NAC
ARCHITECTURE

Patty Hayes, Board Chair
Washington State Board of Health
PO Box 47990
Olympia, WA 98504-7990

AQUATIC CENTER at MLK JR. PARK, Yakima

Variance Letter Date: 2024.06.20

STATE IDENTIFICATION: State ID Facility #: F0476 Project #:2024003

Facility Information:
Aquatic Center at MLK Jr. Park (New outdoor pool facility with 5,300sf pool building and two leisure pools)
Plan Submittal: Drawing Plans have been submitted for review.

Aquatic Center at MLK Jr. Park, City of Yakima

Owner Contact:	Ken Wilkinson	Phone: 509-576-6416
Owner Address:	129 N 2nd street	Yakima, WA 98901
Facility Address:	610 S 9th Street	Yakima, WA 98901
Owner Representative:	Brooke Hanley (NAC Architecture) 509-838-8240	

Variance Request Contact:
NAC Architecture: Brooke Hanley Phone: 509-838-8240 Email: bhanley@nacarchitecture.com

Variance Request Citation:
WAC 246-262-160 states *the board may grant a variance from requirements of chapter **246-262** WAC if, in the sole discretion of the board, data and/or research provides sufficient evidence that the RWCF (attraction, device, equipment, procedure, etc.), will adequately protect public health and safety, as well as water quality.*

Variance Request: Code language related to Diving Envelope (WAC 246-262-010(21) & WAC 246-262-060(5)(vi)) for the **NinjaCross Obstacle Course** attraction.

Items noted in review letter include:

- **NinjaCross Obstacle Course** attraction receiving pool shall conform to the CNCA or FINA standards (depth application and setbacks)

In the Department of Health review response letter issued by Justin Law dated May 22, 2024, Justin requests NAC Architecture (NAC) and WaterTechnology, Inc. (WTI) to address important concerns regarding public safety related to the receiving pool for the proposed **NinjaCross Obstacle Course** attraction in Pool B. The concern is to address the minimum depth of the pool to be compliant with the WAC 246-262-010(21) & WAC 246-262-060(5)(c)(vi) regarding diving envelopes for features where users enter the water from above the water surface.

On behalf of the City of Yakima, WA; NAC & WTI respectfully requests your consideration of the current pool depth design at the NinjaCross for the future Aquatic Center at MLK Jr. Park. To support this request we provide the attached information, engineering exhibits, and following commentary:

- The review letter states that the "diving envelope" from WAC 246-262-010(21) applies to **all attractions** where users enter above pool water level and therefore requires the CNCA (enter less than 20" above the water surface) or FINA (enter 20" or greater above the water surface) water depths. We submit that the attached independent engineering calculations for the **NinjaCross Obstacle Course** will demonstrate that the manufacturer's required water depths and the designed water depths provided at the Yakima Aquatic Center are sufficient to protect the safety of the users allowed to participate in this attraction. Calculations were completed for users ranging in height from 51" tall up to 72" tall, and weight ranging from 58lbs to 275lbs. The minimum user height is 48" and the maximum weight is 275lbs. The manufacturer's minimum depth requirement is 3'-6" feet depending on the obstacles purchased for the system. The current Yakima receiving pool water depth starts at 4'-0" at one end and slopes down to a depth of 5'-4" at the other end. Please review the attached engineering calculations in support of using the manufacturer's depth requirements in lieu of the CNCA or FINA diving envelope dimensions. See page 11 for a graphic section depicting an average user height compared and their position in or above the water using each obstacle. In the event that someone does drop from a height of 20" above the water, which is not anticipated for this attraction, the heaviest user would contact the pool floor feet-first with a force equivalent to contacting the ground after a 3.4" high jump on pavement. Quote from review letter, "The participant is expected to contact the pool bottom in a manner that is consistent with any shallow pool activities." The current design at the Yakima receiving pool exceeds these calculation assumptions by providing deeper water than the minimum required and will be lifeguarded to prevent people from incorrectly using the obstacles.

- WAC 246-262-060(5)(c)(vi) appears to apply specifically to "diving envelopes in pools or areas of pools designated for diving activities". The applicant submits that diving activities are generally defined as plunging into the water headfirst. Diving headfirst into water results in the need for deeper water to avoid a head & neck collision with the bottom of the pool which is different than a feet-first or tucked entry plunge where the body is significantly slowed in the first 2 feet of water. The **NinjaCross Obstacle Course** safety guidelines (provided in the exhibits) will note that users are required to enter the water in a feet-first manner. Diving from the unit is prohibited. The engineering calculations completed also assumes a feet-first plummet into the water. As users traverse the obstacles, they will generally have their feet dragging in the water and would not drop from a height above the water that is any different from stepping into the pool from the deck edge, see page 11.

- The Model Aquatic Health Code also addresses the complexity of “other aquatic features” like this and would suggest that the manufacturer recommendations for design and operation would be adequate to install the feature.

  4.12.10[A] Other Aquatic Features Other AQUATIC FEATURES not otherwise addressed in the CODE, including but not limited to climbing walls, inflatables, and play structures, shall not be installed unless designed and operated in accordance with all manufacturer’s installation and operations recommendations.

- ‘A-frame’ signs with all written safety guidelines will be publicly displayed near the NinjaCross (see page 100 for example) to meet the criteria of WAC 246-262-070(10).

- Safety padding rated for falls from 6ft or less are provided around the base of the truss structure and down the face of the pool wall to prevent injuries at the corner of the gutter.

- This pool will be lifeguarded at all times while in operation and the lifeguard staff will be the first line of defense to screen bathers to make sure they are experienced swimmers, instruct swimmers on proper use of the attraction, and direct proper swimmer circulation to and from the activity within the pool to avoid congestion or collisions. The **NinjaCross** will have a dedicated lifeguard to closely supervise the safety of swimmers when the attraction is open for use.

- Injury statistics requested by the review letter are not available from the manufacturer or another source at this time, but many aquatic centers across the country are replacing their lily pad crossing activities with the NinjaCross obstacle course because it has been deemed safer than having the lily pads anchored to the floor and permanently obscuring the view of the water below the pads from lifeguard supervision. The NinjaCross obstacles do not have those same supervision issues.

- The **NinjaCross** has also been designed and engineered to meet the following standards: Where applicable, NinjaCross follows guidelines from the MAHC (model aquatic health code). As for ASTM, NinjaCross has registered their products as fitness/sporting goods equipment which fall under ASTM F2461-18 Section 1.3.8 Exclusions "1.3.8 Sports equipment, fitness equipment, and diving equipment." This system’s patents and trademarks are registered under Sporting Goods & Fitness equipment and is not classified as an Amusement Ride.

- The City of Yakima specifically requested a pool design that would have a variety of intriguing activities for their patrons but would not need water deeper than 6-7ft. Pools deeper than 6-7ft come with their own safety risks and lifeguarding challenges. Shallow water is easier to supervise and guard. Rescues are much more likely to be needed in deep water where a bather in trouble cannot push off the bottom of the pool to bob back above the surface quickly until the lifeguard can assist them. Yakima is dedicated to making this facility fun while also as safe as possible for their community members and patrons.

- NAC submits that the design as described above and substantiated in the attached documentation meets the intent of providing a safe receiving pool for the **NinjaCross Obstacle Course** feature. NAC, WTI, and the City of Yakima respectfully requests a variance accordingly. If the State Board of Health has any follow-up conditions or actions required of the owner/operator, we are committed to implementing them.

NAC Architecture (NAC) has teamed with Water Technology (WTI) on numerous aquatic projects and so we have a history of producing these projects successfully. WTI has been designing Aquatic venues for over 40 years. WTI is widely known in the industry as one of the leading aquatic design firms in North America. As one of the industry's leaders, WTI has represented the waterpark industry during CPSC meetings on review of VGB rules and has also been involved in reviewing/editing sections of the MAHC. They are also represented in the Washington DOH committee to update the existing administrative code to adopt a more comprehensive aquatic code like the MAHC. The NAC and WTI commitment to safe aquatic facilities is proven. The design of the receiving pool at the **NinjaCross Obstacle Course** for the Yakima Aquatic Center will not put the health and safety of the public at risk. The City of Yakima, having operated a public pool for many years is experienced and committed to the safety and the welfare of their patrons.

On behalf of the City of Yakima, NAC Architecture would like to thank you for your consideration of this Variance Request. Please feel free to contact me with any questions you may have regarding this request.

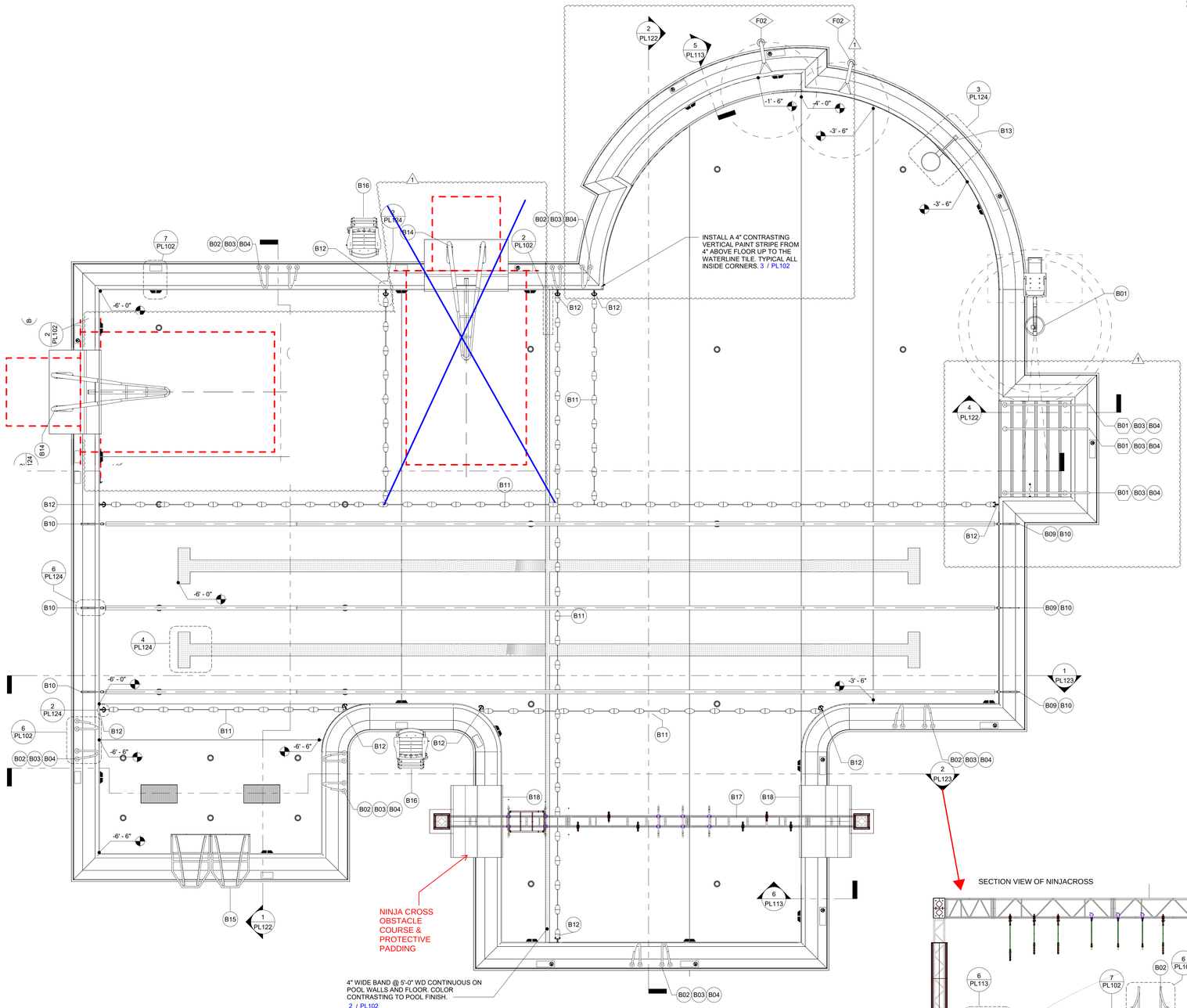
Thank you,

Brooke Hanley

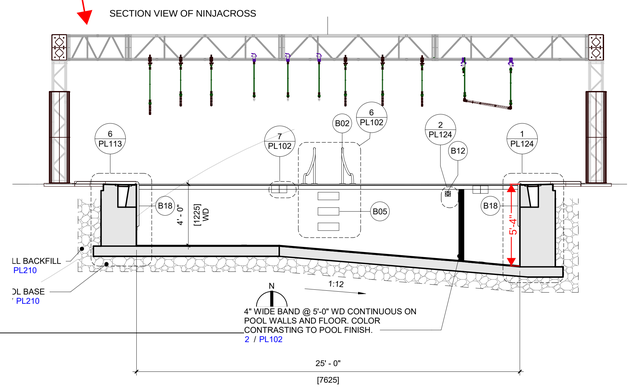
Brooke Hanley, AIA, Principal Architect, NAC Architecture

Attachments:

- NinjaCross Safety Information and Fall Zone Engineering, including a floor plan and section of the receiving pool for the Yakima Aquatic Center.



1 POOL B - ACTIVITY PLAN
PLAN VIEW
1/8" = 1'-0"



POOL B-ACTIVITY DATA

DESCRIPTION	QTY	UNITS		
POOL PERIMETER	314'-0"	FEET		
WATER SURFACE AREA	3,832	SQUARE FEET		
POOL WATER TEMPERATURE	84	°F		
POOL VOLUME	136,514	GALLONS		
SURGE TANK OPERATING VOLUME	7,415	GALLONS		
TOTAL VOLUME OF WATER	147,268	GALLONS		
CIRCULATION RATE	1,033	GPM		
TURNOVER/VOLUME/FLOW	60 MIN.	19,330 GAL.	322	GPM
TURNOVER/VOLUME/FLOW	180 MIN.	127,938 GAL.	711	GPM
FILTRATION RATE	12.66	GPM/FT²		
BACKWASH FLOW	306	GPM		
SURGE FACTOR	1.06	GAL/SQFT		
AVAILABLE SURGE CAPACITY IN SURGE TANK	4075	GALLONS		

SCHEDULE - BASIS OF DESIGN - POOL B

POOL ID	EQUIPMENT ID	EQUIPMENT	QTY	MANUFACTURER	DESCRIPTION
B	01	POOL LIFT	1	SR SMITH, AQUA CREEK, OR EQUAL	STANDARD ANCHORED, ROTATIONAL POOL LIFT, WITH 400 LB MINIMUM LIFTING CAPACITY. MUST MEET ALL APPLICABLE ADA REQUIREMENTS, WHILE MAINTAINING REQUIRED DECK CLEARANCE. PACKAGE TO INCLUDE ARMRESTS, ANCHOR, LIFT COVER, BATTERY CHARGER, AND CADDY
B	02	GRAB RAILS (PAIRS)	6	PARAGON AQUATICS, SPECTRUM AQUATICS, SR SMITH OR EQUAL	PRETZEL BEND STYLE, 1.50" OD x .120 WALL THICKNESS, 500 GRIT FINISH MIN.
B	03	ESCUTCHEON PLATE	34	PARAGON AQUATICS, SPECTRUM AQUATICS, SR SMITH OR EQUAL	STAINLESS STEEL ROUND ESCUTCHEON FOR 1.50" O.D. RAILS
B	04	WEDGE ANCHOR	34	PARAGON AQUATICS, SPECTRUM AQUATICS, SR SMITH OR EQUAL	CAST BRONZE, 4-1/4" LONG, ACCEPTS 1.500" OD TUBING
B	05	IN-WALL STEPS	18	PARAGON AQUATICS, SPECTRUM AQUATICS, SR SMITH OR EQUAL	17-1/2" x 6", INJECTION MOLDED PLASTIC, PEBBLE TEXTURE, 1/4" WALL THICKNESS
B	09	LANE DIVIDERS	3	COMPETITOR SWIM PRODUCTS	4" WAVE QUELLING RACING LANE LINE, COLORS BY OWNER / ARCHITECT
B	10	DaiFLEX LANE LINE ANCHOR	6	DALDORADO	12" - NON-CORROSIVE PVC FLIP UP LANE LINE ANCHOR TO BE USED WITH DALDORADO PARALLEL GRATING. INCLUDES FLIP-UP HATCH, BASE UNIT, & SILICON COVERED SS BRAIDED STRAP EXTENSION WITH HOOK. CAN BE USED WITH THE DaiFLEX 8" OR 14" LANE LINE EXTENSION.
B	11	SAFETY ROPE	6	PARAGON AQUATICS	3/4" POLYETHYLENE ROPE WITH 5"x9" HANDI-LOCK FLOAT, VERIFY LENGTH WITH PLANS
B	12	CUP ANCHOR	10	PARAGON AQUATICS, SPECTRUM AQUATICS, SR SMITH OR EQUAL	4" SQUARE 304L SS ANCHOR AND 304L SS EYE BOLT
B	13	BASKETBALL HOOP	1	SR SMITH	STAINLESS STEEL BASKETBALL HOOP WITH ROCKSOLID ANCHOR
B	14	AQUA ZIPN	1	AQUACLIMB	DECK-MOUNTED OVERHEAD ROPE SWING, WITH SELF-RETRACTING TROLLEY, POWDER-COATED STAINLESS STEEL WITH HIGH TENACITY POLYESTER ROPE. INCLUDES SAFETY PAD-UNIVERSAL, WITH 316 SS HILTI FLUSH MOUNT CONCRETE ANCHORS.
B	15	AQUACLIMB	1	AQUACLIMB	2 WIDE X 3 HIGH AQUATIC CLIMBING WALL
B	16	LIFEGUARD CHAIR	2	TAILWIND, KEIFER, SPECTRUM AQUATICS, SR SMITH OR APPROVED EQUAL	RECYCLED PLASTIC WITH 304 SS HARDWARE, COLOR BY OWNER/ARCHITECT 40" SEAT HEIGHT (OWNER'S SAFETY CONSULTANT TO SPECIFY LOCATION.)
B	17	NINJACROSS	1	NINJACROSS	AQUATIC OBSTACLE COURSE
B	18	SAFETY PAD	3	PLAYTIME	WALL AND DECK SAFETY PAD AT NINJACROSS SYSTEM

SCHEDULE - CUSTOM RAILGOODS - POOL B

POOL ID	EQUIPMENT ID	EQUIPMENT	QTY	MANUFACTURER	DESCRIPTION
B	01	HAND RAIL	3	PARAGON AQUATICS, SPECTRUM AQUATICS, SR SMITH OR EQUAL	CUSTOM FABRICATED, 316L SS, 1.50" OD x .120 WALL THICKNESS, 500 GRIT FINISH MIN.
B	02	HAND RAIL	2	PARAGON AQUATICS, SPECTRUM AQUATICS, SR SMITH OR EQUAL	CUSTOM FABRICATED, 316L SS, 1.50" OD x .120 WALL THICKNESS, 500 GRIT FINISH MIN.

SCHEDULE - WATER FEATURE - POOL B

POOL ID	FEATURE ID	FEATURE	QTY	MANUFACTURER	DESCRIPTION	GPM (ea)	GPM (Total)
~~B~~	~~F01~~	~~DROP SLIDE~~	~~1~~	~~SPLASHTACULAR~~	~~FUTURE SLIDE. PROVIDE PIPING CAPPED ONLY~~	~~500~~	~~500~~
B	F02	WATER SPRAY	2	WATERPLAY	PIPE DELUGE-FAN SPRAY FEATURE	60	120

REVISIONS

REV.NO.	DESCRIPTION	DATE
1	CHANGE PROPOSAL	04/16/2024

CONFORMED SET

CITY OF YAKIMA
YAKIMA POOL
YAKIMA WA

WTI
WATER TECHNOLOGY, INC.
World Leaders in Aquatic Planning, Design and Engineering
100 Park Avenue | Beaver Dam, WI 53916
t 920.887.7375

NAC ARCHITECTURE
nacarchitecture.com
1203 WEST RIVERSIDE AVENUE
SPOKANE WA 99201
P:509.838.8240

NAC NO 111-22082
ISSUE DATE: 4/16/24
PROJECT NUMBER: 22314
DRAWN BY: T.ED
CHECKED BY: ACC

7893 REGISTERED ARCHITECT
MATTHEW W. FREEBY
STATE OF WASHINGTON
4/16/2024

POOL B - ACTIVITY POOL PLAN

PL120

June 12, 2024

Stephen Wagner
Director of Design & Development
NinjaCross™ Systems
stevew@ninjacrosssystems.com

Re: NinjaCross™ Drop Zone Assessment
Spokane Regional Health District
Project #2024-03-129

Stephen,

As requested, Eclipse Engineering has completed the drop zone assessment while using the NinjaCross™ System for the above noted jurisdiction. We utilized data from the CDC to determine the 10th, 50th and 90th percentile for male and female children aged 10, 12, and 14 years old. Using these participants in addition to the maximum user weight for the system, we analyzed a variety of drop orientations into a pool depth of 3'6" from 20" above the surface of the pool, which is comparable to jumping into the water from the pool deck.

While considering the drop orientations from the available system obstacles, we concluded that a drop into the water while using the NinjaCross™ System per its intended use and safety standards would not present a life safety hazard from impacting the water's surface or contacting the pool floor. When a participant who is using the system per design drops from an obstacle, their acceleration stops when they contact the water's surface, and their velocity is significantly reduced within the first 24", thus allowing the participant to contact the pool floor without a sudden impact. The participant is expected to contact the pool bottom in a manner consistent with any shallow pool activities.

Please note that accidents and injuries can happen in any situation regardless of prevention measures put in place. It is the responsibility of the facility, staff, and local governing agencies to follow the operation and maintenance manuals of the NinjaCross™ system to ensure proper use. Eclipse Engineering does not guarantee the health and safety of any participant of a NinjaCross™ system or the facility itself.

Please contact us with any questions.

Sincerely,
Eclipse Engineering, PC

Wade Ambach, P.E.
Project Manager
wambach@eclipse-engineering.com

Digitally signed by Rolf Henry Armstrong
DN: E=rarmstrong@eeimt.com, CN=Rolf Henry Armstrong, O="Eclipse Engineering, P.C.", L=Bend, S=Oregon, C=US
Date: 2024.06.14 01:41:26-07'00'

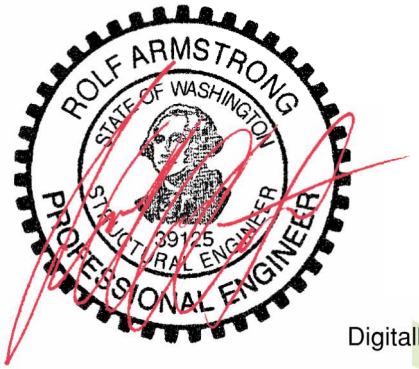
ROLF ARMSTRONG STATE OF WASHINGTON 19125 STRUCTURAL ENGINEER PROFESSIONAL ENGINEER

Rolf Armstrong, P.E., S.E.
CFO, Principal Engineer
rarmstrong@eclipse-engineering.com

Attachment: Safe Drop Zone Graphic

STRUCTURAL CALCULATIONS

NinjaCross – Drop Zone Assessment



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DN: E=rarmstrong@eeimt.com, CN=Rolf Henry Armstrong, O="Eclipse Engineering, P.C.", L=Bend, S=Oregon, C=US
Date: 2024.06.14 01:40:52-07'00'

Prepared For:

NinjaCross Systems
Kyle W. Rieger, CPO
kyle@ninjacrosssystems.com

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Assumptions

A. DENSITY OF PERSON IS 980 KG/M^3.

B. COEFFICIENT OF DRAG OF PERSON DROPPING THROUGH WATER IS 1.0.

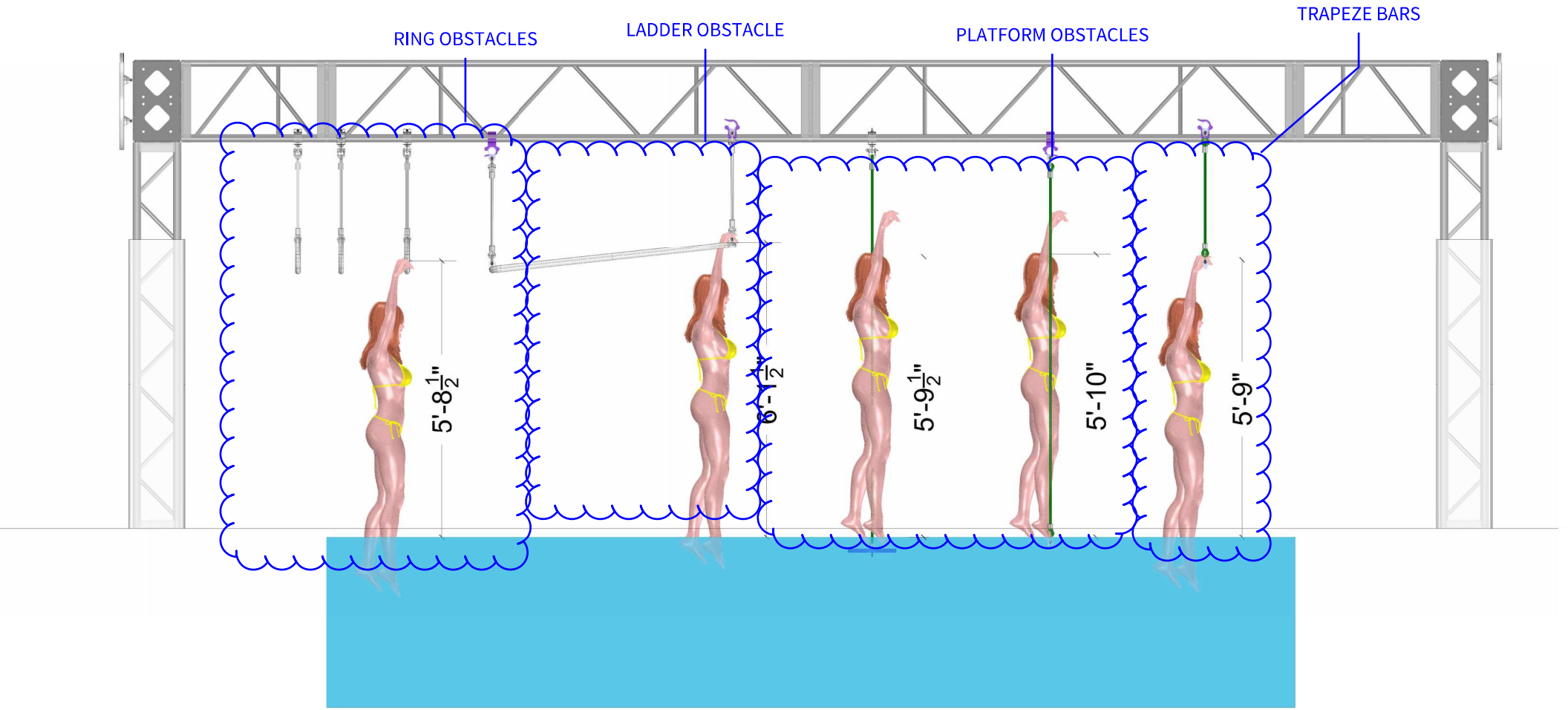
C. PERSON REMAINS STILL THROUGHOUT THE DROP UNTIL MAKING CONTACT WITH THE POOL FLOOR (IF APPLICABLE).

D. THE POOL DEPTH IS 3'-6".

E. PERSON DROPS WITH THEIR FEET 20 INCHES ABOVE THE TOP OF THE WATER.

F. PERSON DROPS FROM REST.

OBSTACLES AND USER CONDITIONS CONSIDERED IN EEPC FALL ZONE REVIEW
MINI NINJA SYSTEM



2 to 20 years: Girls
Stature-for-age and Weight-for-age percentiles

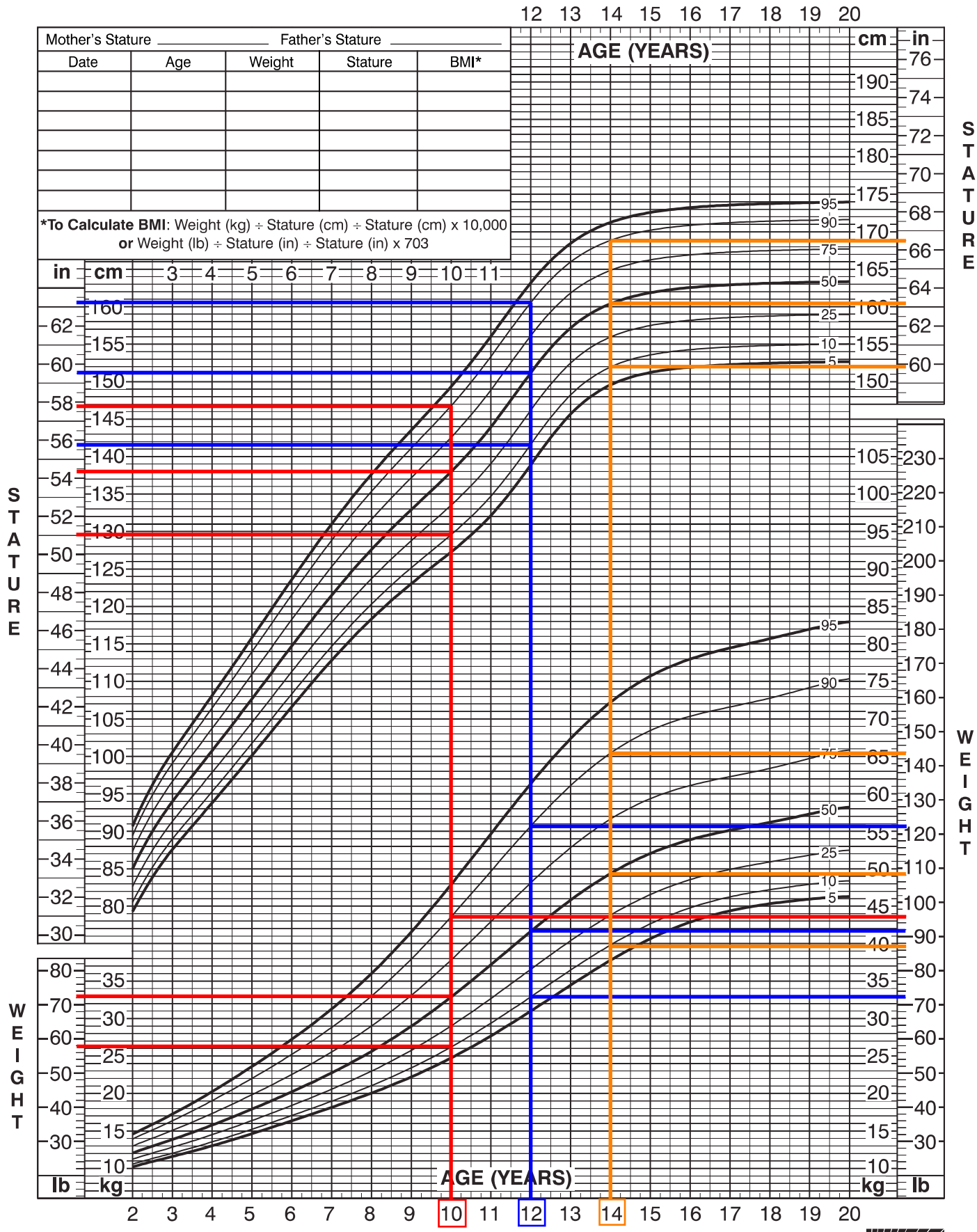
NAME _____

RECORD # _____

Mother's Stature _____ Father's Stature _____

Date	Age	Weight	Stature	BMI*

***To Calculate BMI**: Weight (kg) ÷ Stature (cm) ÷ Stature (cm) x 10,000
or Weight (lb) ÷ Stature (in) ÷ Stature (in) x 703



Published May 30, 2000 (modified 11/21/00).
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
http://www.cdc.gov/growthcharts

2 to 20 years: Boys
Stature-for-age and Weight-for-age percentiles

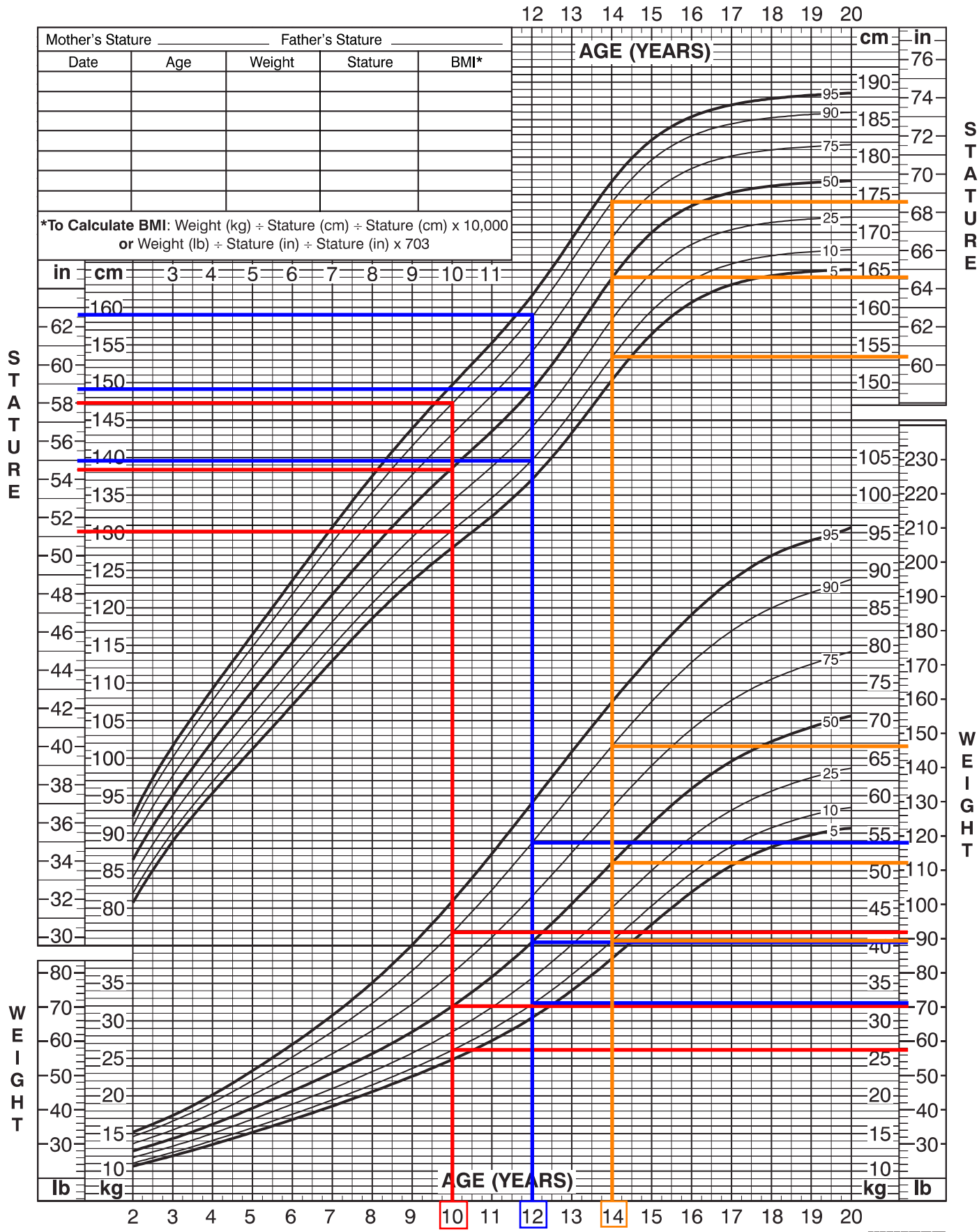
NAME _____

RECORD # _____

Mother's Stature _____ Father's Stature _____

Date	Age	Weight	Stature	BMI*

***To Calculate BMI**: Weight (kg) ÷ Stature (cm) ÷ Stature (cm) x 10,000
or Weight (lb) ÷ Stature (in) ÷ Stature (in) x 703



Published May 30, 2000 (modified 11/21/00).
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
http://www.cdc.gov/growthcharts

Summary Data

Girls Stature & Weight for Age per CDC			
Age	Percentile	Weight (lb)	Height (in)
10	10	58	51
	50	72	54.5
	90	96	57.75
12	10	72	55.75
	50	92	59.5
	90	122	63.25
14	10	87	59.75
	50	108	63.25
	90	144	66.5

Boys Stature & Weight for Age per CDC			
Age	Percentile	Weight (lb)	Height (in)
10	10	58	51.25
	50	70	54.5
	90	92	58
12	10	71	55
	50	89	58.75
	90	118	62.75
14	10	89	60.5
	50	112	64.5
	90	146	68.5

NinjaCross System Design Participant	
Weight (lb)	Height (in)
275.0	72.0

NinjaCross System Design Participant Results				
	Vertical Drop	Diagonal Drop	Tucked Knee Drop	Horizontal Drop
Velocity at Pool Bottom	2.9 mph	2.9 mph	1.8 mph	0.0 mph
Effective Height of Drop	3.4 in	3.4 in	1.3 in	0.0 in

THE MAXIMUM VELOCITY AT WHICH THE PERSON HITS THE POOL FLOOR IS THAT WITH WHICH A PERSON HITS THE GROUND FROM A 3.4 INCH HEIGHT FALL.

$$mgh = \frac{1}{2}mv^2$$

Effective Height Above Ground $h = \frac{v^2}{2g}$

Please note that OSHA does not consider drops less than 4'-0" to require fall protection

Excerpt from https://www.osha.gov/fall-protection:
"OSHA requires that fall protection be provided at elevations of four feet in general industry workplaces."

Female Participant Results

Age	Percentile		Vertical Drop	Diagonal Drop	Tucked Knee Drop	Horizontal Drop
10	10	Velocity at Pool Bottom	0.0 mph	0.0 mph	0.0 mph	0.0 mph
		Effective Height of Drop	0.0 in	0.0 in	0.0 in	0.0 in
	50	Velocity at Pool Bottom	0.0 mph	0.0 mph	0.0 mph	0.0 mph
		Effective Height of Drop	0.0 in	0.0 in	0.0 in	0.0 in
	90	Velocity at Pool Bottom	1.3 mph	0.9 mph	0.0 mph	0.0 mph
		Effective Height of Drop	0.7 in	0.3 in	0.0 in	0.0 in
12	10	Velocity at Pool Bottom	0.0 mph	0.0 mph	0.0 mph	0.0 mph
		Effective Height of Drop	0.0 in	0.0 in	0.0 in	0.0 in
	50	Velocity at Pool Bottom	1.3 mph	0.7 mph	0.0 mph	0.0 mph
		Effective Height of Drop	0.7 in	0.2 in	0.0 in	0.0 in
	90	Velocity at Pool Bottom	2.5 mph	2.2 mph	0.0 mph	0.0 mph
		Effective Height of Drop	2.4 in	2.0 in	0.0 in	0.0 in
14	10	Velocity at Pool Bottom	0.9 mph	0.0 mph	0.0 mph	0.0 mph
		Effective Height of Drop	0.3 in	0.0 in	0.0 in	0.0 in
	50	Velocity at Pool Bottom	2.0 mph	1.8 mph	0.0 mph	0.0 mph
		Effective Height of Drop	1.6 in	1.3 in	0.0 in	0.0 in
	90	Velocity at Pool Bottom	2.9 mph	2.9 mph	0.0 mph	0.0 mph
		Effective Height of Drop	3.4 in	3.4 in	0.0 in	0.0 in

Male Participant Results

Age	Percentile		Vertical Drop	Diagonal Drop	Tucked Knee Drop	Horizontal Drop
10	10	Velocity at Pool Bottom	0.0 mph	0.0 mph	0.0 mph	0.0 mph
		Effective Height of Drop	0.0 in	0.0 in	0.0 in	0.0 in
	50	Velocity at Pool Bottom	0.0 mph	0.0 mph	0.0 mph	0.0 mph
		Effective Height of Drop	0.0 in	0.0 in	0.0 in	0.0 in
	90	Velocity at Pool Bottom	1.1 mph	0.4 mph	0.0 mph	0.0 mph
		Effective Height of Drop	0.5 in	0.1 in	0.0 in	0.0 in
12	10	Velocity at Pool Bottom	0.0 mph	0.0 mph	0.0 mph	0.0 mph
		Effective Height of Drop	0.0 in	0.0 in	0.0 in	0.0 in
	50	Velocity at Pool Bottom	1.1 mph	0.0 mph	0.0 mph	0.0 mph
		Effective Height of Drop	0.5 in	0.0 in	0.0 in	0.0 in
	90	Velocity at Pool Bottom	2.2 mph	2.0 mph	0.0 mph	0.0 mph
		Effective Height of Drop	2.0 in	1.6 in	0.0 in	0.0 in
14	10	Velocity at Pool Bottom	1.1 mph	0.0 mph	0.0 mph	0.0 mph
		Effective Height of Drop	0.5 in	0.0 in	0.0 in	0.0 in
	50	Velocity at Pool Bottom	2.2 mph	1.8 mph	0.0 mph	0.0 mph
		Effective Height of Drop	2.0 in	1.3 in	0.0 in	0.0 in
	90	Velocity at Pool Bottom	3.1 mph	2.9 mph	0.0 mph	0.0 mph
		Effective Height of Drop	3.9 in	3.4 in	0.0 in	0.0 in

NinjaCross System
Design Participant Calculations

Drops Vertically into the Pool

Height of COM	h = 1.42	m	
Mass of Person	m = 124.72	kg =	275 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.19	m^2 =	2 ft^2
Length of Person	L = 1.83	m =	6 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.7	624.2	10.0	-634.2	0.29	0.9
0.200	4.7	432.1	18.2	-450.3	0.52	1.7
0.300	4.1	314.2	25.1	-339.3	0.72	2.4
0.400	3.5	236.3	31.0	-267.3	0.89	2.9
0.500	3.1	182.0	36.2	-218.1	1.04	3.4
0.600	2.7	142.4	40.8	-183.1	1.17	3.8
0.700	2.4	112.6	44.8	-157.4	1.28	4.2
0.800	2.2	89.6	48.4	-138.0	1.39	4.5
0.900	1.9	71.5	51.6	-123.1	1.48	4.9
1.000	1.7	56.9	54.5	-111.4	1.56	5.1
1.100	1.5	45.1	57.1	-102.2	1.63	5.4
1.200	1.4	35.4	59.4	-94.8	1.70	5.6
1.300	1.2	27.5	61.4	-88.9	1.76	5.8
1.400	1.0	20.9	63.2	-84.1	1.81	5.9
1.500	0.9	15.5	64.7	-80.2	1.85	6.1
1.600	0.8	11.1	66.0	-77.1	1.89	6.2
1.700	0.6	7.5	67.1	-74.6	1.92	6.3
1.800	0.5	4.7	68.0	-72.7	1.95	6.4
1.900	0.4	2.6	68.6	-71.2	1.96	6.4
1.980	0.3	1.4	69.0	-70.4	1.98	6.5
2.000	0.2	1.1	69.1	-70.3	1.98	6.5
2.100	0.1	0.3	69.4	-69.7	1.99	6.5

Drops Diagonally into the Pool

Height of COM	h = 1.15	m	
Mass of Person	m = 124.72	kg =	275 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.19	m^2 =	2 ft^2
Length of Person	L = 1.29	m =	4.24264069 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.7	623.6	14.1	-637.7	0.29	0.9
0.200	4.7	430.1	25.7	-455.8	0.52	1.7
0.300	4.0	310.8	35.4	-346.2	0.72	2.3
0.400	3.5	231.6	43.7	-275.3	0.88	2.9
0.500	3.0	176.1	51.0	-227.1	1.03	3.4
0.600	2.7	135.5	57.3	-192.8	1.16	3.8
0.700	2.3	104.9	62.9	-167.8	1.27	4.2
0.800	2.1	81.3	67.7	-149.0	1.37	4.5
0.900	1.8	62.7	72.1	-134.7	1.46	4.8
1.000	1.6	47.8	75.8	-123.6	1.53	5.0
1.100	1.4	35.9	79.1	-115.0	1.60	5.3
1.200	1.2	26.3	81.9	-108.2	1.66	5.4
1.300	1.0	18.6	84.3	-102.9	1.71	5.6
1.400	0.8	12.5	86.3	-98.8	1.75	5.7
1.500	0.6	7.7	87.9	-95.6	1.78	5.8
1.600	0.5	4.2	89.1	-93.3	1.80	5.9
1.700	0.3	1.8	90.0	-91.8	1.82	6.0
1.800	0.1	0.4	90.5	-90.9	1.83	6.0
1.900						
1.980						
2.000						
2.100						

Drops with Tucked Knees into the Pool

Height of COM	h = 0.97	m	
Mass of Person	m = 124.72	kg =	275 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.28	m^2 =	3 ft^2
Length of Person	L = 0.91	m =	3 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.2	783.8	19.1	-802.9	0.27	0.9
0.200	4.0	475.9	33.5	-509.4	0.48	1.6
0.300	3.3	313.5	45.0	-358.5	0.64	2.1
0.400	2.7	216.6	54.5	-271.1	0.78	2.6
0.500	2.3	153.9	62.4	-216.3	0.89	2.9
0.600	2.0	110.7	69.1	-179.9	0.99	3.2
0.700	1.7	79.8	74.8	-154.7	1.07	3.5
0.800	1.4	57.0	79.7	-136.7	1.14	3.7
0.900	1.2	39.9	83.7	-123.6	1.20	3.9
1.000	1.0	26.9	87.1	-114.0	1.25	4.1
1.100	0.8	17.2	89.8	-107.0	1.29	4.2
1.200	0.6	9.9	91.9	-101.9	1.32	4.3
1.300	0.4	4.9	93.5	-98.4	1.34	4.4
1.400	0.2	1.7	94.5	-96.1	1.35	4.4
1.500	0.1	0.1	95.0	-95.1	1.36	4.5
1.600						
1.700						
1.800						
1.900						
1.980						
2.000						
2.100						

Drops Horizontally into the Pool

Height of COM	h = 0.81	m	
Mass of Person	m = 124.72	kg =	275 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.56	m^2 =	6 ft^2
Length of Person	L = 0.61	m =	2 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	4.0	985.0	25.4	-1010.4	0.24	0.8
0.200	2.8	463.1	41.3	-504.4	0.39	1.3
0.300	2.1	259.2	52.8	-312.0	0.50	1.7
0.400	1.6	157.4	61.6	-219.1	0.59	1.9
0.500	1.3	99.1	68.6	-167.7	0.65	2.1
0.600	1.0	62.6	74.1	-136.7	0.71	2.3
0.700	0.8	38.6	78.5	-117.0	0.75	2.5
0.800	0.6	22.4	81.8	-104.2	0.78	2.6
0.900	0.4	11.5	84.3	-95.8	0.80	2.6
1.000	0.3	4.6	86.0	-90.6	0.82	2.7
1.100	0.1	0.9	87.0	-87.9	0.83	2.7
1.200						
1.300						
1.400						
1.500						
1.600						
1.700						
1.800						
1.900						
1.980						
2.000						
2.100						

10-year-old Girl Calculations

Drops Vertically into the Pool

Height of COM	h = 1.16	m	
Mass of Person	m = 26.30	kg =	58 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.30	m =	4.25 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	4.4	195.3	12.5	-207.8	0.25	0.8
0.200	3.1	96.7	20.8	-117.5	0.42	1.4
0.300	2.3	53.1	26.9	-79.9	0.54	1.8
0.370	1.9	35.5	30.2	-65.6	0.61	2.0
0.400	1.7	29.8	31.4	-61.2	0.64	2.1
0.500	1.3	16.1	34.7	-50.8	0.70	2.3
0.570	1.0	9.8	36.5	-46.3	0.74	2.4
0.600	0.9	7.7	37.1	-44.8	0.75	2.5
0.700	0.5	2.7	38.7	-41.4	0.78	2.6
0.730	0.4	1.8	39.0	-40.8	0.79	2.6
0.800	0.2	0.4	39.5	-39.8	0.80	2.6
0.850		0.0	39.6	-39.6	0.80	2.6

Drops Diagonally into the Pool

Height of COM	h = 0.97	m	
Mass of Person	m = 26.30	kg =	58 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 0.92	m =	3.00520382 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	4.4	193.8	17.7	-211.5	0.25	0.8
0.200	3.1	93.4	29.3	-122.7	0.42	1.4
0.300	2.2	48.6	37.6	-86.2	0.54	1.8
0.370	1.8	30.5	42.0	-72.5	0.60	2.0
0.400	1.6	24.7	43.6	-68.3	0.62	2.0
0.500	1.0	11.1	47.7	-58.8	0.68	2.2
0.570	0.7	5.2	49.7	-54.9	0.71	2.3
0.600	0.6	3.5	50.3	-53.8	0.72	2.4
0.700	0.1	0.3	51.4	-51.7	0.74	2.4
0.730		0.0	51.5	-51.5	0.74	2.4
0.800						
0.850						

Drops with Tucked Knees into the Pool

Height of COM	h = 0.83	m	
Mass of Person	m = 26.30	kg =	58 lb
Density of Water	ρ_w = 1000.00	kg/m^3	
Density of Person	ρ_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.20	m^2 =	2.125 ft^2
Length of Person	L = 0.65	m =	2.125 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A \rho_w v^2$

Bouyancy Equation $F_B = Vg(\rho_w - \rho_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	3.0	202.3	20.7	-223.0	0.21	0.7
0.200	1.8	70.4	31.2	-101.6	0.32	1.0
0.300	1.1	27.8	37.8	-65.6	0.38	1.3
0.370	0.8	13.6	40.8	-54.3	0.41	1.4
0.400	0.6	9.5	41.7	-51.2	0.42	1.4
0.500	0.2	1.6	43.8	-45.4	0.44	1.5
0.570		0.0	44.2	-44.2	0.45	1.5
0.600						
0.700						
0.730						
0.800						
0.850						

Drops Horizontally into the Pool

Height of COM	h = 0.66	m	
Mass of Person	m = 26.30	kg =	58 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.39	m^2 =	4.25 ft^2
Length of Person	L = 0.30	m =	1 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	1.8	149.5	33.5	-182.9	0.16	0.5
0.200	0.8	32.9	45.7	-78.6	0.22	0.7
0.300	0.3	4.9	51.2	-56.1	0.24	0.8
0.370		0.0	52.3	-52.3	0.25	0.8
0.400						
0.500						
0.570						
0.600						
0.700						
0.730						
0.800						
0.850						

Drops Vertically into the Pool

Height of COM	h = 1.20	m	
Mass of Person	m = 32.65	kg =	72 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.38	m =	4.54166667 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	4.8	226.4	12.2	-238.6	0.26	0.9
0.200	3.5	123.2	20.8	-143.9	0.45	1.5
0.300	2.7	73.1	27.3	-100.4	0.59	1.9
0.400	2.1	44.9	32.4	-77.2	0.70	2.3
0.500	1.7	27.3	36.3	-63.6	0.79	2.6
0.600	1.3	15.9	39.4	-55.3	0.85	2.8
0.660	1.1	11.0	40.8	-51.8	0.89	2.9
0.700	0.9	8.3	41.7	-50.0	0.90	3.0
0.800	0.6	3.5	43.2	-46.8	0.94	3.1
0.850	0.4	1.9	43.8	-45.7	0.95	3.1
0.900	0.3	0.8	44.2	-45.0	0.96	3.1
0.990		0.0	44.4	-44.4	0.96	3.2

Drops Diagonally into the Pool

Height of COM	h = 1.00	m	
Mass of Person	m = 32.65	kg =	72 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 0.98	m =	3.2114433 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = Vg(p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	4.8	225.2	17.2	-242.4	0.26	0.9
0.200	3.5	120.1	29.3	-149.4	0.45	1.5
0.300	2.6	68.7	38.3	-107.0	0.59	1.9
0.400	2.0	39.5	45.1	-84.7	0.69	2.3
0.500	1.5	21.6	50.3	-71.9	0.77	2.5
0.600	1.0	10.4	54.0	-64.4	0.83	2.7
0.660	0.8	5.9	55.6	-61.5	0.85	2.8
0.700	0.6	3.7	56.4	-60.1	0.86	2.8
0.800	0.2	0.5	57.6	-58.0	0.88	2.9
0.850		0.0	57.7	-57.7	0.88	2.9
0.900						
0.990						

Drops with Tucked Knees into the Pool

Height of COM	h = 0.85	m	
Mass of Person	m = 32.65	kg =	72 lb
Density of Water	ρ_w = 1000.00	kg/m^3	
Density of Person	ρ_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.21	m^2 =	2.270833 ft^2
Length of Person	L = 0.69	m =	2.27083333 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A \rho_w v^2$

Bouyancy Equation $F_B = V g (\rho_w - \rho_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	3.3	257.6	20.3	-277.8	0.22	0.7
0.200	2.1	98.2	31.3	-129.5	0.34	1.1
0.300	1.4	43.8	38.5	-82.3	0.42	1.4
0.400	0.9	19.0	43.3	-62.2	0.47	1.5
0.500	0.5	6.5	46.3	-52.8	0.50	1.6
0.600	0.2	0.9	47.8	-48.7	0.52	1.7
0.660		0.0	48.0	-48.0	0.52	1.7
0.700						
0.800						
0.850						
0.900						
0.990						

Drops Horizontally into the Pool

Height of COM	h = 0.66	m	
Mass of Person	m = 32.65	kg =	72 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.42	m^2 =	4.541667 ft^2
Length of Person	L = 0.30	m =	1 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	2.0	204.9	35.8	-240.7	0.17	0.6
0.200	1.0	52.0	50.1	-102.1	0.24	0.8
0.300	0.5	12.0	57.4	-69.4	0.27	0.9
0.400	0.1	0.4	60.0	-60.4	0.29	0.9
0.500						
0.600						
0.660						
0.700						
0.800						
0.850						
0.900						
0.990						

Drops Vertically into the Pool

Height of COM	h = 1.24	m	
Mass of Person	m = 43.54	kg =	96 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.47	m =	4.8125 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.2	266.3	12.0	-278.2	0.27	0.9
0.200	4.1	161.8	21.0	-182.9	0.48	1.6
0.300	3.3	105.0	28.3	-133.2	0.65	2.1
0.400	2.7	70.3	34.1	-104.4	0.78	2.6
0.490	2.3	49.3	38.5	-87.8	0.88	2.9
0.500	2.2	47.4	38.9	-86.3	0.89	2.9
0.600	1.8	31.6	42.9	-74.5	0.98	3.2
0.700	1.4	20.4	46.1	-66.5	1.06	3.5
0.790	1.2	13.1	48.4	-61.5	1.11	3.6
0.800	1.1	12.4	48.6	-61.0	1.12	3.7
0.900	0.8	6.7	50.5	-57.3	1.16	3.8
1.000	0.5	2.9	51.9	-54.8	1.19	3.9
1.100	0.3	0.7	52.7	-53.4	1.21	4.0
1.200		0.0	52.9	-52.9	1.22	4.0

Drops Diagonally into the Pool

Height of COM	h = 1.03	m	
Mass of Person	m = 43.54	kg =	96 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.04	m =	3.40295138 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.2	265.2	16.9	-282.1	0.27	0.9
0.200	4.0	159.1	29.7	-188.8	0.48	1.6
0.300	3.2	100.7	39.7	-140.5	0.65	2.1
0.400	2.6	64.8	47.8	-112.6	0.78	2.5
0.490	2.1	43.2	53.7	-96.8	0.87	2.9
0.500	2.1	41.2	54.2	-95.4	0.88	2.9
0.600	1.6	25.1	59.3	-84.4	0.96	3.2
0.700	1.2	14.0	63.2	-77.2	1.03	3.4
0.790	0.8	7.2	65.8	-73.0	1.07	3.5
0.800	0.8	6.6	66.0	-72.6	1.07	3.5
0.900	0.4	2.1	67.8	-69.9	1.10	3.6
1.000	0.1	0.1	68.5	-68.7	1.11	3.7
1.100						
1.200						

Drops with Tucked Knees into the Pool

Height of COM	h = 0.87	m	
Mass of Person	m = 43.54	kg =	96 lb
Density of Water	ρ_w = 1000.00	kg/m^3	
Density of Person	ρ_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.22	m^2 =	2.40625 ft^2
Length of Person	L = 0.73	m =	2.40625 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A \rho_w v^2$

Bouyancy Equation $F_B = V g (\rho_w - \rho_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	3.7	345.5	20.4	-365.9	0.23	0.8
0.200	2.5	148.0	32.5	-180.5	0.37	1.2
0.300	1.8	74.2	40.8	-115.0	0.47	1.5
0.400	1.3	38.3	46.7	-85.0	0.54	1.8
0.490	0.9	20.1	50.6	-70.7	0.58	1.9
0.500	0.9	18.6	50.9	-69.6	0.58	1.9
0.600	0.5	7.4	53.8	-61.2	0.62	2.0
0.700	0.2	1.7	55.4	-57.0	0.64	2.1
0.790		0.0	55.8	-55.8	0.64	2.1
0.800						
0.900						
1.000						
1.100						
1.200						

Drops Horizontally into the Pool

Height of COM	h = 0.66	m	
Mass of Person	m = 43.54	kg =	96 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.45	m^2 =	4.8125 ft^2
Length of Person	L = 0.30	m =	1 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	2.4	306.2	39.4	-345.6	0.19	0.6
0.200	1.4	91.0	57.0	-148.0	0.27	0.9
0.300	0.8	29.3	67.0	-96.3	0.32	1.0
0.400	0.3	6.0	72.2	-78.2	0.34	1.1
0.490		0.0	73.6	-73.6	0.35	1.2
0.500						
0.600						
0.700						
0.790						
0.800						
0.900						
1.000						
1.100						
1.200						

12-year-old Girl Calculations

Drops Vertically into the Pool

Height of COM	h = 1.22	m	
Mass of Person	m = 32.65	kg =	72 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.42	m =	4.64583333 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	4.8	226.5	11.9	-238.4	0.26	0.9
0.200	3.5	123.3	20.3	-143.6	0.45	1.5
0.300	2.7	73.4	26.7	-100.1	0.59	1.9
0.400	2.2	45.2	31.7	-76.8	0.70	2.3
0.500	1.7	27.6	35.6	-63.2	0.79	2.6
0.600	1.3	16.2	38.6	-54.8	0.85	2.8
0.660	1.1	11.3	40.0	-51.3	0.89	2.9
0.700	0.9	8.6	40.8	-49.4	0.91	3.0
0.800	0.6	3.7	42.4	-46.2	0.94	3.1
0.860	0.4	1.9	43.0	-44.9	0.95	3.1
0.900	0.3	1.0	43.3	-44.3	0.96	3.2
1.000		0.0	43.7	-43.7	0.97	3.2

Drops Diagonally into the Pool

Height of COM	h = 1.01	m	
Mass of Person	m = 32.65	kg =	72 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.00	m =	3.28510025 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	4.8	225.3	16.8	-242.1	0.26	0.9
0.200	3.5	120.3	28.6	-149.0	0.45	1.5
0.300	2.7	69.1	37.4	-106.5	0.59	1.9
0.400	2.0	39.9	44.2	-84.1	0.69	2.3
0.500	1.5	22.1	49.2	-71.3	0.77	2.5
0.600	1.0	10.8	52.9	-63.7	0.83	2.7
0.660	0.8	6.3	54.5	-60.7	0.85	2.8
0.700	0.6	4.0	55.3	-59.3	0.87	2.8
0.800	0.2	0.6	56.5	-57.2	0.89	2.9
0.860		0.0	56.7	-56.8	0.89	2.9
0.900						
1.000						

Drops with Tucked Knees into the Pool

Height of COM	h = 0.86	m	
Mass of Person	m = 32.65	kg =	72 lb
Density of Water	ρ_w = 1000.00	kg/m^3	
Density of Person	ρ_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.22	m^2 =	2.322917 ft^2
Length of Person	L = 0.71	m =	2.32291667 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A \rho_w v^2$

Bouyancy Equation $F_B = V g (\rho_w - \rho_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	3.3	257.3	19.7	-277.1	0.22	0.7
0.200	2.0	97.6	30.3	-127.9	0.34	1.1
0.300	1.4	43.5	37.2	-80.8	0.41	1.4
0.400	0.9	19.0	41.9	-60.8	0.46	1.5
0.500	0.5	6.6	44.8	-51.4	0.50	1.6
0.600	0.2	1.0	46.3	-47.3	0.51	1.7
0.660		0.0	46.5	-46.5	0.52	1.7
0.700						
0.800						
0.860						
0.900						
1.000						

Drops Horizontally into the Pool

Height of COM	h = 0.66	m	
Mass of Person	m = 32.65	kg =	72 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.43	m^2 =	4.645833 ft^2
Length of Person	L = 0.30	m =	1 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	2.0	202.6	35.5	-238.1	0.17	0.6
0.200	1.0	51.0	49.5	-100.5	0.24	0.8
0.300	0.5	11.7	56.6	-68.3	0.27	0.9
0.400	0.0	0.3	59.2	-59.5	0.28	0.9
0.500						
0.600						
0.660						
0.700						
0.800						
0.860						
0.900						
1.000						

Drops Vertically into the Pool

Height of COM	h = 1.26	m	
Mass of Person	m = 41.72	kg =	92 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.51	m =	4.95833333 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.2	260.6	11.5	-272.2	0.27	0.9
0.200	4.0	156.2	20.2	-176.4	0.48	1.6
0.300	3.2	100.3	27.1	-127.4	0.64	2.1
0.400	2.6	66.6	32.7	-99.2	0.77	2.5
0.480	2.2	48.3	36.4	-84.7	0.86	2.8
0.500	2.1	44.6	37.2	-81.8	0.88	2.9
0.600	1.7	29.5	40.9	-70.4	0.97	3.2
0.700	1.4	18.9	43.9	-62.7	1.04	3.4
0.780	1.1	12.6	45.8	-58.4	1.08	3.6
0.800	1.1	11.3	46.2	-57.5	1.09	3.6
0.900	0.8	6.0	48.0	-54.0	1.14	3.7
1.000	0.5	2.5	49.2	-51.7	1.16	3.8
1.100	0.2	0.6	49.9	-50.5	1.18	3.9
1.190		0.0	50.1	-50.1	1.19	3.9

Drops Diagonally into the Pool

Height of COM	h = 1.04	m	
Mass of Person	m = 41.72	kg =	92 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.07	m =	3.50607112 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.1	259.6	16.3	-275.9	0.27	0.9
0.200	4.0	153.5	28.5	-182.0	0.48	1.6
0.300	3.1	96.1	38.1	-134.3	0.64	2.1
0.400	2.5	61.3	45.7	-107.1	0.76	2.5
0.480	2.1	42.5	50.7	-93.2	0.85	2.8
0.500	2.0	38.6	51.8	-90.4	0.87	2.8
0.600	1.5	23.3	56.6	-79.8	0.95	3.1
0.700	1.1	12.8	60.2	-72.9	1.01	3.3
0.780	0.8	7.0	62.3	-69.3	1.04	3.4
0.800	0.8	5.8	62.7	-68.6	1.05	3.4
0.900	0.4	1.7	64.3	-66.1	1.08	3.5
1.000	0.0	0.1	65.0	-65.0	1.09	3.6
1.100						
1.190						

Drops with Tucked Knees into the Pool

Height of COM	h = 0.89	m	
Mass of Person	m = 41.72	kg =	92 lb
Density of Water	ρ_w = 1000.00	kg/m^3	
Density of Person	ρ_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.23	m^2 =	2.479167 ft^2
Length of Person	L = 0.76	m =	2.47916667 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A \rho_w v^2$

Bouyancy Equation $F_B = V g (\rho_w - \rho_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	3.6	332.4	19.4	-351.8	0.23	0.8
0.200	2.4	138.5	30.7	-169.2	0.36	1.2
0.300	1.7	68.2	38.3	-106.5	0.45	1.5
0.400	1.2	34.7	43.7	-78.4	0.52	1.7
0.480	0.9	19.3	46.9	-66.2	0.55	1.8
0.500	0.8	16.5	47.6	-64.0	0.56	1.8
0.600	0.5	6.3	50.1	-56.4	0.59	1.9
0.700	0.2	1.2	51.4	-52.7	0.61	2.0
0.780		0.0	51.8	-51.8	0.61	2.0
0.800						
0.900						
1.000						
1.100						
1.190						

Drops Horizontally into the Pool

Height of COM	h = 0.66	m	
Mass of Person	m = 41.72	kg =	92 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.46	m^2 =	4.958333 ft^2
Length of Person	L = 0.30	m =	1 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	2.3	285.1	38.3	-323.4	0.18	0.6
0.200	1.3	81.9	54.9	-136.8	0.26	0.9
0.300	0.7	25.1	64.1	-89.2	0.31	1.0
0.400	0.3	4.3	68.7	-73.1	0.33	1.1
0.480		0.0	69.7	-69.7	0.33	1.1
0.500						
0.600						
0.700						
0.780						
0.800						
0.900						
1.000						
1.100						
1.190						

Drops Vertically into the Pool

Height of COM	h = 1.31	m	
Mass of Person	m = 55.33	kg =	122 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.61	m =	5.27083333 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.5	297.0	11.2	-308.2	0.28	0.9
0.200	4.5	196.1	20.2	-216.3	0.51	1.7
0.300	3.8	135.9	27.6	-163.5	0.69	2.3
0.400	3.2	96.8	33.8	-130.6	0.85	2.8
0.500	2.7	69.9	39.0	-108.9	0.98	3.2
0.550	2.5	59.5	41.4	-100.8	1.04	3.4
0.600	2.3	50.5	43.5	-94.0	1.09	3.6
0.700	1.9	36.1	47.3	-83.4	1.19	3.9
0.800	1.6	25.3	50.5	-75.8	1.27	4.2
0.900	1.3	17.0	53.1	-70.2	1.34	4.4
0.930	1.2	15.0	53.8	-68.8	1.35	4.4
1.000	1.1	10.8	55.3	-66.1	1.39	4.6
1.100	0.8	6.2	56.9	-63.1	1.43	4.7
1.200	0.5	3.0	58.1	-61.1	1.46	4.8
1.230	0.5	2.3	58.4	-60.6	1.47	4.8
1.300	0.3	1.0	58.9	-59.9	1.48	4.9
1.400	0.1	0.1	59.2	-59.3	1.49	4.9
1.430		0.0	59.2	-59.2	1.49	4.9

Drops Diagonally into the Pool

Height of COM	h = 1.08	m	
Mass of Person	m = 55.33	kg =	122 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.14	m =	3.72704199 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.5	296.1	15.9	-312.0	0.28	0.9
0.200	4.5	193.7	28.5	-222.2	0.51	1.7
0.300	3.7	132.1	38.8	-170.9	0.69	2.3
0.400	3.1	91.7	47.4	-139.2	0.84	2.8
0.500	2.6	63.8	54.6	-118.4	0.97	3.2
0.550	2.3	53.0	57.7	-110.7	1.03	3.4
0.600	2.1	43.7	60.5	-104.3	1.08	3.5
0.700	1.7	29.0	65.4	-94.4	1.16	3.8
0.800	1.4	18.2	69.4	-87.5	1.23	4.0
0.900	1.0	10.3	72.4	-82.7	1.29	4.2
0.930	0.9	8.5	73.2	-81.6	1.30	4.3
1.000	0.7	4.9	74.6	-79.5	1.33	4.4
1.100	0.4	1.6	76.0	-77.5	1.35	4.4
1.200	0.1	0.1	76.6	-76.7	1.36	4.5
1.230		0.0	76.6	-76.6	1.36	4.5
1.300						
1.400						
1.430						

Drops with Tucked Knees into the Pool

Height of COM	h = 0.91	m	
Mass of Person	m = 55.33	kg =	122 lb
Density of Water	ρ_w = 1000.00	kg/m^3	
Density of Person	ρ_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.24	m^2 =	2.635417 ft^2
Length of Person	L = 0.80	m =	2.63541667 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A \rho_w v^2$

Bouyancy Equation $F_B = V g (\rho_w - \rho_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	4.0	433.7	19.3	-453.0	0.24	0.8
0.200	2.8	200.5	31.3	-231.8	0.39	1.3
0.300	2.0	108.0	39.9	-147.9	0.50	1.6
0.400	1.5	61.4	46.3	-107.8	0.58	1.9
0.500	1.2	34.8	51.2	-86.0	0.64	2.1
0.550	1.0	25.7	53.1	-78.8	0.67	2.2
0.600	0.8	18.5	54.8	-73.3	0.69	2.3
0.700	0.6	8.5	57.3	-65.8	0.72	2.4
0.800	0.3	2.7	58.9	-61.6	0.74	2.4
0.900	0.1	0.2	59.6	-59.8	0.75	2.5
0.930		0.0	59.6	-59.6	0.75	2.5
1.000						
1.100						
1.200						
1.230						
1.300						
1.400						
1.430						

Drops Horizontally into the Pool

Height of COM	h = 0.66	m	
Mass of Person	m = 55.33	kg =	122 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.49	m^2 =	5.270833 ft^2
Length of Person	L = 0.30	m =	1 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	2.7	411.5	41.6	-453.1	0.20	0.7
0.200	1.6	134.8	61.6	-196.4	0.29	1.0
0.300	1.0	51.0	73.6	-124.6	0.35	1.2
0.400	0.5	16.2	80.8	-97.0	0.39	1.3
0.500	0.2	2.1	84.3	-86.4	0.40	1.3
0.550		0.1	84.8	-84.8	0.40	1.3
0.600						
0.700						
0.800						
0.900						
0.930						
1.000						
1.100						
1.200						
1.230						
1.300						
1.400						
1.430						

14-year-old Girl Calculations

Drops Vertically into the Pool

Height of COM	h = 1.27	m	
Mass of Person	m = 39.46	kg =	87 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.52	m =	4.97916667 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.1	253.1	11.4	-264.5	0.27	0.9
0.200	3.9	148.6	19.9	-168.5	0.47	1.6
0.300	3.1	94.0	26.5	-120.5	0.63	2.1
0.400	2.5	61.5	31.9	-93.4	0.76	2.5
0.460	2.2	48.0	34.6	-82.5	0.82	2.7
0.500	2.0	40.6	36.2	-76.8	0.86	2.8
0.600	1.6	26.4	39.7	-66.1	0.94	3.1
0.700	1.3	16.4	42.5	-58.9	1.01	3.3
0.750	1.1	12.6	43.7	-56.3	1.04	3.4
0.800	1.0	9.5	44.7	-54.1	1.06	3.5
0.900	0.7	4.7	46.2	-50.9	1.10	3.6
0.990	0.4	1.9	47.2	-49.1	1.12	3.7
1.000	0.4	1.7	47.3	-49.0	1.12	3.7
1.100	0.1	0.2	47.8	-48.0	1.14	3.7
1.150		0.0	47.9	-47.9	1.14	3.7

Drops Diagonally into the Pool

Height of COM	h = 1.04	m	
Mass of Person	m = 39.46	kg =	87 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.07	m =	3.52080251 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.1	252.0	16.1	-268.2	0.27	0.9
0.200	3.9	145.9	28.1	-173.9	0.47	1.5
0.300	3.0	89.9	37.3	-127.1	0.63	2.1
0.400	2.4	56.3	44.6	-100.9	0.75	2.5
0.460	2.1	42.3	48.2	-90.6	0.81	2.7
0.500	1.9	34.8	50.4	-85.1	0.85	2.8
0.600	1.4	20.3	54.8	-75.2	0.92	3.0
0.700	1.0	10.7	58.2	-68.8	0.98	3.2
0.750	0.8	7.2	59.4	-66.6	1.00	3.3
0.800	0.7	4.4	60.5	-64.9	1.02	3.3
0.900	0.3	1.0	61.8	-62.8	1.04	3.4
0.990		0.0	62.1	-62.1	1.04	3.4
1.000						
1.100						
1.150						

Drops with Tucked Knees into the Pool

Height of COM	h = 0.89	m	
Mass of Person	m = 39.46	kg =	87 lb
Density of Water	ρ_w = 1000.00	kg/m^3	
Density of Person	ρ_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.23	m^2 =	2.489583 ft^2
Length of Person	L = 0.76	m =	2.48958333 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A \rho_w v^2$

Bouyancy Equation $F_B = V g (\rho_w - \rho_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	3.5	314.3	19.0	-333.4	0.23	0.7
0.200	2.3	127.6	29.8	-157.4	0.35	1.2
0.300	1.6	61.5	37.1	-98.6	0.44	1.4
0.400	1.1	30.5	42.2	-72.6	0.50	1.6
0.460	0.9	19.3	44.4	-63.8	0.53	1.7
0.500	0.7	13.8	45.7	-59.5	0.54	1.8
0.600	0.4	4.8	47.9	-52.7	0.57	1.9
0.700	0.1	0.6	49.0	-49.7	0.58	1.9
0.750		0.0	49.2	-49.2	0.58	1.9
0.800						
0.900						
0.990						
1.000						
1.100						
1.150						

Drops Horizontally into the Pool

Height of COM	h = 0.66	m	
Mass of Person	m = 39.46	kg =	87 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.46	m^2 =	4.979167 ft^2
Length of Person	L = 0.30	m =	1 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	2.2	262.2	37.4	-299.6	0.18	0.6
0.200	1.2	72.8	53.1	-125.9	0.25	0.8
0.300	0.6	21.0	61.7	-82.7	0.29	1.0
0.400	0.2	2.9	65.7	-68.6	0.31	1.0
0.460		0.0	66.4	-66.4	0.32	1.0
0.500						
0.600						
0.700						
0.750						
0.800						
0.900						
0.990						
1.000						
1.100						
1.150						

Drops Vertically into the Pool

Height of COM	h = 1.31	m	
Mass of Person	m = 48.98	kg =	108 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.61	m =	5.27083333 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.4	281.8	11.1	-292.9	0.28	0.9
0.200	4.3	178.8	19.7	-198.6	0.50	1.6
0.300	3.5	120.2	26.7	-147.0	0.67	2.2
0.400	2.9	83.4	32.5	-115.9	0.82	2.7
0.500	2.5	58.6	37.3	-95.9	0.94	3.1
0.600	2.1	41.1	41.4	-82.5	1.04	3.4
0.700	1.7	28.3	44.8	-73.1	1.13	3.7
0.800	1.4	18.9	47.6	-66.5	1.20	3.9
0.870	1.2	13.8	49.2	-63.0	1.24	4.1
0.900	1.1	11.9	49.8	-61.8	1.25	4.1
1.000	0.8	6.9	51.6	-58.4	1.30	4.3
1.100	0.6	3.3	52.8	-56.2	1.33	4.4
1.150	0.4	2.1	53.3	-55.4	1.34	4.4
1.200	0.3	1.1	53.7	-54.8	1.35	4.4
1.300	0.1	0.1	54.0	-54.1	1.36	4.5
1.330		0.0	54.0	-54.0	1.36	4.5

Drops Diagonally into the Pool

Height of COM	h = 1.08	m	
Mass of Person	m = 48.98	kg =	108 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.14	m =	3.72704199 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.4	280.9	15.7	-296.6	0.28	0.9
0.200	4.3	176.4	27.8	-204.2	0.49	1.6
0.300	3.5	116.3	37.6	-154.0	0.67	2.2
0.400	2.8	78.3	45.6	-123.9	0.81	2.7
0.500	2.3	52.6	52.2	-104.8	0.93	3.0
0.600	1.9	34.6	57.5	-92.1	1.02	3.4
0.700	1.5	21.7	61.8	-83.5	1.10	3.6
0.800	1.1	12.5	65.1	-77.6	1.16	3.8
0.870	0.9	7.8	66.9	-74.7	1.19	3.9
0.900	0.8	6.2	67.6	-73.7	1.20	3.9
1.000	0.5	2.2	69.1	-71.3	1.23	4.0
1.100	0.1	0.2	69.9	-70.2	1.24	4.1
1.150		0.0	70.0	-70.0	1.24	4.1
1.200						
1.300						
1.330						

Drops with Tucked Knees into the Pool

Height of COM	h = 0.91	m	
Mass of Person	m = 48.98	kg =	108 lb
Density of Water	ρ_w = 1000.00	kg/m^3	
Density of Person	ρ_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.24	m^2 =	2.635417 ft^2
Length of Person	L = 0.80	m =	2.63541667 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A \rho_w v^2$

Bouyancy Equation $F_B = V g (\rho_w - \rho_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	3.8	389.3	18.7	-408.0	0.24	0.8
0.200	2.6	170.8	30.0	-200.8	0.38	1.2
0.300	1.8	88.5	37.8	-126.3	0.48	1.6
0.400	1.4	48.3	43.6	-91.9	0.55	1.8
0.500	1.0	25.8	47.8	-73.6	0.60	2.0
0.600	0.7	12.5	50.8	-63.3	0.64	2.1
0.700	0.4	4.7	52.8	-57.5	0.66	2.2
0.800	0.2	0.8	53.9	-54.7	0.68	2.2
0.870		0.0	54.1	-54.1	0.68	2.2
0.900						
1.000						
1.100						
1.150						
1.200						
1.300						
1.330						

Drops Horizontally into the Pool

Height of COM	h = 0.66	m	
Mass of Person	m = 48.98	kg =	108 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.49	m^2 =	5.270833 ft^2
Length of Person	L = 0.30	m =	1 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	2.5	349.7	39.8	-389.6	0.19	0.6
0.200	1.4	107.6	57.9	-165.5	0.28	0.9
0.300	0.8	37.3	68.5	-105.8	0.33	1.1
0.400	0.4	9.6	74.4	-84.0	0.35	1.2
0.500	0.0	0.3	76.6	-76.9	0.37	1.2
0.600						
0.700						
0.800						
0.870						
0.900						
1.000						
1.100						
1.150						
1.200						
1.300						
1.330						

Drops Vertically into the Pool

Height of COM	h = 1.35	m	
Mass of Person	m = 65.31	kg =	144 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.69	m =	5.54166667 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.7	316.4	10.9	-327.3	0.29	0.9
0.200	4.8	219.8	19.8	-239.5	0.52	1.7
0.300	4.1	158.7	27.3	-186.0	0.72	2.4
0.400	3.5	117.3	33.7	-151.1	0.89	2.9
0.500	3.0	87.9	39.3	-127.2	1.04	3.4
0.600	2.6	66.1	44.1	-110.2	1.17	3.8
0.700	2.3	49.6	48.3	-97.9	1.28	4.2
0.800	2.0	36.8	51.9	-88.7	1.37	4.5
0.900	1.7	26.8	55.0	-81.8	1.45	4.8
1.000	1.4	18.9	57.6	-76.5	1.52	5.0
1.100	1.1	12.7	59.8	-72.5	1.58	5.2
1.200	0.9	8.0	61.5	-69.5	1.63	5.3
1.300	0.7	4.5	62.9	-67.3	1.66	5.5
1.380	0.5	2.4	63.7	-66.1	1.68	5.5
1.400	0.4	2.0	63.8	-65.8	1.69	5.5
1.500	0.2	0.5	64.4	-65.0	1.70	5.6
1.600		0.0	64.6	-64.6	1.71	5.6

Drops Diagonally into the Pool

Height of COM	h = 1.11	m	
Mass of Person	m = 65.31	kg =	144 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.19	m =	3.91855008 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.7	315.7	15.3	-331.1	0.29	0.9
0.200	4.8	217.7	27.9	-245.6	0.52	1.7
0.300	4.0	155.1	38.5	-193.6	0.72	2.4
0.400	3.4	112.5	47.4	-159.9	0.89	2.9
0.500	2.9	81.9	55.1	-137.0	1.03	3.4
0.600	2.5	59.3	61.6	-120.9	1.15	3.8
0.700	2.1	42.2	67.1	-109.3	1.25	4.1
0.800	1.7	29.1	71.7	-100.9	1.34	4.4
0.900	1.4	19.2	75.5	-94.7	1.41	4.6
1.000	1.1	11.6	78.5	-90.2	1.47	4.8
1.100	0.8	6.2	80.8	-87.0	1.51	5.0
1.200	0.5	2.5	82.4	-84.9	1.54	5.1
1.300	0.2	0.5	83.2	-83.7	1.56	5.1
1.380		0.0	83.4	-83.4	1.56	5.1
1.400						
1.500						
1.600						

Drops with Tucked Knees into the Pool

Height of COM	h = 0.93	m	
Mass of Person	m = 65.31	kg =	144 lb
Density of Water	ρ_w = 1000.00	kg/m^3	
Density of Person	ρ_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.26	m^2 =	2.770833 ft^2
Length of Person	L = 0.84	m =	2.77083333 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A \rho_w v^2$

Bouyancy Equation $F_B = V g (\rho_w - \rho_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	4.2	502.0	18.8	-520.8	0.25	0.8
0.200	3.0	244.5	31.0	-275.5	0.41	1.3
0.300	2.3	137.5	39.9	-177.4	0.53	1.7
0.400	1.7	82.2	46.7	-128.9	0.62	2.0
0.500	1.4	49.8	52.0	-101.8	0.69	2.3
0.600	1.0	29.5	56.1	-85.6	0.74	2.4
0.700	0.8	16.2	59.2	-75.4	0.78	2.6
0.800	0.5	7.7	61.4	-69.1	0.81	2.7
0.900	0.3	2.6	62.8	-65.4	0.83	2.7
1.000	0.1	0.2	63.5	-63.7	0.84	2.8
1.100						
1.200						
1.300						
1.380						
1.400						
1.500						
1.600						

Drops Horizontally into the Pool

Height of COM	h = 0.66	m	
Mass of Person	m = 65.31	kg =	144 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.51	m^2 =	5.541667 ft^2
Length of Person	L = 0.30	m =	1 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	2.9	501.1	43.3	-544.4	0.21	0.7
0.200	1.8	175.2	65.2	-240.4	0.31	1.0
0.300	1.1	72.2	78.8	-151.0	0.38	1.2
0.400	0.7	27.5	87.5	-115.0	0.42	1.4
0.500	0.3	6.9	92.4	-99.3	0.44	1.4
0.600	0.0	0.1	94.1	-94.2	0.45	1.5
0.700						
0.800						
0.900						
1.000						
1.100						
1.200						
1.300						
1.380						
1.400						
1.500						
1.600						

10-year-old Boy Calculations

Drops Vertically into the Pool

Height of COM	h = 1.16	m	
Mass of Person	m = 26.30	kg =	58 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.30	m =	4.27083333 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	4.4	195.3	12.4	-207.7	0.25	0.8
0.200	3.1	96.7	20.7	-117.4	0.42	1.4
0.300	2.3	53.1	26.7	-79.9	0.54	1.8
0.370	1.9	35.5	30.0	-65.6	0.61	2.0
0.400	1.7	29.9	31.2	-61.1	0.64	2.1
0.500	1.3	16.1	34.6	-50.7	0.70	2.3
0.570	1.0	9.8	36.3	-46.2	0.74	2.4
0.600	0.9	7.7	37.0	-44.7	0.75	2.5
0.700	0.5	2.8	38.5	-41.3	0.79	2.6
0.730	0.4	1.8	38.8	-40.6	0.79	2.6
0.800	0.2	0.4	39.3	-39.7	0.80	2.6
0.860		0.0	39.4	-39.4	0.80	2.6

Drops Diagonally into the Pool

Height of COM	h = 0.97	m	
Mass of Person	m = 26.30	kg =	58 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 0.92	m =	3.01993521 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = Vg(p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	4.4	193.8	17.6	-211.4	0.25	0.8
0.200	3.1	93.4	29.2	-122.6	0.42	1.4
0.300	2.2	48.7	37.4	-86.1	0.54	1.8
0.370	1.8	30.6	41.8	-72.4	0.60	2.0
0.400	1.6	24.8	43.4	-68.2	0.62	2.1
0.500	1.0	11.1	47.5	-58.6	0.68	2.2
0.570	0.7	5.3	49.5	-54.8	0.71	2.3
0.600	0.6	3.5	50.1	-53.6	0.72	2.4
0.700	0.1	0.3	51.2	-51.5	0.74	2.4
0.730		0.0	51.3	-51.3	0.74	2.4
0.800						
0.860						

Drops with Tucked Knees into the Pool

Height of COM	h = 0.83	m	
Mass of Person	m = 26.30	kg =	58 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.20	m^2 =	2.135417 ft^2
Length of Person	L = 0.65	m =	2.13541667 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	3.0	202.2	20.6	-222.7	0.21	0.7
0.200	1.8	70.2	31.0	-101.3	0.32	1.0
0.300	1.1	27.8	37.5	-65.3	0.38	1.3
0.370	0.8	13.6	40.5	-54.0	0.41	1.4
0.400	0.6	9.5	41.5	-50.9	0.42	1.4
0.500	0.2	1.6	43.5	-45.1	0.44	1.5
0.570		0.0	43.9	-43.9	0.45	1.5
0.600						
0.700						
0.730						
0.800						
0.860						

Drops Horizontally into the Pool

Height of COM	h = 0.66	m	
Mass of Person	m = 26.30	kg =	58 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.40	m^2 =	4.270833 ft^2
Length of Person	L = 0.30	m =	1 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	1.8	149.1	33.4	-182.4	0.16	0.5
0.200	0.8	32.8	45.5	-78.3	0.22	0.7
0.300	0.3	4.9	51.0	-55.9	0.24	0.8
0.370		0.0	52.1	-52.1	0.25	0.8
0.400						
0.500						
0.570						
0.600						
0.700						
0.730						
0.800						
0.860						

Drops Vertically into the Pool

Height of COM	h = 1.20	m	
Mass of Person	m = 31.75	kg =	70 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.38	m =	4.54166667 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	4.7	222.4	12.1	-234.5	0.26	0.9
0.200	3.5	119.6	20.6	-140.2	0.45	1.5
0.300	2.7	70.4	27.0	-97.4	0.59	1.9
0.400	2.1	42.8	32.0	-74.8	0.69	2.3
0.500	1.6	25.8	35.8	-61.6	0.78	2.5
0.600	1.2	14.7	38.8	-53.5	0.84	2.8
0.650	1.0	10.7	40.0	-50.7	0.87	2.8
0.700	0.9	7.5	41.0	-48.5	0.89	2.9
0.800	0.5	3.0	42.5	-45.5	0.92	3.0
0.840	0.4	1.8	42.9	-44.7	0.93	3.0
0.900	0.2	0.6	43.3	-43.9	0.94	3.1
0.980		0.0	43.5	-43.5	0.94	3.1

Drops Diagonally into the Pool

Height of COM	h = 1.00	m	
Mass of Person	m = 31.75	kg =	70 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 0.98	m =	3.2114433 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = Vg(p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	4.7	221.2	17.1	-238.3	0.26	0.9
0.200	3.4	116.6	29.0	-145.6	0.44	1.5
0.300	2.6	66.0	37.9	-103.9	0.58	1.9
0.400	2.0	37.5	44.6	-82.1	0.68	2.2
0.500	1.4	20.2	49.6	-69.8	0.76	2.5
0.600	1.0	9.4	53.1	-62.6	0.81	2.7
0.650	0.7	5.8	54.4	-60.2	0.83	2.7
0.700	0.5	3.1	55.4	-58.5	0.85	2.8
0.800	0.1	0.3	56.4	-56.7	0.86	2.8
0.840		0.0	56.5	-56.5	0.87	2.8
0.900						
0.980						

Drops with Tucked Knees into the Pool

Height of COM	h = 0.85	m	
Mass of Person	m = 31.75	kg =	70 lb
Density of Water	ρ_w = 1000.00	kg/m^3	
Density of Person	ρ_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.21	m^2 =	2.270833 ft^2
Length of Person	L = 0.69	m =	2.27083333 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A \rho_w v^2$

Bouyancy Equation $F_B = Vg(\rho_w - \rho_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	3.3	249.7	20.1	-269.8	0.22	0.7
0.200	2.0	94.0	30.9	-124.9	0.34	1.1
0.300	1.3	41.4	37.9	-79.3	0.41	1.3
0.400	0.9	17.5	42.6	-60.1	0.46	1.5
0.500	0.5	5.7	45.4	-51.1	0.49	1.6
0.600	0.1	0.6	46.8	-47.4	0.51	1.7
0.650		0.0	46.9	-46.9	0.51	1.7
0.700						
0.800						
0.840						
0.900						
0.980						

Drops Horizontally into the Pool

Height of COM	h = 0.66	m	
Mass of Person	m = 31.75	kg =	70 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.42	m^2 =	4.541667 ft^2
Length of Person	L = 0.30	m =	1 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	2.0	196.0	35.4	-231.4	0.17	0.6
0.200	1.0	48.8	49.3	-98.1	0.24	0.8
0.300	0.5	10.7	56.2	-67.0	0.27	0.9
0.400	0.0	0.2	58.7	-58.9	0.28	0.9
0.500						
0.600						
0.650						
0.700						
0.800						
0.840						
0.900						
0.980						

Drops Vertically into the Pool

Height of COM	h = 1.24	m	
Mass of Person	m = 41.72	kg =	92 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.47	m =	4.83333333 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.2	260.6	11.8	-272.4	0.27	0.9
0.200	4.0	156.0	20.8	-176.8	0.48	1.6
0.300	3.2	100.0	27.8	-127.8	0.64	2.1
0.400	2.6	66.3	33.5	-99.7	0.77	2.5
0.480	2.2	48.0	37.3	-85.2	0.86	2.8
0.500	2.1	44.2	38.1	-82.3	0.88	2.9
0.600	1.7	29.1	41.9	-71.0	0.97	3.2
0.700	1.4	18.4	44.9	-63.4	1.04	3.4
0.770	1.1	12.9	46.7	-59.6	1.08	3.5
0.800	1.1	10.9	47.3	-58.2	1.09	3.6
0.900	0.8	5.6	49.1	-54.7	1.13	3.7
1.000	0.5	2.2	50.3	-52.5	1.16	3.8
1.010	0.4	2.0	50.4	-52.4	1.16	3.8
1.100	0.2	0.4	51.0	-51.4	1.17	3.9
1.170		0.0	51.1	-51.1	1.18	3.9

Drops Diagonally into the Pool

Height of COM	h = 1.03	m	
Mass of Person	m = 41.72	kg =	92 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.04	m =	3.41768278 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.1	259.5	16.7	-276.3	0.27	0.9
0.200	4.0	153.2	29.3	-182.5	0.48	1.6
0.300	3.1	95.8	39.1	-134.9	0.64	2.1
0.400	2.5	60.9	46.9	-107.7	0.76	2.5
0.480	2.1	42.0	51.9	-93.9	0.85	2.8
0.500	2.0	38.1	53.1	-91.2	0.87	2.8
0.600	1.5	22.7	57.9	-80.6	0.94	3.1
0.700	1.1	12.3	61.6	-73.9	1.00	3.3
0.770	0.8	7.2	63.5	-70.6	1.03	3.4
0.800	0.7	5.4	64.1	-69.6	1.05	3.4
0.900	0.4	1.5	65.7	-67.2	1.07	3.5
1.000	0.0	0.0	66.2	-66.2	1.08	3.5
1.010		0.0	66.2	-66.2	1.08	3.5
1.100						
1.170						

Drops with Tucked Knees into the Pool

Height of COM	h = 0.88	m	
Mass of Person	m = 41.72	kg =	92 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.22	m^2 =	2.416667 ft^2
Length of Person	L = 0.74	m =	2.41666667 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	3.7	331.9	20.0	-351.9	0.23	0.8
0.200	2.4	139.3	31.8	-171.1	0.37	1.2
0.300	1.7	68.7	39.7	-108.4	0.46	1.5
0.400	1.2	34.8	45.4	-80.2	0.52	1.7
0.480	0.9	19.3	48.7	-68.0	0.56	1.8
0.500	0.8	16.4	49.4	-65.7	0.57	1.9
0.600	0.5	6.1	52.0	-58.1	0.60	2.0
0.700	0.2	1.1	53.3	-54.4	0.61	2.0
0.770		0.0	53.6	-53.6	0.62	2.0
0.800						
0.900						
1.000						
1.010						
1.100						
1.170						

Drops Horizontally into the Pool

Height of COM	h = 0.66	m	
Mass of Person	m = 41.72	kg =	92 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.45	m^2 =	4.833333 ft^2
Length of Person	L = 0.30	m =	1 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	2.4	287.9	38.7	-326.6	0.18	0.6
0.200	1.3	83.4	55.6	-139.0	0.27	0.9
0.300	0.7	25.8	65.0	-90.8	0.31	1.0
0.400	0.3	4.5	69.8	-74.4	0.33	1.1
0.480		0.0	70.9	-70.9	0.34	1.1
0.500						
0.600						
0.700						
0.770						
0.800						
0.900						
1.000						
1.010						
1.100						
1.170						

12-year-old Boy Calculations

Drops Vertically into the Pool

Height of COM	h = 1.21	m	
Mass of Person	m = 32.20	kg =	71 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.40	m =	4.58333333 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	4.8	224.5	12.0	-236.5	0.26	0.9
0.200	3.5	121.5	20.5	-142.0	0.45	1.5
0.300	2.7	71.9	26.9	-98.8	0.59	1.9
0.400	2.1	43.9	31.9	-75.8	0.70	2.3
0.410	2.1	41.8	32.3	-74.2	0.71	2.3
0.500	1.7	26.7	35.8	-62.4	0.78	2.6
0.600	1.3	15.4	38.8	-54.2	0.85	2.8
0.650	1.1	11.3	40.0	-51.3	0.87	2.9
0.700	0.9	8.0	41.0	-49.0	0.90	2.9
0.800	0.6	3.3	42.5	-45.9	0.93	3.1
0.850	0.4	1.8	43.0	-44.9	0.94	3.1
0.900	0.3	0.8	43.4	-44.2	0.95	3.1
0.990		0.0	43.6	-43.7	0.95	3.1
1.000						

Drops Diagonally into the Pool

Height of COM	h = 1.00	m	
Mass of Person	m = 32.20	kg =	71 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 0.99	m =	3.24090608 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	4.7	223.2	17.0	-240.2	0.26	0.9
0.200	3.5	118.4	28.9	-147.3	0.45	1.5
0.300	2.6	67.5	37.8	-105.3	0.58	1.9
0.400	2.0	38.7	44.5	-83.2	0.69	2.3
0.410	1.9	36.5	45.0	-81.6	0.70	2.3
0.500	1.5	21.1	49.5	-70.6	0.77	2.5
0.600	1.0	10.1	53.1	-63.2	0.82	2.7
0.650	0.8	6.3	54.4	-60.8	0.84	2.8
0.700	0.6	3.5	55.4	-59.0	0.86	2.8
0.800	0.2	0.4	56.6	-57.0	0.87	2.9
0.850		0.0	56.7	-56.7	0.88	2.9
0.900						
0.990						
1.000						

Drops with Tucked Knees into the Pool

Height of COM	h = 0.86	m	
Mass of Person	m = 32.20	kg =	71 lb
Density of Water	ρ_w = 1000.00	kg/m^3	
Density of Person	ρ_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.21	m^2 =	2.291667 ft^2
Length of Person	L = 0.70	m =	2.29166667 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A \rho_w v^2$

Bouyancy Equation $F_B = V g (\rho_w - \rho_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	3.3	253.6	20.0	-273.5	0.22	0.7
0.200	2.0	95.8	30.7	-126.6	0.34	1.1
0.300	1.4	42.5	37.7	-80.2	0.41	1.4
0.400	0.9	18.2	42.3	-60.6	0.46	1.5
0.410	0.8	16.6	42.7	-59.3	0.47	1.5
0.500	0.5	6.2	45.2	-51.4	0.49	1.6
0.600	0.2	0.8	46.7	-47.5	0.51	1.7
0.650		0.0	46.9	-46.9	0.51	1.7
0.700						
0.800						
0.850						
0.900						
0.990						
1.000						

Drops Horizontally into the Pool

Height of COM	h = 0.66	m	
Mass of Person	m = 32.20	kg =	71 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.43	m^2 =	4.583333 ft^2
Length of Person	L = 0.30	m =	1 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	2.0	199.5	35.5	-235.0	0.17	0.6
0.200	1.0	50.0	49.5	-99.4	0.24	0.8
0.300	0.5	11.2	56.5	-67.7	0.27	0.9
0.400	0.0	0.3	59.0	-59.3	0.28	0.9
0.410		0.1	59.0	-59.1	0.28	0.9
0.500						
0.600						
0.650						
0.700						
0.800						
0.850						
0.900						
0.990						
1.000						

Drops Vertically into the Pool

Height of COM	h = 1.25	m	
Mass of Person	m = 40.36	kg =	89 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.49	m =	4.89583333 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.1	256.1	11.6	-267.8	0.27	0.9
0.200	3.9	151.6	20.3	-171.9	0.47	1.6
0.300	3.2	96.4	27.2	-123.5	0.63	2.1
0.400	2.6	63.4	32.7	-96.0	0.76	2.5
0.470	2.2	47.5	35.9	-83.4	0.84	2.8
0.500	2.1	42.0	37.1	-79.1	0.87	2.8
0.600	1.7	27.4	40.8	-68.1	0.95	3.1
0.700	1.3	17.1	43.7	-60.8	1.02	3.3
0.760	1.1	12.5	45.1	-57.6	1.05	3.5
0.800	1.0	9.9	45.9	-55.9	1.07	3.5
0.900	0.7	5.0	47.6	-52.6	1.11	3.6
0.990	0.4	2.1	48.6	-50.7	1.14	3.7
1.000	0.4	1.9	48.7	-50.6	1.14	3.7
1.100	0.1	0.3	49.3	-49.5	1.15	3.8
1.160		0.0	49.3	-49.3	1.15	3.8

Drops Diagonally into the Pool

Height of COM	h = 1.04	m	
Mass of Person	m = 40.36	kg =	89 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.06	m =	3.46187695 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.1	255.1	16.5	-271.5	0.27	0.9
0.200	3.9	148.8	28.7	-177.5	0.47	1.6
0.300	3.1	92.2	38.2	-130.4	0.63	2.1
0.400	2.4	58.1	45.7	-103.8	0.76	2.5
0.470	2.1	41.7	50.0	-91.8	0.83	2.7
0.500	1.9	36.0	51.7	-87.7	0.85	2.8
0.600	1.5	21.2	56.3	-77.5	0.93	3.1
0.700	1.1	11.2	59.8	-71.0	0.99	3.2
0.760	0.8	7.0	61.3	-68.3	1.01	3.3
0.800	0.7	4.8	62.2	-66.9	1.03	3.4
0.900	0.3	1.2	63.6	-64.7	1.05	3.4
0.990		0.0	64.0	-64.0	1.06	3.5
1.000						
1.100						
1.160						

Drops with Tucked Knees into the Pool

Height of COM	h = 0.88	m	
Mass of Person	m = 40.36	kg =	89 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.23	m^2 =	2.447917 ft^2
Length of Person	L = 0.75	m =	2.44791667 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	3.6	321.4	19.6	-341.0	0.23	0.7
0.200	2.3	132.5	30.8	-163.3	0.36	1.2
0.300	1.6	64.5	38.4	-102.9	0.45	1.5
0.400	1.1	32.2	43.8	-76.0	0.51	1.7
0.470	0.9	19.0	46.5	-65.5	0.54	1.8
0.500	0.8	14.8	47.5	-62.3	0.55	1.8
0.600	0.5	5.3	49.9	-55.2	0.58	1.9
0.700	0.2	0.8	51.1	-51.9	0.60	2.0
0.760		0.0	51.3	-51.3	0.60	2.0
0.800						
0.900						
0.990						
1.000						
1.100						
1.160						

Drops Horizontally into the Pool

Height of COM	h = 0.66	m	
Mass of Person	m = 40.36	kg =	89 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.45	m^2 =	4.895833 ft^2
Length of Person	L = 0.30	m =	1 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	2.3	273.1	38.0	-311.0	0.18	0.6
0.200	1.2	77.3	54.3	-131.5	0.26	0.8
0.300	0.7	23.0	63.2	-86.2	0.30	1.0
0.400	0.2	3.5	67.6	-71.1	0.32	1.1
0.470		0.0	68.4	-68.4	0.33	1.1
0.500						
0.600						
0.700						
0.760						
0.800						
0.900						
0.990						
1.000						
1.100						
1.160						

Drops Vertically into the Pool

Height of COM	h = 1.30	m	
Mass of Person	m = 53.51	kg =	118 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.59	m =	5.22916667 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.5	292.9	11.3	-304.2	0.28	0.9
0.200	4.5	191.3	20.2	-211.5	0.50	1.7
0.300	3.7	131.5	27.6	-159.0	0.69	2.3
0.400	3.1	93.0	33.7	-126.7	0.84	2.8
0.500	2.6	66.6	38.9	-105.4	0.97	3.2
0.540	2.5	58.3	40.7	-99.0	1.02	3.3
0.600	2.2	47.7	43.3	-90.9	1.08	3.5
0.700	1.9	33.7	47.0	-80.7	1.17	3.8
0.800	1.6	23.3	50.0	-73.3	1.25	4.1
0.900	1.3	15.4	52.6	-68.0	1.31	4.3
0.910	1.2	14.7	52.8	-67.5	1.32	4.3
1.000	1.0	9.5	54.6	-64.1	1.36	4.5
1.100	0.7	5.2	56.2	-61.4	1.40	4.6
1.200	0.5	2.3	57.3	-59.6	1.43	4.7
1.300	0.2	0.6	57.9	-58.5	1.44	4.7
1.400		0.0	58.1	-58.1	1.45	4.8

Drops Diagonally into the Pool

Height of COM	h = 1.07	m	
Mass of Person	m = 53.51	kg =	118 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.13	m =	3.69757921 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.5	292.0	15.9	-308.0	0.28	0.9
0.200	4.4	188.9	28.5	-217.5	0.50	1.7
0.300	3.6	127.6	38.8	-166.4	0.68	2.2
0.400	3.0	87.8	47.3	-135.1	0.83	2.7
0.500	2.5	60.5	54.3	-114.8	0.96	3.1
0.540	2.3	51.9	56.8	-108.7	1.00	3.3
0.600	2.1	40.9	60.2	-101.1	1.06	3.5
0.700	1.7	26.7	64.9	-91.6	1.15	3.8
0.800	1.3	16.3	68.7	-85.0	1.21	4.0
0.900	0.9	8.9	71.6	-80.5	1.26	4.1
0.910	0.9	8.3	71.8	-80.1	1.27	4.2
1.000	0.6	3.9	73.6	-77.5	1.30	4.3
1.100	0.3	1.0	74.8	-75.8	1.32	4.3
1.200		0.0	75.2	-75.2	1.33	4.4
1.300						
1.400						

Drops with Tucked Knees into the Pool

Height of COM	h = 0.91	m	
Mass of Person	m = 53.51	kg =	118 lb
Density of Water	ρ_w = 1000.00	kg/m^3	
Density of Person	ρ_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.24	m^2 =	2.614583 ft^2
Length of Person	L = 0.80	m =	2.61458333 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A \rho_w v^2$

Bouyancy Equation $F_B = V g (\rho_w - \rho_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	4.0	420.9	19.3	-440.2	0.24	0.8
0.200	2.7	192.3	31.3	-223.6	0.39	1.3
0.300	2.0	102.6	39.8	-142.4	0.50	1.6
0.400	1.5	57.7	46.1	-103.8	0.58	1.9
0.500	1.1	32.2	50.8	-83.0	0.63	2.1
0.540	1.0	25.1	52.4	-77.4	0.65	2.1
0.600	0.8	16.7	54.3	-71.0	0.68	2.2
0.700	0.5	7.3	56.7	-64.0	0.71	2.3
0.800	0.3	2.0	58.2	-60.2	0.73	2.4
0.900	0.0	0.0	58.7	-58.7	0.73	2.4
0.910		0.0	58.7	-58.7	0.73	2.4
1.000						
1.100						
1.200						
1.300						
1.400						

Drops Horizontally into the Pool

Height of COM	h = 0.66	m	
Mass of Person	m = 53.51	kg =	118 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.49	m^2 =	5.229167 ft^2
Length of Person	L = 0.30	m =	1 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	2.7	394.8	41.3	-436.1	0.20	0.6
0.200	1.5	127.5	60.8	-188.4	0.29	1.0
0.300	0.9	47.3	72.5	-119.8	0.35	1.1
0.400	0.5	14.3	79.4	-93.7	0.38	1.2
0.500	0.1	1.5	82.5	-84.0	0.39	1.3
0.540		0.1	82.9	-82.9	0.40	1.3
0.600						
0.700						
0.800						
0.900						
0.910						
1.000						
1.100						
1.200						
1.300						
1.400						

14-year-old Boy Calculations

Drops Vertically into the Pool

Height of COM	h = 1.28	m	
Mass of Person	m = 40.36	kg =	89 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.54	m =	5.04166667 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.1	256.2	11.3	-267.5	0.27	0.9
0.200	3.9	151.8	19.7	-171.5	0.48	1.6
0.300	3.2	96.7	26.4	-123.1	0.63	2.1
0.400	2.6	63.7	31.7	-95.5	0.76	2.5
0.470	2.2	47.9	34.9	-82.8	0.84	2.8
0.500	2.1	42.4	36.1	-78.5	0.87	2.8
0.600	1.7	27.8	39.7	-67.5	0.95	3.1
0.700	1.3	17.6	42.5	-60.1	1.02	3.4
0.770	1.1	12.3	44.1	-56.4	1.06	3.5
0.800	1.0	10.4	44.7	-55.1	1.08	3.5
0.900	0.7	5.4	46.4	-51.8	1.12	3.7
1.000	0.5	2.1	47.5	-49.7	1.14	3.7
1.010	0.4	1.9	47.6	-49.5	1.14	3.8
1.100	0.2	0.4	48.1	-48.5	1.16	3.8
1.110	0.2	0.3	48.2	-48.5	1.16	3.8
1.170		0.0	48.3	-48.3	1.16	3.8

Drops Diagonally into the Pool

Height of COM	h = 1.05	m	
Mass of Person	m = 40.36	kg =	89 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.09	m =	3.56499669 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.1	255.2	16.0	-271.2	0.27	0.9
0.200	3.9	149.1	27.9	-177.0	0.47	1.6
0.300	3.1	92.6	37.1	-129.7	0.63	2.1
0.400	2.5	58.6	44.4	-103.0	0.76	2.5
0.470	2.1	42.3	48.7	-90.9	0.83	2.7
0.500	1.9	36.6	50.3	-86.8	0.85	2.8
0.600	1.5	21.8	54.8	-76.6	0.93	3.1
0.700	1.1	11.7	58.2	-70.0	0.99	3.2
0.770	0.8	6.8	60.0	-66.9	1.02	3.3
0.800	0.7	5.2	60.6	-65.8	1.03	3.4
0.900	0.4	1.4	62.1	-63.5	1.06	3.5
1.000	0.0	0.0	62.6	-62.6	1.06	3.5
1.010		0.0	62.6	-62.6	1.06	3.5
1.100						
1.110						
1.170						

Drops with Tucked Knees into the Pool

Height of COM	h = 0.89	m	
Mass of Person	m = 40.36	kg =	89 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.23	m^2 =	2.520833 ft^2
Length of Person	L = 0.77	m =	2.52083333 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	3.5	321.8	18.8	-340.6	0.23	0.7
0.200	2.3	131.5	29.6	-161.1	0.36	1.2
0.300	1.6	63.9	36.8	-100.7	0.44	1.5
0.400	1.1	32.0	41.9	-74.0	0.50	1.7
0.470	0.9	19.0	44.6	-63.6	0.54	1.8
0.500	0.8	14.9	45.5	-60.4	0.55	1.8
0.600	0.5	5.5	47.8	-53.3	0.57	1.9
0.700	0.2	0.9	49.0	-49.9	0.59	1.9
0.770		0.0	49.2	-49.2	0.59	1.9
0.800						
0.900						
1.000						
1.010						
1.100						
1.110						
1.170						

Drops Horizontally into the Pool

Height of COM	h = 0.66	m	
Mass of Person	m = 40.36	kg =	89 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.47	m^2 =	5.041667 ft^2
Length of Person	L = 0.30	m =	1 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	2.2	269.8	37.5	-307.3	0.18	0.6
0.200	1.2	75.6	53.4	-129.1	0.25	0.8
0.300	0.6	22.3	62.2	-84.4	0.30	1.0
0.400	0.2	3.3	66.4	-69.7	0.32	1.0
0.470		0.0	67.1	-67.1	0.32	1.1
0.500						
0.600						
0.700						
0.770						
0.800						
0.900						
1.000						
1.010						
1.100						
1.110						
1.170						

Drops Vertically into the Pool

Height of COM	h = 1.33	m	
Mass of Person	m = 50.79	kg =	112 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.64	m =	5.375 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.4	286.4	10.9	-297.4	0.28	0.9
0.200	4.4	184.1	19.5	-203.6	0.50	1.6
0.300	3.6	125.0	26.5	-151.5	0.68	2.2
0.400	3.0	87.5	32.3	-119.8	0.83	2.7
0.500	2.5	62.1	37.1	-99.3	0.95	3.1
0.530	2.4	56.1	38.4	-94.5	0.99	3.2
0.600	2.1	44.1	41.2	-85.3	1.06	3.5
0.700	1.8	30.9	44.7	-75.6	1.15	3.8
0.800	1.5	21.0	47.6	-68.6	1.22	4.0
0.890	1.2	14.3	49.7	-64.0	1.27	4.2
0.900	1.2	13.7	49.9	-63.6	1.28	4.2
1.000	0.9	8.2	51.8	-60.0	1.33	4.4
1.100	0.7	4.3	53.2	-57.5	1.36	4.5
1.180	0.5	2.2	54.0	-56.1	1.38	4.5
1.200	0.4	1.7	54.1	-55.8	1.39	4.6
1.300	0.2	0.3	54.6	-55.0	1.40	4.6
1.370		0.0	54.7	-54.7	1.40	4.6

Drops Diagonally into the Pool

Height of COM	h = 1.09	m	
Mass of Person	m = 50.79	kg =	112 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.16	m =	3.80069895 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.4	285.6	15.4	-301.0	0.28	0.9
0.200	4.3	181.7	27.5	-209.2	0.50	1.6
0.300	3.5	121.2	37.3	-158.5	0.68	2.2
0.400	2.9	82.5	45.3	-127.8	0.82	2.7
0.500	2.4	56.2	51.9	-108.1	0.94	3.1
0.530	2.3	50.0	53.7	-103.6	0.97	3.2
0.600	2.0	37.6	57.4	-95.0	1.04	3.4
0.700	1.6	24.2	61.8	-85.9	1.12	3.7
0.800	1.2	14.5	65.2	-79.7	1.18	3.9
0.890	0.9	8.2	67.6	-75.8	1.23	4.0
0.900	0.9	7.6	67.9	-75.5	1.23	4.0
1.000	0.5	3.1	69.6	-72.8	1.26	4.1
1.100	0.2	0.6	70.6	-71.3	1.28	4.2
1.180		0.0	70.9	-70.9	1.29	4.2
1.200						
1.300						
1.370						

Drops with Tucked Knees into the Pool

Height of COM	h = 0.92	m	
Mass of Person	m = 50.79	kg =	112 lb
Density of Water	ρ_w = 1000.00	kg/m^3	
Density of Person	ρ_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.25	m^2 =	2.6875 ft^2
Length of Person	L = 0.82	m =	2.6875 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A \rho_w v^2$

Bouyancy Equation $F_B = V g (\rho_w - \rho_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	3.8	403.4	18.5	-421.8	0.24	0.8
0.200	2.6	178.7	29.6	-208.3	0.38	1.2
0.300	1.9	93.5	37.4	-130.9	0.48	1.6
0.400	1.4	51.7	43.2	-94.9	0.55	1.8
0.500	1.0	28.2	47.4	-75.7	0.61	2.0
0.530	0.9	23.3	48.5	-71.8	0.62	2.0
0.600	0.7	14.2	50.5	-64.7	0.65	2.1
0.700	0.5	5.8	52.7	-58.5	0.68	2.2
0.800	0.2	1.4	53.9	-55.2	0.69	2.3
0.890		0.0	54.2	-54.2	0.69	2.3
0.900						
1.000						
1.100						
1.180						
1.200						
1.300						
1.370						

Drops Horizontally into the Pool

Height of COM	h = 0.66	m	
Mass of Person	m = 50.79	kg =	112 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.50	m^2 =	5.375 ft^2
Length of Person	L = 0.30	m =	1 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	2.5	365.3	40.1	-405.4	0.19	0.6
0.200	1.4	113.8	58.5	-172.3	0.28	0.9
0.300	0.9	40.4	69.3	-109.6	0.33	1.1
0.400	0.4	11.0	75.4	-86.4	0.36	1.2
0.500	0.1	0.6	77.9	-78.5	0.37	1.2
0.530		0.0	78.0	-78.0	0.37	1.2
0.600						
0.700						
0.800						
0.890						
0.900						
1.000						
1.100						
1.180						
1.200						
1.300						
1.370						

Drops Vertically into the Pool

Height of COM	h = 1.38	m	
Mass of Person	m = 66.21	kg =	146 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.74	m =	5.70833333 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.7	318.0	10.5	-328.6	0.29	0.9
0.200	4.8	221.9	19.2	-241.1	0.52	1.7
0.300	4.1	160.8	26.6	-187.4	0.72	2.4
0.400	3.5	119.4	32.9	-152.3	0.90	2.9
0.500	3.1	89.8	38.3	-128.2	1.04	3.4
0.600	2.7	68.0	43.1	-111.0	1.17	3.8
0.700	2.3	51.3	47.2	-98.5	1.28	4.2
0.800	2.0	38.4	50.7	-89.1	1.38	4.5
0.900	1.7	28.2	53.8	-82.0	1.47	4.8
1.000	1.4	20.2	56.4	-76.6	1.54	5.0
1.100	1.2	13.9	58.6	-72.5	1.60	5.2
1.200	1.0	9.0	60.4	-69.4	1.65	5.4
1.300	0.7	5.2	61.8	-67.1	1.68	5.5
1.400	0.5	2.6	62.9	-65.4	1.71	5.6
1.500	0.3	0.9	63.5	-64.4	1.73	5.7
1.600	0.1	0.1	63.8	-63.9	1.74	5.7
1.640		0.0	63.9	-63.9	1.74	5.7

Drops Diagonally into the Pool

Height of COM	h = 1.12	m	
Mass of Person	m = 66.21	kg =	146 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.09	m^2 =	1 ft^2
Length of Person	L = 1.23	m =	4.03640121 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	5.7	317.3	14.9	-332.2	0.29	0.9
0.200	4.8	219.8	27.2	-247.0	0.52	1.7
0.300	4.1	157.4	37.5	-194.9	0.72	2.4
0.400	3.5	114.7	46.3	-160.9	0.89	2.9
0.500	3.0	84.0	53.8	-137.8	1.04	3.4
0.600	2.5	61.3	60.2	-121.5	1.16	3.8
0.700	2.1	44.0	65.6	-109.7	1.26	4.1
0.800	1.8	30.8	70.2	-101.0	1.35	4.4
0.900	1.5	20.6	74.0	-94.6	1.43	4.7
1.000	1.1	12.9	77.1	-90.0	1.48	4.9
1.100	0.9	7.2	79.4	-86.6	1.53	5.0
1.200	0.6	3.2	81.1	-84.3	1.56	5.1
1.300	0.3	0.9	82.1	-83.0	1.58	5.2
1.400	0.0	0.0	82.5	-82.5	1.59	5.2
1.500						
1.600						
1.640						

Drops with Tucked Knees into the Pool

Height of COM	h = 0.94	m	
Mass of Person	m = 66.21	kg =	146 lb
Density of Water	ρ_w = 1000.00	kg/m^3	
Density of Person	ρ_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.27	m^2 =	2.854167 ft^2
Length of Person	L = 0.87	m =	2.85416667 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A \rho_w v^2$

Bouyancy Equation $F_B = V g (\rho_w - \rho_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	4.2	511.0	18.2	-529.2	0.25	0.8
0.200	3.0	247.9	30.0	-277.8	0.41	1.3
0.300	2.2	139.4	38.5	-177.9	0.52	1.7
0.400	1.7	83.6	45.1	-128.7	0.61	2.0
0.500	1.4	51.0	50.2	-101.2	0.68	2.2
0.600	1.0	30.5	54.2	-84.6	0.74	2.4
0.700	0.8	17.1	57.2	-74.3	0.78	2.6
0.800	0.5	8.4	59.4	-67.8	0.81	2.7
0.900	0.3	3.1	60.8	-63.9	0.83	2.7
1.000	0.1	0.4	61.6	-62.0	0.84	2.8
1.100						
1.200						
1.300						
1.400						
1.500						
1.600						
1.640						

Drops Horizontally into the Pool

Height of COM	h = 0.66	m	
Mass of Person	m = 66.21	kg =	146 lb
Density of Water	p_w = 1000.00	kg/m^3	
Density of Person	p_B = 980.00	kg/m^3	
Cross-Sectional Area	A = 0.53	m^2 =	5.708333 ft^2
Length of Person	L = 0.30	m =	1 ft
Volume of Person	V = 0.33	m^3	
Coefficient of Drag	C_D = 1.00		
Gravitational Constant	g = 9.81	m/s^2	

Drag Force Equation $F_D = \frac{1}{2} C_D A p_w v^2$

Bouyancy Equation $F_B = V g (p_w - p_B)$

Initial Conditions		
t_o =	0	s
v_o =	3.157	mph

ELAPSED TIME (s)	**VELOCITY AT TIME (mph)**	DRAG FORCE (N)	BOUYANCY FORCE (N)	NET FORCE (N)	DISTANCE (m)	**TOTAL DEPTH (ft)**
0	**7.1**				0.0	**0.0**
0.100	2.9	506.8	43.1	-549.9	0.21	0.7
0.200	1.7	176.6	64.7	-241.3	0.31	1.0
0.300	1.1	72.8	78.2	-151.0	0.37	1.2
0.400	0.7	27.9	86.8	-114.7	0.41	1.4
0.500	0.3	7.1	91.7	-98.8	0.44	1.4
0.600	0.0	0.1	93.5	-93.6	0.45	1.5
0.700						
0.800						
0.900						
1.000						
1.100						
1.200						
1.300						
1.400						
1.500						
1.600						
1.640						

Product Solutions

biscuits • bones • treats • desserts

GRAND OPENING

upswing
in overall
sales volume

NINJA CROSS™

NinjaCross MiniNinja Rules

1. Participants must be a minimum of 48-inches tall
2. Participants maximom weight of 275lbs
3. Wait your turn to start, follow direction by facility staff at all times
4. Diving, jumping, running, pushing, etc. is strictly prohibited
5. Participants to use systems solely at their own risk – this is a skill-based system and is meant to be challenging. Owner, operator, manufacturer and any additional parties will not be held responsible for any injury on the system
6. Climbing obstacles cables, structure column legs or any other components on the system is strictly prohibited
7. Touching obstacle frame or support truss, electronics, or any other components other than the obstacles is strictly prohibited
8. Only use if you are capable of safely swimming the length of the pool and able to hold your breath under-water for 10-seconds or more. Non-Swimmers are not permitted.
9. Only 1 participant per obstacle set at a time, no more than 3 participants on the system at one time
10. Use only under supervision of lifeguard or attendant
11. If you fall into water, move on to next obstacle or swim out of the lane
12. If you feel exhausted or weak, stop participation and swim out of lane to closest pool wall
13. Do not push, shove or harass other guests – bullying will not be tolerated and you may be asked to leave the facility
14. Do not use this equipment while under the influence of alcohol or drugs
15. No diving allowed anywhere around this system
16. Leave MiniNinja pool area promptly after completing the course or if you are unable to complete the course
17. Participants assume all risk of injury due to misuse of the NinjaCross MiniNinja or failure to follow rules

NINJA CROSS

NinjaCross Systems

MiniNinja

Standard Operating Procedures and Operations Manual V1.1

Contact Ninja*Cross* Systems at:

Phone- 800-778-9702

Email- Support@NinjaCrossSystems.com

Section 1

Introduction

The purpose of this operations manual is to provide the owner/operator with the basic rules and maintenance information necessary to operate the NinjaCross MiniNinja System in a manner designed to minimize problems and ensure the safety of the participant(s). This manual deals with the operation of the NinjaCross equipment only. It does not address pool operations, health codes, water quality, or local ordinances.

Facilities should follow the manufacturer's guidelines for installation, safe inspection, maintenance, operations and use of its various fitness systems and features. However, your employer should provide you with a specific set of guidelines and training if you are responsible for these inspections

Most local regulatory agencies have public swimming pool standards. It is recommended that local codes, regulations, and guidelines be followed. This will insure a harmonious relationship between the pool/slide operation and the local authorities.

To assist owners and operators in providing a safe, fun, and enjoyable experience for all facility patrons, NinjaCross Systems provides the following additional services;

- Annual NinjaCross Inspections
- Annual on-site safety training for lifeguards and operators
- Maintenance programs to prolong the life of your investment

Section 2

Terms

Box Truss - a type of truss that uses four major cords with connecting cords to form a strong structure that takes the shape of a rectangular box.

Corner Block - a 12” square aluminum block that mounts to the Aluminum Box truss section. All Static Lines attach at a Corner Block and all cross members of the Obstacle Frame attached at Corner Blocks.

Designated Safety Area - the area that includes all pool space under the obstacle frame and the adjacent 8-feet on either side of the Obstacle Frame stretching from end of pool to opposite end.

Eye Clamp - A clamp that allows attachment of a NetForm Rope or other item to the Obstacle Frame.

Mounting Plate - the square aluminum plate that secures the Obstacle Frame to the pool deck. The plate is anchored by wedge anchors.

NetForm Rope - the rope that connects an obstacle to the Obstacle Frame

Obstacle - a combination of aluminum parts, ropes, and hardware that create a means for the participant to traverse.

OAB (Obstacle Attachment Bar) - An aluminum bat that attached to the Obstacle Frame and allows Obstacles with dual ropes to be attached.

Obstacle Frame - the aluminum truss that Obstacles hang from, Static Cables and Lifting Cables attach to, and BackUp System attaches to.

Obstacle Frame Leg - the aluminum truss vertical sections that hold the Obstacle Frame at elevation. These legs are mounted to the pool deck via the Mounting Plates.

Participant - the guest that is using the NinjaCross MiniNinja system

Pinch Block - an aluminum block with indents that allows it to secure into the tube of the Obstacle Frame. Used for connecting Obstacles to the Obstacle Frame.

Safety Padding - a section of padding applied to deck and pool wall that protects participant from falls against the pool deck.

Swivel Clamp - A dual clamp system that allows attachment of the OAB to the Obstacle Frame.

Section 1

NinjaCross MiniNinja Standard Rules

1. Follow the directions of facility personnel at all times

2. Wait your turn prior to starting

3. Diving, jumping, running, pushing, etc. is strictly prohibited

4. Participants to use system solely at their own risk - this is a skill-based system and is meant to be challenging

5. Climbing obstacle cables, legs, or any other components on their system is strictly prohibited

6. Touching obstacle frame or support truss, electronics, or any other components other than the obstacles is strictly prohibited

7. Do climb the ropes or onto the Obstacle Frame. Do not try to hold onto the Obstacle Frame

8. Only use if you are capable of swimming and able to hold your breath under water for 10-seconds or more

9. Only one participant per obstacle set at a time. A maximum or 2 participants may be on a single lane at any one time. The minimum distance between participants shall be no less than 10’

10. Use only under the supervision of lifeguard or attendant

11. Swinging, leaping, jumping, or swimming in adjacent lane is strictly prohibited

12. No standing on Above Water Level obstacles

13. If you fall on an obstacle, move onto the next obstacle and attempt to complete

14. If you feel exhausted or weak, stop participation and swim out of lane to closet pool wall

15. Do not push, shove, or harass other guests - bullying will not be tolerated, and you will be asked to leave facility.

16. Recommended Minimum age 5 years old

17. Minimum Height 48” tall

18. Maximum Weight 270lbs

19. Participant must not wear lifejacket, shoes (including swim shoes), loose jewelry, or other item of clothing that may get caught in obstacles

20. Lifeguards are responsible for final determination of swim ability, age, and height according to the existing rules of the facility.

21. Intoxicated person are not allowed to use the system or operate the system

22. No spectators in the designated safety area of the pool

Section 2

End of Day Procedures

End of Day Washdown

•This procedure should be followed on a daily basis

• Rinse the Obstacle Frame including the Ropes, Plates, and other attachments with fresh water

Section 3

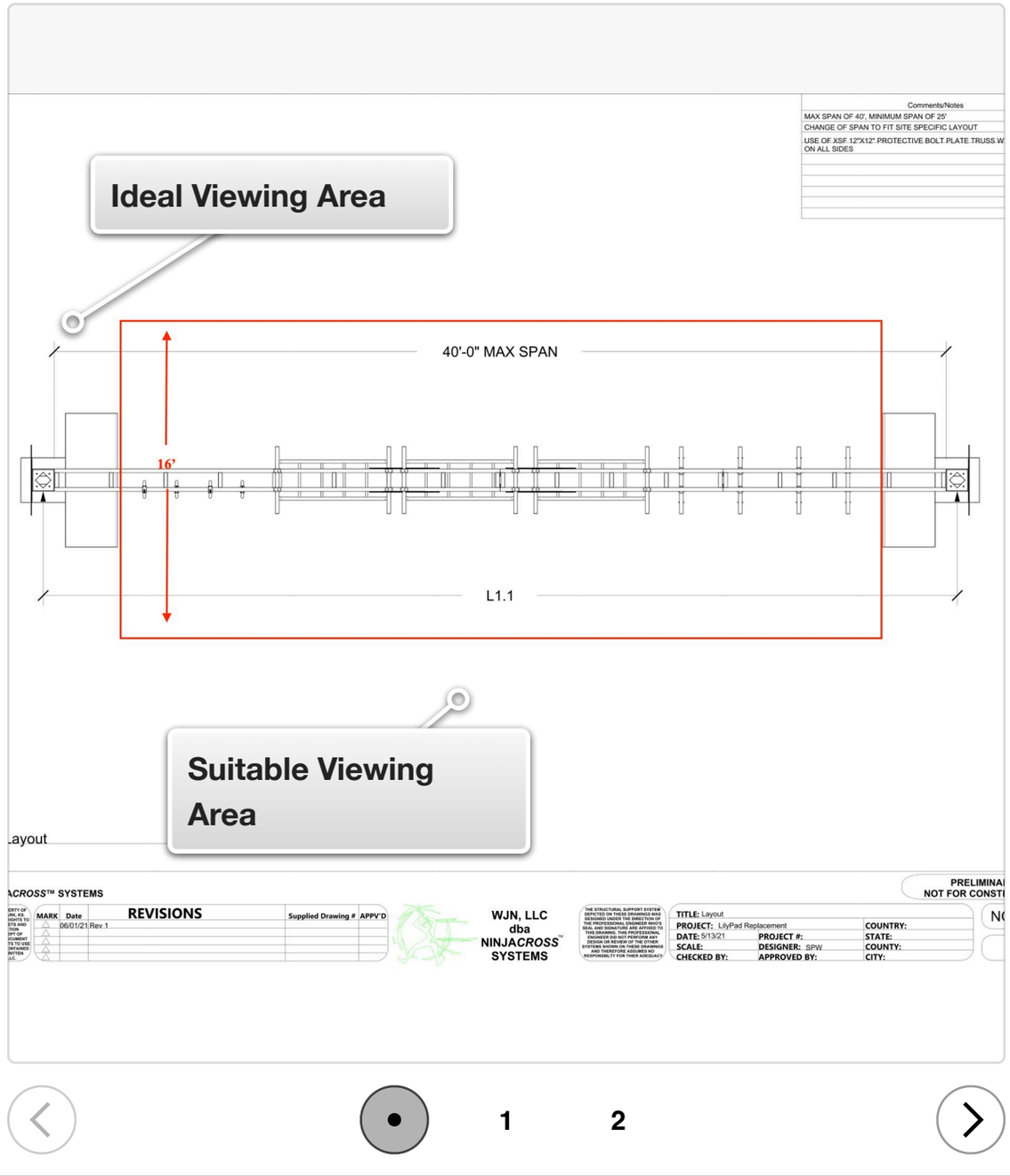
Designated Safety Area

he Designated Safety Area is the zone where only participants may be in the pool during the operating time of the NinjaCross MiniNinja System. The safety area is detailed as the area directly under the Obstacle Frame as well as an additional 8-feet on either side of the Obstacle Frame stretching from end of pool to end of pool.

During operations, spectators are prohibited from entering the Designated Safety Area.

Participants who quit the course without finishing shall be instructed to exit the course to the outside of the Designated Safety Area without crossing the path of other participants and exit the Designated Safety Area as quickly and safely as possible.

Interactive 3.1 Designated Safety Area



Section 4

Seasonal Shut Down Procedures

Long Term Shutdown

Procedures

When storing the Ninja*Cross* MiniNinja system for winter or long-term storage, the following steps should be taken.

1. Remove all obstacles and store in a secure safe location. Take care in storing obstacles as to not damage the materials or coating.

2. Store Ropes in a dry location free of any chemicals.

Section 1

Obstacle Types

There are two types of obstacles with the NinjaCross MiniNinja System a) OAB mounted obstacles, and b) Direct frame mounted obstacles.

OAB mounted obstacles are those obstacles that use 2 or more cables attached to the obstacle and require a spacing of more than 12” between the NetForm ropes. The OAB attaches to the Obstacle Frame by way of 2 Swivel Clamps. Obstacles attach to the OAB via the stud connection on the OAB and the shackles of the NetForm Rope.

Examples of OAB Mounted Obstacles are:

Trapeze Bars Low Bars Ladders

Direct frame mounted obstacles are those obstacles that attach to the Obstacle Frame directly by use of an Eye Clamp or other method.

Examples of Direct Mounted Obstacles are:

Sea of Discs Overhead Rings CannonBall Alley

Section 2

Obstacle Mounting Procedures

In order to mount any obstacle using a Swivel Clamp or Eye Clamp the following procedures need to be followed

1. Ensure that the Obstacle Frame is fully deployed in its operational position and the pool is clear of all swimmers.

2. Choose location for obstacle to be mounted.

3. Choose correct type of clamp for the obstacle to be installed

4. Unscrew the wing nut on the clamp to allow clamp to easily open

5. Place clamp in position, close the clamp over the Obstacle Frame tube, close bolt into clamp tab ensuring that the wing nut and washer clear the top of the clamp.

6. Tighten the wing nut until snug, do not over tighten as damage may occur to the Obstacle Frame truss

7. Attach obstacle to Eye Clamp or attach OAB to Swivel Clamps.

   a. If using an Eye Clamp, open the shackle at end of the NetForm Rope by turning the shackle pin counterclockwise using an Allen wrench. Place shackle over the open eye of the clamp and insert shackle pin into the shackle through the eye of the clamp. Tighten shackle pin (the use of blue Loctite will ensure shackle does not come loose.)

   b. If using an OAB, open the shackle at end of the NetForm Rope by turning the shackle pin counter-clockwise using an Allen wrench. Place shackle over the open stud of the OAB and insert shackle pin into the shackle through the stud of the OAB. Tighten shackle pin (the use of blue Loctite will ensure shackle does not come loose.)

When moving Obstacles from initial installed location, please refer to the Obstacle Water Depth Chart included in this manual to ensure obstacles are installed over the proper depth of pool.

Access to truss can be by use of a secured ladder in the pool leaned up against the Obstacle Frame or by use of the EZ Dock floating dock system. Care must be taken to not put excessive lateral force on the Obstacle Frame at any time, and at no time should staff sit, stand, or walk on the Obstacle Frame for access.

Obstacle Water Depth

Obstacle	Min Water Depth in Feet
Overhead Rings	4
Rising Rings	4
Cannonball Alley	5
Low Bar	4
Trapeze Bar	4
Ladder	4
Camelback	5

Section 3

Obstacle Frame

The Obstacle Frame is a 12”x12” aluminum box truss connected by way of Corner Blocks. The Obstacle Frame is the connection point for all Obstacles. The Obstacle Frame is designed to distribute the weight of the Obstacles and participants over a specified range according to the individual design of each system.

The Obstacle Frame is bolted together with 5/8”x2.5” Stainless Steel or Galvanized Bolts. The bolts utilize 5/8” washers and 5/8” nylon washers. The Nylon Washers prevent galvanic reactions from occurring on the different metal types of the bolts and Obstacle Frame.

12”x12” 6-way Corner Blocks are installed every at the vertical legs. All cross members of the Obstacle Frame are connected at Corner Blocks. Corner Blocks utilize the same 5/8” hardware as other parts of the Obstacle Frame.

Section 1

Obstacle Frame Maintenance

Cleaning

Powder coated aluminum should require little maintenance, other than to gently clean with water and a mild liquid detergent to remove any dirt or splashes. A microfiber cloth or sponge should be used to wipe over the surfaces of the furniture. Removing surface water with a drying cloth (like you would use on your car) will help avoid water spots. Avoid using any abrasive cleaning agents or materials, as these could mark the surface of the powder coat. Do not use steel wool or Scotch-Brite on powder coated surfaces.

Section 2

Obstacle Maintenance

Aluminum Obstacles

Cleaning

Powder coated aluminum should require little maintenance, other than to gently clean with water and a mild liquid detergent to remove any dirt or splashes. A microfiber cloth or sponge should be used to wipe over the surfaces of the furniture. Removing surface water with a drying cloth (like you would use on your car) will help avoid water spots. Avoid using any abrasive cleaning agents or materials, as these could mark the surface *of the powder coat. Do not use steel wool or Scotch-Brite on powder coated surfaces.*

Paint and Coatings Care

Over the course of use, the obstacles will receive chips and scraps on the coated surfaces. It is important that these chips and scraps be attended to as soon as they are discovered to prevent them from worsening. When a chip or scrap is discovered it is important to follow these procedures.

1. Remove obstacle from the water
2. Completely dry the obstacle and wipe clean any dirt or residues
3. Apply touch up paint to effected area
4. Allow paint to completely dry before allowing obstacle to get wet

Ropes

Cleaning

Rinse with clean fresh water, do not use chemicals or abrasives.

Section 3

Material Specific Maintenance

The following pages have information on the proper methods for cleaning specific types of metals found in the Ninja*Cross* MiniNinja System. If you have any questions, please contact Ninja*Cross* Systems for advise.

Care and Cleaning of Stainless Steel

Introduction

Cleanliness and stainless steel are closely related and, in many applications, each is dependent upon the other. In the handling of food, chemicals, pharmaceuticals and in the use of stainless steel as a construction material (roofs, wall panels, entry ways, signs, etc.), stainless steel provides the degree of corrosion resistance that is necessary to prevent product contamination or surface rusting. However, stainless steel performs best when clean — cleanliness is essential for maximum resistance to corrosion.

This handbook describes various practices for cleaning stainless steel during manufacture and in use. This includes methods for removing free-iron contamination on stainless steel surfaces that may have been picked up from metalworking tools; and for removing general accumulation of dirt, grime and surface stains that occur during normal handling and exposure to the elements.

The reader should keep in mind that there are few specific rules for a cleaning procedure. Accordingly, the methods discussed in this handbook are suggestions. Each manufacturer or user, after obtaining competent advice with respect to their individual requirements, should select methods appropriate to those requirements.

What is Stainless Steel?

Stainless steel is not a single alloy, but rather the name applies to a group of iron-based alloys containing a minimum 10.5% chromium. Other elements are added and the chromium content increased to improve the corrosion resistance and heat resisting properties, enhance mechanical properties, and/or improve fabricating characteristics. There are over 50 stainless steel grades that were originally recognized by the American Iron and Steel Institute (AISI). Three general classifications are used to identify stainless steel. They are:

1) Metallurgical structure.

2) The AISI numbering system (200, 300 and 400 series numbers).

3) The Unified Numbering System, which was developed by the American Society for Testing Materials (ASTM) and the Society of Automotive Engineers (SAE) to apply to all commercial metals and alloys.

The various types of stainless steel are detailed in a designer handbook, “Design Guidelines for the Selection and Use of Stainless Steel,” available from the Specialty Steel Industry of North America (SSINA). Several other publications are also available, including: “Stainless Steel Fabrication,” “Stainless Steel Fasteners,” “Stainless Steel Finishes,” “Stainless Steel Specifications,” and “Stainless Steel Architectural Facts,” to mention a few.

Alloy Types

304 is the basic chromium-nickel austenitic stainless steel and has been found suitable for a wide range of applications. It is the most readily available in a variety of product forms. This grade is easy to form and fabricate with excellent resistance to corrosion.

•304L is the low carbon version of 304. It is sometimes specified where extensive welding will be done.

•316 offers a more corrosion-resistance through the addition of molybdenum. This grade is desirable where the possibility of severe corrosion exists, such as heavy industrial atmospheres and marine environments.

•316L is the low carbon version of 316.

•430 is a straight chromium ferritic stainless steel with lower corrosion resistance than the 300 series. It is principally employed for interior use.

Cleaning of Stainless Steel

Stainless steels need to be cleaned for aesthetic considerations and to preserve corrosion resistance. Stainless steel is protected from corrosion by a thin layer of chromium oxide. Oxygen from the atmosphere combines with the chromium in the stainless steel to form this passive chromium oxide film that protects from further corrosion. Any contamination of the surface by dirt, or other material, hinders this passivation process and traps corrosive agents, reducing corrosion protection. Thus, some form of routine cleaning is necessary to preserve the appearance and integrity of the surface. Stainless steels are easily cleaned by many different methods. They actually thrive with frequent cleaning, and unlike some other materials, it is impossible to “wear out” stainless steel by excessive cleaning. The effect of surface/pattern roughness, grain/pattern orientation and designs that allow for maximum rain cleaning (exterior applications)should be considered.

Types of surface contaminants

• Dirt -Like any surface that is exposed to the environment, stainless steel can get dirty. Dirt and soil can consist of accumulated dust and a variety of contaminates that come from many sources, ranging from the wind to everyday use. These contaminates will vary greatly in their effect on appearance and corrosively and ease of removal. While some may be easily removed, others may require specific cleaners for effective removal. It may be necessary to identify the contaminate or experiment with various cleaners. Frequently, warm water with or without a gentle detergent is sufficient.

Next in order are mild non-scratching abrasive powders such as typical household cleaners. These can be used with warm water, bristle brushes, sponges, or clean cloths. Ordinary carbon steel brushes or steel wool should be avoided as they may leave particles embedded on the surface which can lead to RUSTING. For more aggressive cleaning, a small amount of vinegar can be added to the scouring powder. Cleaning should always be followed by rinsing in clean hot water. When water contains mineral solids, which leave water spots, it is advisable to wipe the surface completely with dry towels.

• Fingerprints and Stains -Fingerprints and mild stains resulting from normal use in consumer and architectural applications are the most common surface contaminates. Fortunately, these usually affect only appearance and seldom have an effect on corrosion resistance. They are easy to remove by a variety of simple cleaning methods. Fingerprints are probably the most troublesome marks to remove from the surface of smooth polished or bright finished stainless steel. Fortunately, they can be removed with a glass cleaner or by gentle rubbing with a paste of soda ash (sodium carbonate) and water applied with a soft rag. Once again, this should be followed by a thorough warm water rinse. There are several special surface finishes where fingerprints present special problems: polished No. 6, etched, some abrasive blasted finishes, and light electrochemical colors applied over satin or brushed finishes.

(NOTE: there are several special finishes designed to withstand fingerprints: embossed, swirl patterns, lined patterns, etc.).

• Shop oil and Grease -Shop oils, which may carry grease, grit and metal chips, commonly produce surface soiling after many shop operations. Greases and other contaminates may also soil surfaces in food preparation and many other household and commercial situations. These soils may be corrosive in themselves or may not allow the surface to maintain passivity, and so periodic removal is a necessity. Initially, soap or detergent and water may be tried or a combination of detergent and water plus a solvent. The removal of oil and grease from stainless steel parts by immersion in chemical solvents is frequently used with cold-formed or machined parts that are laden with lubricants. This process, in its simplest form, consists of bringing liquid solvent into contact with the surface to be cleaned and allowing dissolution to take place; for example, washing a surface with trichloroethylene or similar liquid or stirring a batch of small parts in a container of solvent. Non-halogenated solvents, such as acetone, methyl alcohol, ethyl alcohol, methyl ethyl ketone, benzene, isopropyl alcohol, toluene, mineral spirits, and turpentine work well.

Many of these solvents are widely used as individual cleaners, but there are thousands of blended or compound cleaners on the market. Users are advised to contact suppliers of solvents for information on their applications on stainless steel.

Types of Cleaners and Methods

General Precautions

In selecting cleaning practices, consider the possibility of scratching and the potential for post-cleaning corrosion caused by incompletely removed cleaners. Scratching can occur on a bright mirror finish by cleaners that contain hard abrasives, or even by "grit" in wash water. This is usually not a problem on dull finishes, or those surfaces finished with a coarse polishing grit. The best preventative measure is to avoid using abrasive cleaners unless absolutely necessary. When abrasives are needed, first experiment on an inconspicuous area. A "soft abrasive," such as pumice, should be used. Abrasives can permanently damage some colored and highly polished finishes. Advice should be obtained from the finish supplier when cleaning special finishes. Many cleaners contain corrosive ingredients which require thorough post-clean rinsing with clean water; however, thorough rinsing is recommended for all cleaning procedures.

• **Clean Water and Wipe** - The simplest, safest, and least costly method that will adequately do the job is always the best method. Stainless surfaces thrive with frequent cleaning because there is no surface coating to wear off stainless steels. A soft cloth and clean warm water should always be the first choice for mild stains and loose dirt and soils. A final rinse with clean water and a dry wipe will complete the process and eliminate the possibility of water stains.

• **Solvent Cleaning** -Organic solvents can be used to remove fresh fingerprints and oils and greases that have not had time to oxidize or decompose. The preferred solvent is one that does not contain chlorine, such as acetone, methyl alcohol, and mineral spirits. There are many compounded or blended organic cleaners that are commercially available and attempt to optimize both clean ability and safety attributes. Cleaning can be accomplished by immersing smaller articles directly into the solvent, wiping with solvent-impregnated cloths, or by sophisticated vapor or spray methods. The wiping technique sometimes leaves a streaked surface.

Effective Cleaning Methods

• **Household Cleaners -** Household cleaners fall into two categories: detergent (non-abrasive) and abrasive cleaners. Both are effective for many mild dirt, stain, and soil deposits, as well as light oils such as fingerprints. The abrasive cleaners are more effective but introduce the possibility of scratching the surface. However, the degree of abrasiveness will vary greatly with the particular product, and some brands will produce noticeable scratching on only the most highly polished and some colored surfaces. All of these cleaners vary widely with respect to their acidity and the amount of chloride they contain. A neutral cleaner low in chloride is preferred unless the user is assured that the surface can be thoroughly rinsed after cleaning. The fact that the label states “for stainless steel” is no guarantee that the product is not abrasive, not acidic, or low in chloride. The cleaning method generally employed with these cleaners is to apply them to the stainless surface and follow by cloth wiping, or to wipe directly with a cleaner-impregnated soft cloth. In all cases, the cleaned surface should be thoroughly rinsed with clean water and wiped dry with a soft cloth if water streaking is a consideration.

• **Commercial Cleaners -** Many commercial cleaners compounded from phosphates, synthetic detergents, and alkalis are available for the cleaning of severely soiled or stained stainless surfaces. When used with a variety of cleaning methods, these cleaners can safely provide effective cleaning. Manufacturers should be consulted and their recommendations followed whenever using cleaners of this kind. The general precautions stated above also pertain to these cleaners.

Care of Stainless Steel

The cleaner stainless steel can be kept while in storage, being processed or during use, the greater the assurance of optimum corrosion resistance. Some tips on the care of stainless steel are listed below:

1) Use paper or other protective wrapping on the surface of the stainless steel until processing is complete.*

2) Handle stainless steel with clean gloves or cloths to guard against stains or finger marks.

3) Avoid the use of oily rags or greasy cloths when wiping the surface.

4) Do routine cleaning of exposed surfaces. Buildings with window washing systems can utilize this method to clean exterior panels.

5) Where possible, after cleaning, rinse thoroughly with water.

6) Cleaning with chloride-containing detergents must be avoided.

7) Even the finest cleaning powders can scratch or burnish a mill-rolled finish. On polished finishes, rubbing or wiping should be done in the direction of the polish lines, NOT across them.

8) **DO NOT USE SOLVENTS** in closed spaces or while smoking.

*Many adhesive-backed papers and plastic sheets or tape applied to stainless steel for protection “age” in fairly short periods of time and become extremely difficult to remove.

Manufacturers should be contacted regarding information as to how long protective films or paper can be left in place.

Acknowledgments

The Specialty Steel Industry of North America (SSINA) acknowledges that this new handbook contains information originally published by the Committee of Stainless Steel Producers, American Iron and Steel Institute, which no longer exists. Current SSINA member companies were represented on that committee. The SSINA wishes to acknowledge the contributions of the Nickel Development Institute and its consultant, Technical Marketing Resources (Pittsburgh, PA) for help in preparing the contents of this handbook.

Powder Coating Care and Maintenance

Proper Care of Powdered Surfaces Is Essential

Powder coatings that are applied to metal products exposed to the weather will inevitably degrade over time. A number of conditions, including those found in nature, will contribute to shortening the life of this type of protective finish.

•Sun

•Rain

•Wind

•Pollution

•Cold weather

•Salt water

•Electrical current

•Dissimilar metals

How to Maintain Powder Coated Surfaces

1. Avoid harsh chemicals: Unlike spray paint, powder coating is much more resistant to things like rust, corrosion, peeling and fading. However, that resistance does not mean it's completely fine to use chemical cleaners and solvents to clean powder coated items. Harsh cleaners and solvents like acetone can actually damage powder coating.

2. Clean gently: You can still clean powder coated surfaces. Just wipe off dust with a soft clock. If more cleaning is necessary, use a highly diluted, mild soap in water and a soft towel or soft sponge to very gently clean. Rinse with a little water, then dry with another soft towel.

3. Wax: If your powder coated metal has lost its gloss and shine, after removing dirt with mild soap, you can apply a thin layer of wax just like you do after you wash your car. After the wax dries, wipe all of it off and powder coated metal will look like new.

4. Don't paint: If you're wondering if you can touch up imperfections and rust with paint, the answer is no. Because of how the powder coating process works, paint won't adhere to powder coated surfaces. If your powder coating is starting to show signs of wear and tear, it's time to have a professional either repair or redo the powder coating.

5. Maintenance schedules: We recommend you regularly inspect and clean your powder coated items. How often you wipe your metal surfaces clean depends on the amount of dirt and grime in the area, the time of year, and if there's been any intense weather like a hurricanes or tornados.

NetForm Ropes

System Inspection

NetForm structures and associated hardware including backing nets, cables and fasteners should be inspected by a competent person after installation and on a regular scheduled basis thereafter. It is good practice to keep a dated and signed maintenance log of each netting system to assure that all safety measures have been followed.

The system must be inspected following alterations, repairs and impact loading. If any welding or cutting operations occur near the structures, weld protection must be provided for that area, and more frequent inspections should be conducted in proportion to the dangers involved.

NetForm should be inspected on a daily and weekly basis.

• Daily Inspection should include a quick visual of the NetForm and any backing netting, to look for any obvious broken net mesh or frays. Report for replacement any missing NetForm cross joints or tees.

• Weekly Inspection should include any lashing cord that may be used in the NetForm system, including loose and broken lashes. Repair as necessary. Visually check and hand-test all rope handrails, hardware, cables, anchors, etc. All hardware should be in place with no substitutes. Document any faults with a photograph to help expedite repairs.

General Environmental Inspection

NetForm, backing nets or hardware that show deterioration from mildew, corrosion, wear, or stress, that may affect their strength, must be immediately removed from service for further inspection, repair or disposal.

• Inspect the NetForm and backing nets for cuts, pulls, fraying of material and discoloration indicating material aging.

• Inspect cross joints and tees for stress cracking.

• Inspect support cables for cuts, twists, kinks, fraying of strands and corrosive rust.

• Inspect support and anchor hardware to assure fasteners are properly secured and that no pieces are missing. Look for damaging rust that may affect hardware strength or abrade the NetForm or backing nets.

Repairs

Field repairs and modifications may be done with guidance and materials from the manufacturer. Photographs are always the best way to convey the extent of a fault area. If replacement of a net panel or system is required, the manufacturer will determine the best method of replacement.

ABS Wrap/Signage Care

• Clean debris from wraps and signage as they appear dirty. Failure to remove debris may make care more difficult over time.

• Test any cleaning solutions on a small section of wrap before using to clean wrap.

• Use a wet, non-abrasive detergent and a soft clean rag for cleaning.

• Rinse thoroughly with clean water. Dry with a microfiber cloth.

• If choosing to wax the wrap, use only waxes that do not contain petroleum distillates

• Do not use mechanical brushes or pressure washers to clean the wraps. Doing so may damage the graphics or wraps themselves.

Vertical Truss Leg Wraps are not included in base MiniNinja System. NinjaCross Systems suggests the use of wraps to prevent access to the Obstacle Frame.

Section 1

Daily Pre-use Inspections

Prior to use each day, the system must undergo a complete Pre-use Daily Inspection to ensure that the system components are in proper working order and ready for use. This is a comprehensive inspection that is done at start of each day.

The complete system SHALL undergo the following inspections as laid out and documented. Any problems, concerns, or points of interests SHALL be noted in the inspection logs for review by NinjaCross Systems.

1. Ensure that the Obstacle Frame Legs are secured to the mounting plates.

2. Ensure Obstacle Frame is secure and not damaged.

3. Ensure that all Obstacles are in proper placement and not entangled in the Obstacle Frame, OAB's, or Signage.

4. Check the pool and surrounding deck for parts, hardware, or materials that may have fallen.

5. Ensure all Obstacles are at their proper depth in the pool and are located as designed.

6. Inspect NetForm Ropes for damage, broken strands, or opening or fraying. Check for mildew or staining.

7. Have lifeguards run through both lanes to ensure system is operating correctly.

8. Ensure that all signage is undamaged, visible without obstructions, and can be viewed by participants on the deck.

9. Document inspection and note any concerns or problems.

Section 2

Quarterly Inspection

The complete system **SHALL** undergo the following quarterly inspections as laid out and documented. Any problems, concerns, or points of interests **SHALL** be noted in the inspection logs for review by NinjaCross Systems.

1. Obstacle Frame -

a. Check that Obstacle Frame joints, where two Truss Sections meet or a Truss Section and Corner Block meet, are secure and not loose.

b. Ensure that all hardware is present at every joint, each Truss Section is bolted to a Truss Section or Corner Block with 4 bolt assemblies.

c. Check for chipped paint

d. Checked for cracked paint, cracked paint may indicate a stress fracture in the truss cord.

e. Ensure that the Obstacle Frame is level both side to side and front to back

f. Rinse frame with fresh water

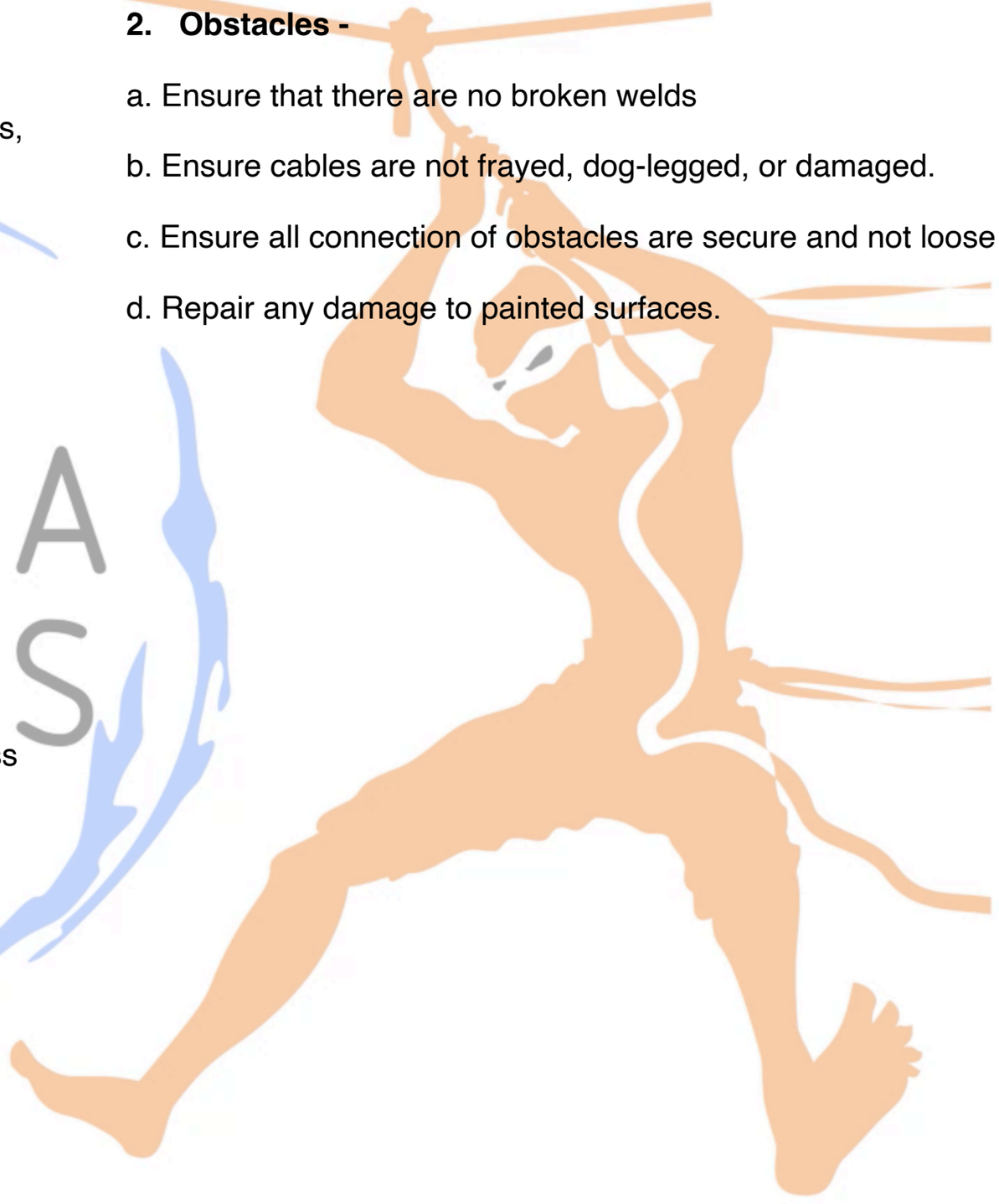
2. Obstacles -

a. Ensure that there are no broken welds

b. Ensure cables are not frayed, dog-legged, or damaged.

c. Ensure all connection of obstacles are secure and not loose

d. Repair any damage to painted surfaces.



Section 3

Yearly Inspection

All NinjaCross MiniNinja System components **SHALL** be inspected annually by NinjaCross Systems or an authorized representative. Failure to have the system inspected will result in NinjaCross Systems notifying all relevant inspection authorities that the system cannot be declared safe to use by manufacturer.

A minimum of 4-weeks' notice to NinjaCross Systems must be given for scheduling the annual inspection. Contact NinjaCross Systems via your sales contact or directly at Support@NinjaCrossSystems.com

Annual Inspection **SHALL** include and inspection of the following items to ensure the safe and proper working order of the NinjaCross MiniNinja System.

1. Obstacle Frame System including mounting plate
2. Obstacles
3. Inspection and Maintenance Logs

Section 4

Inspection Forms

Ninja*Cross* Systems has provided the following sample inspection forms for use or as a guideline to creating your own inspection forms. At minimum, all inspection forms must include the items including in each form.

Inspection Forms

Ninja*Cross* **:** Daily Pre-use Inspection

Description **:** Daily safety checks to be performed prior to use.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Monthly
Obstacle Frame Mounting Plate																																
Obstacle Frame																																
Obstacle Ropes																																
Obstacles																																

Notes **:**

Inspection Forms

Ninja*Cross* **:** Quarterly Inspection

Description **:** System inspection every 3 months

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Obstacle Mounting Plate and Anchors				
Obstacle Frame Connections				
Obstacle Connections				
Obstacle Rope integrity				
Obstacle integrity				

Notes **:**

Certification and Training

Detailed instructions, extensive training, and actual operations specific to each NinjaCross MiniNinja System will be provided and addressed during the on-site Training and Certification conducted by The Owner/Operator of the MiniNinja System. The Owner/Operator will be responsible for instructing the operations team on Operations, Daily, Quarterly, Seasonal and Annual Inspections, Safe Usage, Procedures to follow in order to minimize possible injuries as well as cleaning and maintenance to

insure the longevity of your obstacle course & fitness system.

Personnel Training

(Please Note the Following Contains the Manufactures Minimum Recommendations but are Subject to Your Facilities Local and State Codes as well as contracted Third Party Organizations such as the American Red Cross)

Having properly trained and conscientious employees on site is the most important safety factor in the operation of the NinjaCross MiniNinja System.

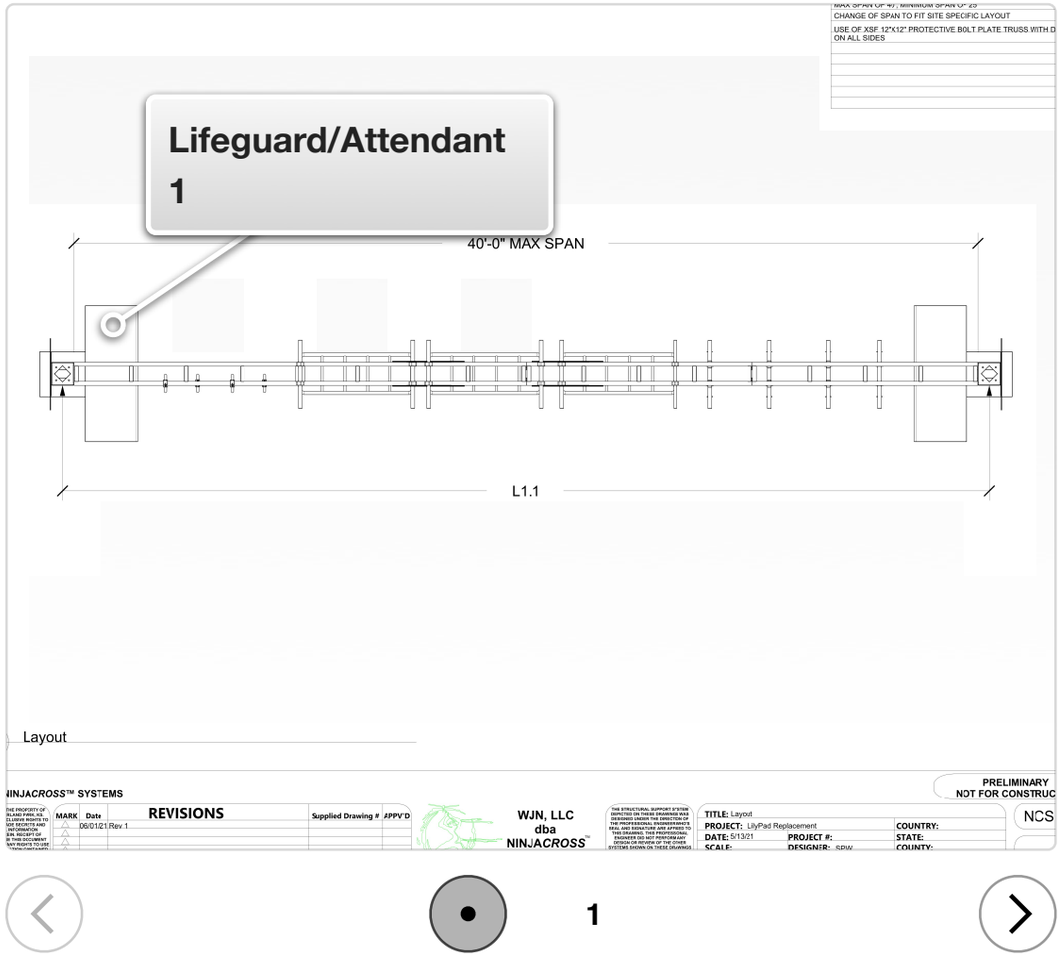
It is our recommendation that all employees who are responsible for the NinjaCross MiniNinja System operations be certified lifeguards and be qualified in both first-aid and life-saving techniques through the American Red Cross training or the equivalent. At least one person who has completed the Standard First Aid and Personal Safety course, as offered by the American Red Cross, or the equivalent should be on duty always during operating hours. This person should also be competent in carrying out any emergency procedures peculiar to the slide he or she is operating. Under most conditions, this is also a recommendation of the insurance carrier if applicable.

Each owner/operator shall have written operating procedures for the NinjaCross MiniNinja System, which are an integral part of their staff-training program. These procedures shall include but not be limited to:

Lifeguard/Attendant Station 1 - one trained lifeguard/attendant SHALL be stationed at the edge of the pool at the starting location. This staff duties are to ensure that all Participants start in the water, to ensure the proper spacing of Participants at the start, and to observe Participants at the start of the course.

All NinjaCross MiniNinja personnel should be alert to controlling crowd behavior and the proper entry rate into the pool; therefore, we recommend the line to participate be formed on the pool deck rather than the pool edge. One Participant may be stationed at the edge of pool to start the course, while any additional may be at a point away from the pool edge preparing to move into starting position at the command of the lifeguard/attendant. Once the Participant who is at edge of pool starts the course the Participant

Interactive 7.1 Lifeguard/Attendant locations



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on the deck enters the starting area at the edge of the pool then the line then moves up one position.

Lifeguards at the start of the course should address each and every Participant when it is their turn and then inform the Participant on the rules of the course prior to starting the course. All Participants should be instructed how to use the course and not allowed to run, jump, or leap into the pool. The Lifeguard(s) stationed at start will address each Participant first by asking that they follow their instructions and Do Not proceed into the pool until they are given the okay to do so.

Safe and orderly exit from the pool area helps reduce the risk of disoriented riders colliding with other pool guests. Lifeguards shall instruct Participants to exit the Designated Safety Area in the correct manner and direction.

An uninterrupted view of the pool and Obstacle Frame must be maintained at all times. It is recommended that all lifeguards be familiar with all the jobs related to the Obstacle Frame. Rotating lifeguards between positions keeps interest and attention high.

Section 2

Facility Requirements

Communications

Each facility shall ensure they have a communication plan in place for all staff working the NinjaCross MiniNinja System and have trained them in the proper use of signals, devices, or other methods.

Signage:

The owner/operator shall place signage as specified. These signs shall include safety, warning, and instructional signage reflecting manufacturer recommendations. Signage shall be prominently displayed at the course entrance or other appropriate area and shall include but not be limited to:

- **Instructions, which include:**
  - Expected participant conduct,
  - Dispatch procedures,
  - Exiting procedures, and
  - Obey attendant/lifeguard instructions.
- **Warnings, which include:**
  - NinjaCross MiniNinja characteristics, such as challenging & competitive
  - Water depth if not posted near pool edge already
- **Requirements which include:**
  - Participants being free of medical conditions, including but not limited to pregnancy and heart, back, or musculoskeletal problems,
  - Mental conditions that may prevent comprehension or adherence to posted rules,
  - Maximum/minimum height and weight, and
  - Any swimming or physical ability requirement or both.

Section 1

System Overview

Your Ninja*Cross* MiniNinja System is an indoor or outdoor system that includes the deck mounted anchor points and mounts. This section will give an overview of the different materials that make up the components of the system.

Stainless Steel Components

1. Bolting Hardware
2. Shackles

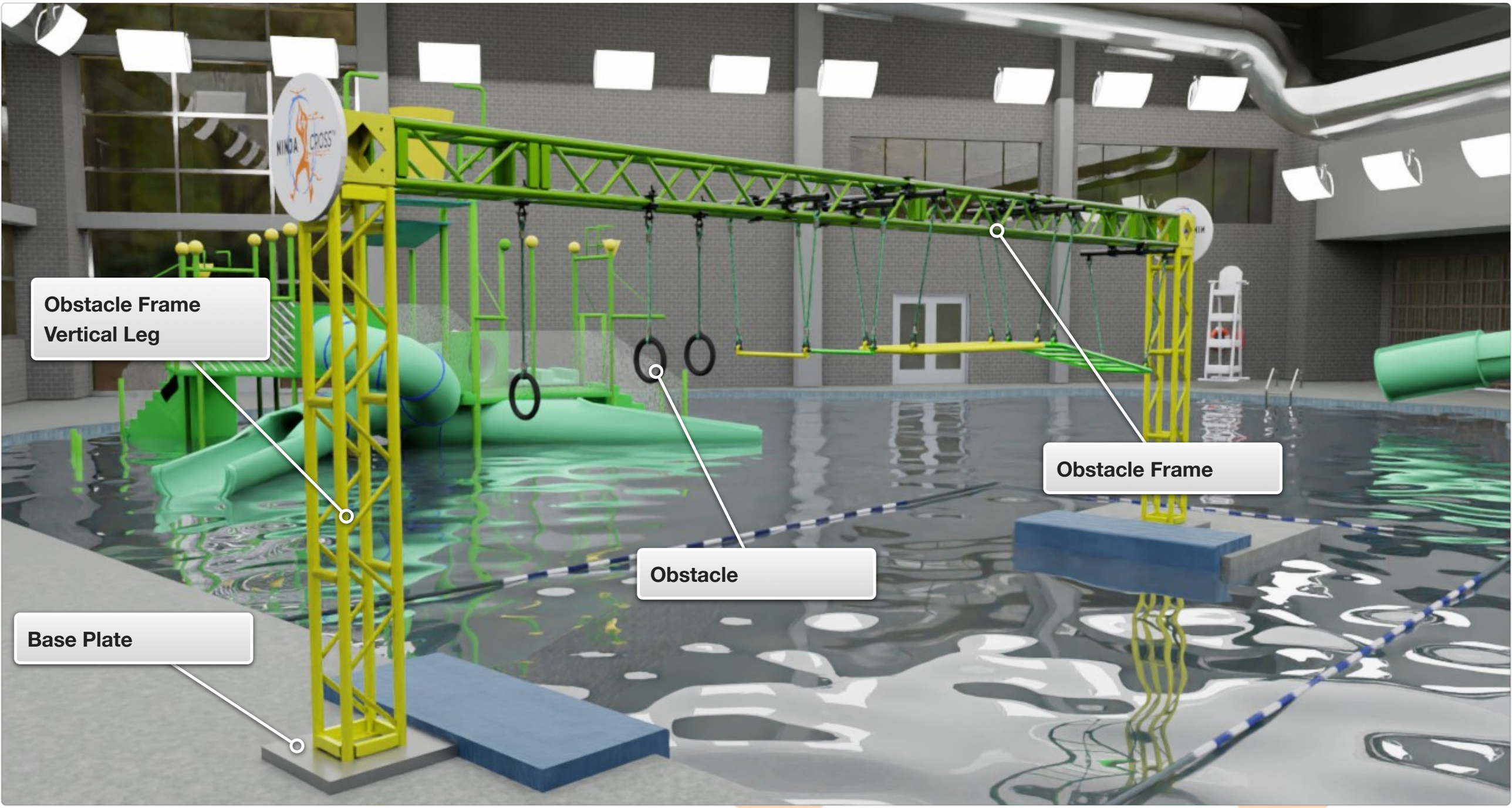
Aluminum Components

1. All metal Obstacles and OAB's
2. Obstacle Frame Truss and Corner Blocks
3. Truss Picks and Clamps

Other Materials

1. Signs - ABS
2. Backup System - powder-coated steel with galvanized cable
3. Ropes - InCord NetForm, Polyester Fiber Braided Steel Wire
4. Discs, Rings, and other Obstacles - HDPE

Interactive 8.1 System Overview



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Section 2

Obstacle Frame Components

The Obstacle Frame consists of 3 primary components

1. 12”x12” Box Truss

2. 12” 6-way Corner Blocks

3. Mounting Plate

The parts of the Obstacle Frame System include:

1. **12”x12” Box Truss -** this aluminum box truss comprises the main structural component of the Obstacle Frame. Each section is at maximum 10’ long with the shortest being 2’ long. The type of Box Truss used is a bolt plate type that utilizes 5/8” bolt hardware.

2. **12”x12” 6-Way Corner Block -**is a 12” square block used to connect sections of Box Truss. The block is the only point where Static Lines are permitted to be installed.

3. **Mounting Plate -** this is a square aluminum plate designed to allow anchorage of the MiniNinja system to the concrete deck. The Mounting Plate is secured to the deck via wedge anchors and secured to the vertical Box Truss legs via bolting hardware.

Gallery 8.1 Obstacle Truss System

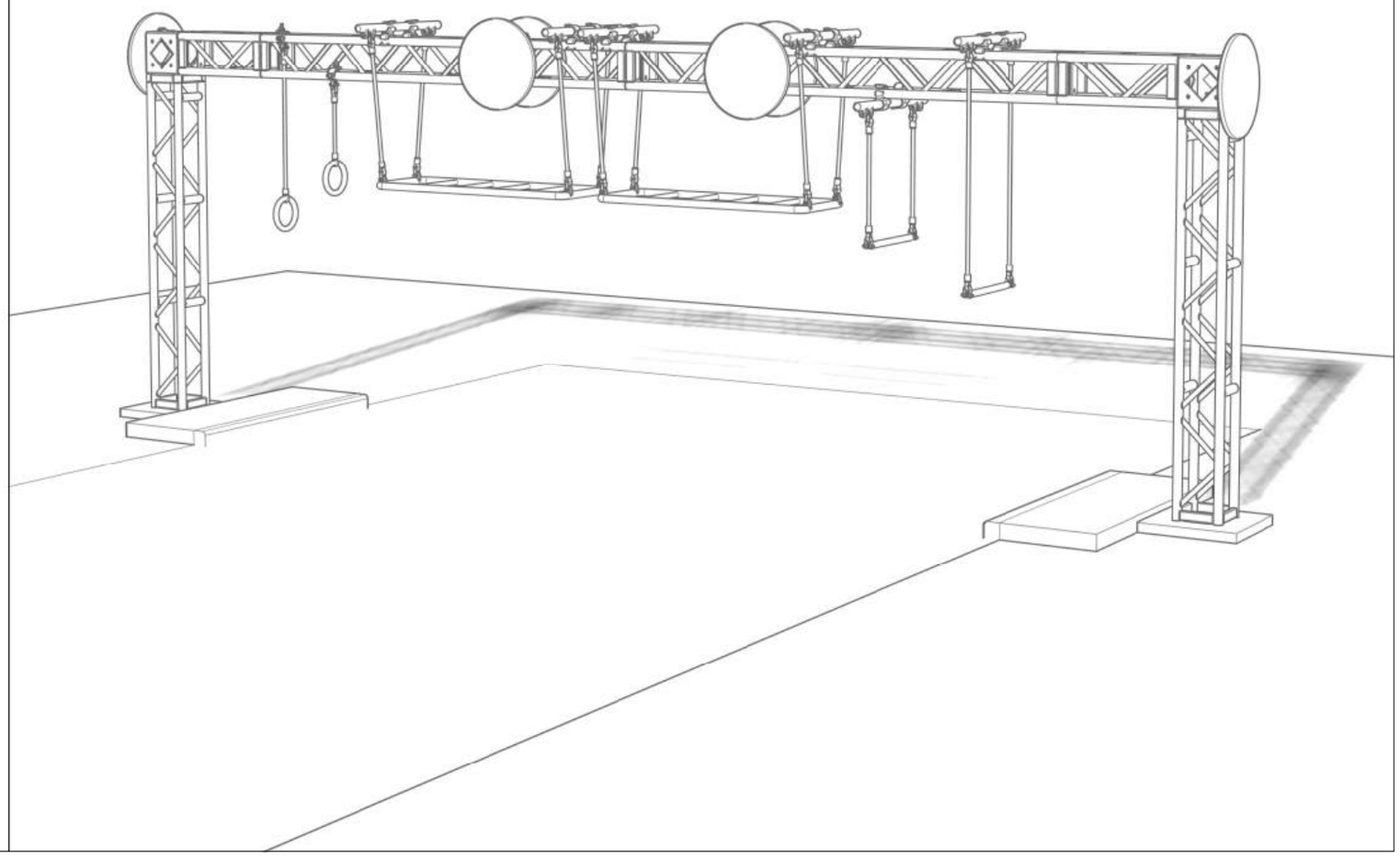
Corner Block

BASE PLATE AND ANCHOR NOTES:

FOR SLABS BETWEEN 4" AND 6" THICK:
INSTALL CUSTOM XSF BASE PLATE WITH (4) 5/8"Ø THREADED ROD ANCHORS IN AN 18" SQUARE PATTERN. EMBED 2¾" USING HILTI HIT-RE 500 V3 ADHESIVE.

FOR SLABS 6" THICK OR GREATER:
ANCHOR TRUSS DIRECTLY DOWN TO SLAB WITH (4) 5/8"Ø THREADED RODS AND HILTI HIT-RE 500 V3 ADHESIVE. USE A MINIMUM 4½" EMBEDMENT.

CONCRETE COMPRESSION STRENGTH SHALL BE 4000 PSI OR GREATER IN ALL CASES.



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Comments/Notes
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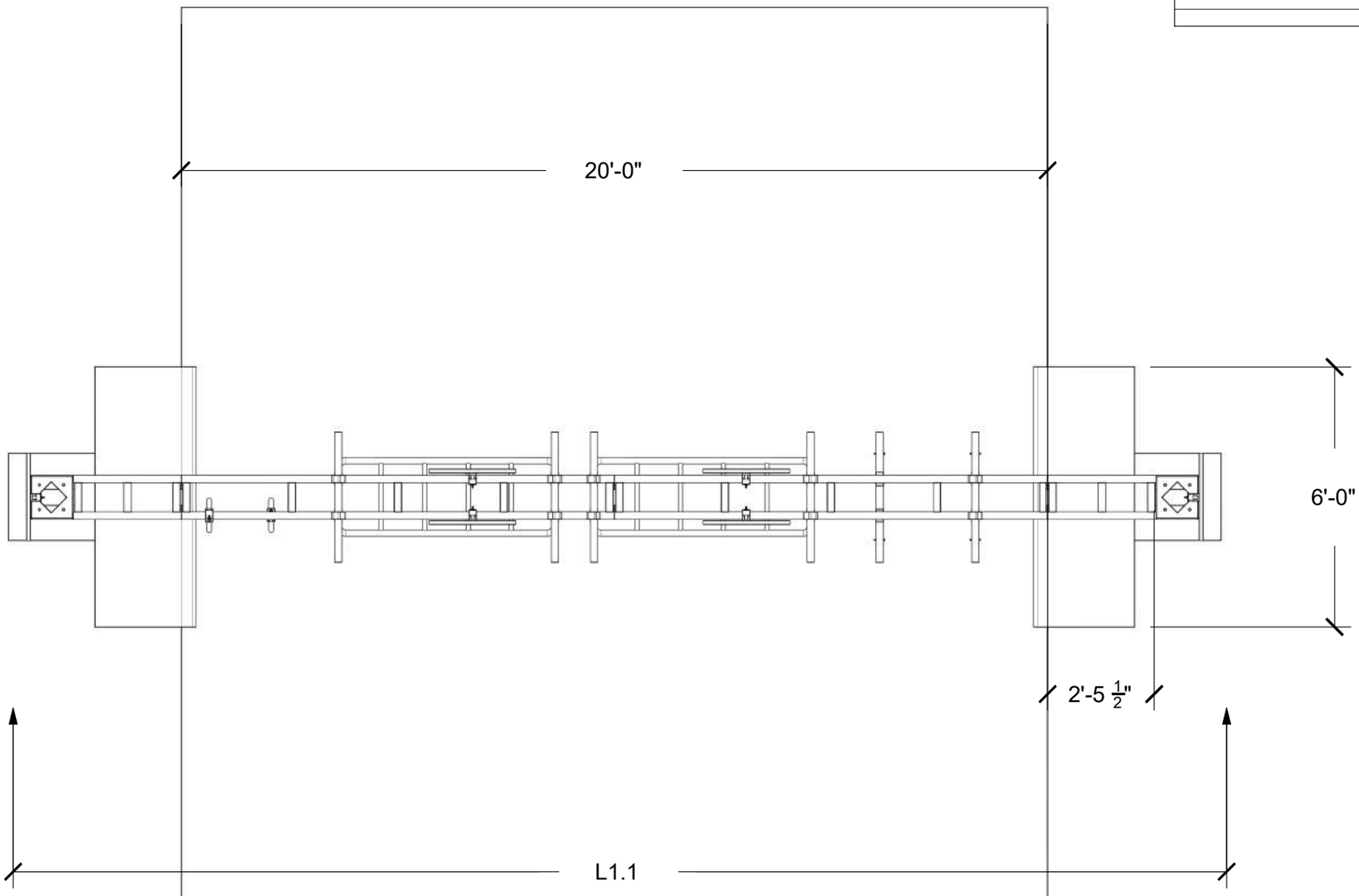

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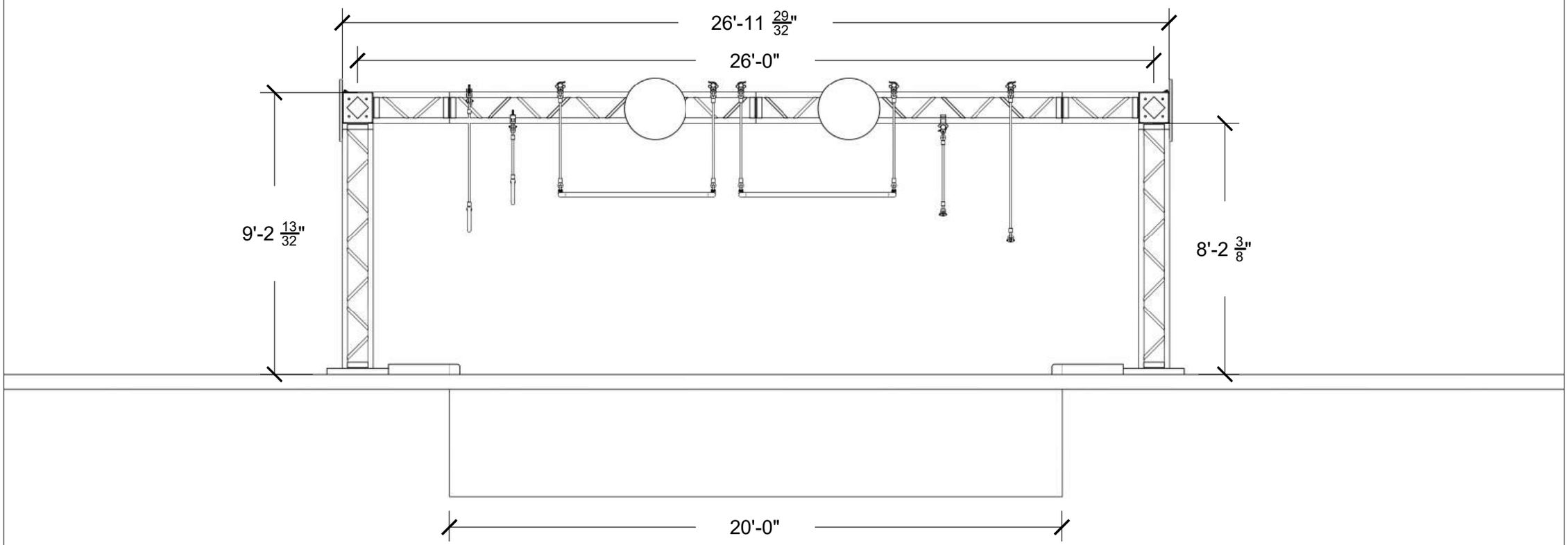

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THE STRUCTURAL SUPPORT SYSTEM DEPICTED ON THESE DRAWINGS WAS DESIGNED UNDER THE DIRECTION OF THE PROFESSIONAL ENGINEER WHO'S SEAL AND SIGNATURE ARE AFFIXED TO THIS DRAWING. THIS PROFESSIONAL ENGINEER DID NOT PERFORM ANY DESIGN OR REVIEW OF THE OTHER SYSTEMS SHOWN ON THESE DRAWINGS AND THEREFORE ASSUMES NO RESPONSIBILTY FOR THER ADEQUACY.

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Disclaimers and Important Manufacturer Information

- **The NinjaCross MiniNinja System & ancillary components require installation by qualified personnel. Use of non-qualified trades' people or use of non-approved parts will void the manufacturer's Warranty.**

- **NinjaCross MiniNinja maintenance is the responsibility of the owner. It is recommended a maintenance log be kept documenting water quality including all performed maintenance. See suggested inspection check lists, water quality log, and maintenance section for guidelines on how to maintain the system, in addition to keeping your Warranty valid. These documents may be called on if warranty issues arise.**

- **When receiving manufacturer shipments, inspect all items for damage and quantity immediately. Failure to do so could result in costly repair or replacement costs at the expense of the owner/installer. When receiving any shipments, be sure to inform the driver of any discrepancies and report as indicated on the shipping documentation when signing for receipt of goods. All claims must be reported within 48 hours of receipt of goods. Claims reported outside of this time cannot be guaranteed. If nothing has been noted on the Bill of Lading a claim may not be accepted. If you are unable to inspect the shipment at time of receipt you must note on the Bill of Lading "Subject to inspection".**

- **NinjaCross Systems does not supply the Safety Padding. Safety Padding is the sole responsibility of the Owner/ Operator. Pool Side Pads are designed to be placed on the side of the pool to protect patrons as they enter and exit the MiniNinja area. Pads typically form an L-Shape covering the length of your area and protect the top walk area, the pool side wall and the pool edge. Pads can also be made in a "stair-step" shape to protect pool walls with drain gutters.**