Morgan's Norms	Phoria	ABduction (BI or NRV) - BIN	ADduction (BO or PRV) - BOP	Infra (BU)	Supra (BD)	NRA/PRA
6 M	0-2 XP	x/5/3	7/15/8	3/1	3/1	
40 cm	0-6 XP	11/19/10	14/18/7			+1.75/-1.75

NPA	Min = 15 – (age ÷ 4) ; 2.00D below norm is abnormal
NPC	<6cm (≥ 6cm and/or regression w/ repeat PU might indicate a convergence problem)
Stereoacuity	≤ 40 sec
Versions (EOM)	SAFE (Smooth, Accurate, Full, Extensive)
Pupils	PERRL-A (Pupils Equal, Round, Reactive to Light – and Accommodation)
Calculated AC/A	5/1 (< 3/1 is low, > 7/1 is high) -- proximal convergence accounts for calc AC/A to be higher $AC/A = PD_{cm} + (H_N – H_D)(0.4)$
Gradient AC/A	4/1 (5/1 is high) -- lag of accommodation (under-accommodate for 40cm) accounts for gradient AC/A to be lower
Tonometry	10 – 21 mmHg (15 to 16 ± 5 mmHg) Normal diurnal variation: 3-6 mmHg
Flippers	Monocular: 12 cpm / Binocular: 8 cpm — Adults: ≥ 13 yo ±1.50D @ 40cm / Children: < 13 yo ±2.00D @ 33cm
MEM Ret	+0.50 to +1.00D LAG
X-cyl	Monocular: +1.00 (any other value is NOT normal) Binocular: +0.50 (any other value is NOT normal)
NRA/PRA	If higher than +2.50 -- pt might be over-minused or under-plused Measurements ≤ 1.50 is considered LOW (abnormal)
Reflex Fusion Stress Test	6 BO (10 cycles at 40cm) — Mean: 21 +/- 4 sec — Expected: <25 sec 6 BI (10 cycles at 40cm) — Mean: 22 +/- 3 sec — Expected: <25 sec
TBUT	> 10 sec
ONH	Rim width: ISNT (widest → narrow) Narrowing: ISNT (usually narrows first → last to narrow)
AV ratio	Artery is 2/3-3/4 width of vein; observe ~2DD away from ONH
Refractive Error	
Exophthalmometry	Normal: 16-22mm Asian 16mm; Caucasian 18mm; Af-Am 20mm 3 mm between eyes significant

Systolic	Diastolic	Stage	Follow-Up
<120	<80	Normal	Recheck in 2 years
120-139	80-89	Pre-hypertension	Recheck in 1 year
140-159	90-99	Stage 1	Recheck in 2 mos
160-179	100-109	Stage 2	REFER w/in 1 mo
180-209	110-119	Stage 3	REFER w/in 1 week
> 210	> 120	Stage 4	REFER IMMEDIATELY!

	Randot	sec
1	L	400
2	R	200
3	L	140
4	M	100
5	R	70
6	M	50
7	L	40
8	R	30
9	M	25
10	R	20
A	Cat	400
B	Rabbit	200
C	Monkey	100

cm	D
20	5
19	5.25
18	5.55
17	6
16	6.25
15	6.7
14	7
13	7.7
12	8
11	9
10	10
9	11
8	12.5
7	14
6	16.7
5	20
4	25
3	33
2	50
1	100

Material	Index	Abbe	Density	Absorption
Glass	1.523	58.9	2.54	100% UVC 80% UCB 15% UVA
CR-39	1.498	58	1.32	100% UVC/B 85% UVA
Polycarb	1.586	30	1.20	100% UVC/B/A
Trivex	1.53	46	1.11	100% UVC/B/A

Multifocal	Vertical Seg Height (from mid-eyewire)	Minimum Seg Height
Bifocals	To lash margin	½ width (FT25 → min 13), D/N Binocular PDs
Trifocals	To half inferior visible iris diameter; if dilated, lower lid intersects globe + 2-3 mm above	intermediate + ½ width (FT7x25 → 20) Need large B dimension (2*SH + 5) D/N Binocular PDs
PALs	To center of pupil (penlight corneal reflex)	1-2 mm more than manufacturer min. SH Distance Monocular PDs

Age	Add (40 cm)
41-42	+0.50
43-44	+0.75
45-46	+1.00 to +1.25
47-48	+1.25 to +1.50
49-50	+1.50 to +1.75
51-53	+1.75 to +2.00
54-56	+2.00 to +2.25
57-59	+2.25
60+	+2.50

Age	Min. AA
10	12.5
15	11.25
20	10
25	8.75
30	7.5
35	6.25
40	5
45	3.75
50	2.5

Condition	Cover Test	Calc. AC/A	AA	Vergences	NRA/PRA	Flippers	MEM	1° Treatment	2° Tx
Convergence Insufficiency	High exo at near	Low	↓ NPC	↓ BO (PRV)	↓ NRA	Fail (+) BAF	Low lead	VT	BI prism at near
Divergence Insufficiency	High eso at distance	Low		↓ BI (NRV) at distance				BO prism overall or at distance only	VT
Convergence Excess	High eso at near	High		↓ BI (NRV)	↓ PRA	Fails (−) BAF	Large lag	(+) lenses at near & BO overall if eso at distance	BO prism VT
Divergence Excess	High exo at distance	High		↓ BO (PRV) at distance ↓ BI (NRV) at near				VT	(−) lenses at distance BI prism
Basic Esophoria	Eso similar at near & dist			↓ BI (NRV)	↓ PRA	Fails (−) BAF	Large lag	BO prism overall	(+) lenses VT
Basic Exophoria	Exo similar at near & dist			↓ BO (PRV)	↓ NRA	Fails (+) BAF	Low lead	VT	BI prism overall
Vergence Dysfunction				↓ BI & BO	↓ NRA/PRA	Fails (+)/(−) BAF			
Accommodative Insufficiency			↓ AA	↓ BO (PRV) at near (?)	↓ PRA	Fails (−) B&M	Large lag	(+) lenses	VT
Ill-Sustained Accommodation			↓ AA with multiple PU	↓ BO (PRV) at near (?)	↓ PRA	Fails (−) B&M over time	Large lag if fatigued	(+) lenses	VT
Accommodative Infacility				↓ BO & BI at near (?)	↓ NRA/PRA	Fails (+)/(−) B&F		VT	(+) lenses
Accommodative Spasm				↓ BI (NRV) at near (?)	↓ NRA	Fails (+) B&M	Low lead	VT	(+) lenses Cycloplegic