design element (shown by dotted line) should not extend outside the corresponding shaded area. For more details, see Design Resource 17 (http://www.udeworld.com/knee-and-toe-clearances-for-wheeled-mobility-users).

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Anthropometry and Space Requirements for Wheeled Mobility Users
Examples of Wheeled Mobility Users Potentially Excluded by Design in the Built Environment

Manual user with a large knee clearance depth and occupied depth

Power chair user with large knee and toe clearance height and depth, and occupied depth

Power chair user with a high knee and toe clearance height, and large occupied depth

Power chair user with high knee and toe clearances

Power chair user with high knee clearance

Manual chair user with high knee clearance

Power chair user with a large occupied width

Manual chair user with a large occpied width

Scooter user with a small device length and width

Scooter user with a large occupied length

Power chair user with a large occupied length and width due to additional carry-on luggage

Power chair user with a large occupied length due to additional carry-on luggage