B. Saran

Sebagai pengembangan dan tindak lanjut penelitian balok beton bertulang *GFRP bar* tanpa selimut yang menggunakan *GFRP sheet* sebagai tulangan geser, beberapa hal yang perlu dilakukan:

1. Penelitian lanjut yang menggunakan balok uji dengan mode keruntuhan yang sama antara balok beton bertulang GFRP bar dan balok beton bertulang baja
2. Penelitian lanjut tentang perilaku geser balok beton bertulang GFRP bar.

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LAMPIRAN

Lampiran 1. Perhitungan beban lentur dan beban geser balok BK

Prosedur perhitungan	Nilai	Satuan
Langkah -1		
Momen dan Gaya geser maksimum berdasarkan model pembebanan pada **Gambar 10**.		
M = 0.6P+0.96	-	kNm
D = 0.5P+1.293	-	kN
Langkah -2		
Momen nominal balok BK berdasarkan **Gambar 11**.		
Mutu beton (f'c)	24.5	MPa
Mutu baja (fy)	378.36	MPa
A_s (3D13)	380.03	mm^2
Inersia Bruto, $I_g = 1/12\ b.h^3$	0.000195	M^4
Kuat lentur, $f_r = 0.62\sqrt{f'_c}$	3.0688	MPa
Momen retak awal, $M_{cr} = 2f_r.I_g/h$	4.7873	kNm
Berdasarkan pada langkah-1, didapatkan beban retak awal(P_{cr})	6.37	kN
Regangan beton, $\varepsilon_c = (c/(d-c))\ \varepsilon_y$	0.00107	
Momen pada saat titik leleh, $M_y = C.h_m$	27.024	kNm
Berdasarkan pada langkah-1, didapatkan beban leleh (P_y)	43.44	kN
Luas tulangan seimbang $A_{sb} = \beta_1 \frac{f'_c}{f_y} bd\left(\frac{510}{600+f_y}\right)$	919.49	mm^2
Tinggi blok tekan, $a = \frac{A_s.f_y}{0.85 f'_c b}$	46.03	mm
Momen nominal penampang, $M_n = A_s \cdot f_y\left(d - \frac{a}{2}\right)$	27.411	kNm
Berdasarkan pada langkah-1, didapatkan beban lentur (P_{lentur})	44.08	kN
Gaya geser yang terjadi (V_{max}) berdasarkan beban lentur (P_{lentur})	22.17	kN
Langkah-3		
Gaya geser nominal balok BK berdasarkan		

Gambar 10.		
Kontribusi beton, $V_c = \frac{\sqrt{f'_c}}{6} bd$	26.44	kN
Kontribusi tulangan (ϕ8-100), $V_s = \frac{A_v f_y d}{s}$	41.75	kN
Gaya geser nominal ($V_n = V_c + V_s$)	68.19	kN
Berdasarkan pada langkah-1, didapatkan beban Geser (P_{geser})	133.79	kN

Lampiran-2. Perhitungan beban lentur dan geser balok BFS

Lampiran 2. Perhitungan beban lentur dan beban geser balok BFS

Prosedur perhitungan	Nilai	Satuan
Langkah -1		
Momen dan Gaya geser maksimum berdasarkan model pembebanan pada **Gambar 10**.		
M = 0.6P+0.96	-	kNm
D = 0.5P+1.293	-	kN
Langkah -2		
Momen nominal balok berdasarkan **Gambar 11**		
Mutu beton ($f'c$)	24.5	MPa
Regangan ultimit beton (ε_{cu})	0.003	
Mutu *GFRP bar* (f_{fu})	632.16	MPa
Modulus elastisitas *GFRP bar* (E_f)	43900	MPa
Luas tulangan, A_f (3D13)	380.03	mm^2
Rasio tulangan, $\rho_f = \frac{A_f}{b \cdot d}$	0.0119	
Tegangan dalam tulangan, F desain (f_f)	708	MPa
Tinggi blok tekan equivalen, $a = \frac{A_f f_f}{0.85 f'_c b}$	86.134	mm

Momen nominal penampang, $M_n = A_f \cdot f_f\left(d - \frac{a}{2}\right)$	45.897	kNm
Berdasarkan pada langkah-1, didapatkan beban lentur (P_{lentur})	74.89	kN
Gaya geser yang terjadi (V_{max}) akibat beban lentur (P_{lentur})	38,738	kN

Lanjutan Tabel 3

Langkah-3

Gaya geser nominal balok BFS berdasarkan **Gambar 11**		
Kontribusi beton, $V_c = \frac{2}{5}\sqrt{f'_c}bc$	26,437 1	kN
Kontribusi tulangan (ϕ8-100), $V_s = \frac{A_v f_y d}{s}$	41.75	kN
Gaya geser nominal ($V_n = V_{c,f} + V_s$)	68,1	kN
Berdasarkan pada langkah-1, didapatkan beban Geser (P_{geser})	98.06	kN

Lampiran 3. Tahapan pengecoran balok beton bertulang

(a). Beton Ready Mix

(b) Pengukuran Slump

(c) Penuangan beton ke bekisting

(c) Pemadatan beton

(e)Perataan permukaan balok

(f) Pengambilan sampel uji properti