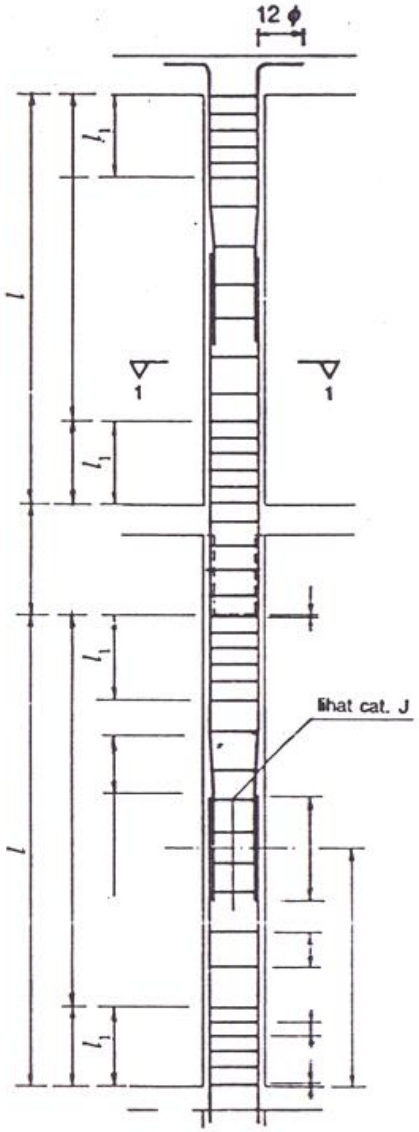
STRUKTUR BANGUNAN SIPIL

DETAIL KOLOM, BALOK & TANGGA

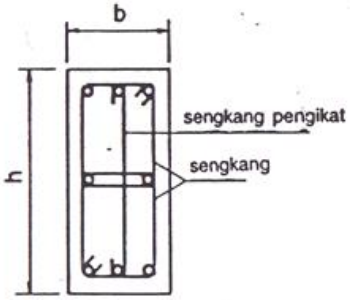
(pertemuan ke 10)

Ir. BESMAN SURBAKTI. MT

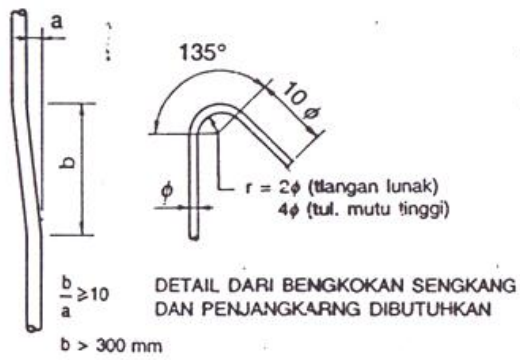
Semester A – 2011/2012



DETAIL PEMBENGKOKAN TULANGAN



1 – 1



DETAIL DARI BENGKOKAN SENGKANG DAN PENJANGKARNG DIBUTUHKAN

Catatan:

A. l_1 = harga tertinggi dari
   1. h(h > b)
   2. $l_u/6$
   3. 450 mm

B. untuk kolom yang membutuhkan pengekangan khusus Sh_1 = jarak dari semua pengekangan dari sengkang dan ikatan pada daerah kekangan dengan jarak maksimum 0-2b, 6ϕ atau 200 mm luasan tulangan pengekang harus dihitung berdasarkan kekuatan penampang

C. Sh_2 = jarak sengkang untuk daerah intermidiate zone
   1. 12ϕ
   2. 400 mm
   3. 0-4b

D. jarak dari luar tulangan dari sengkang dan ikatan yang melalui sambungan balok kolom lihat bab sambungan balok beton.

E. Pengaturan sengkang harus juga dapat menahan gaya geser yang harus dipikul

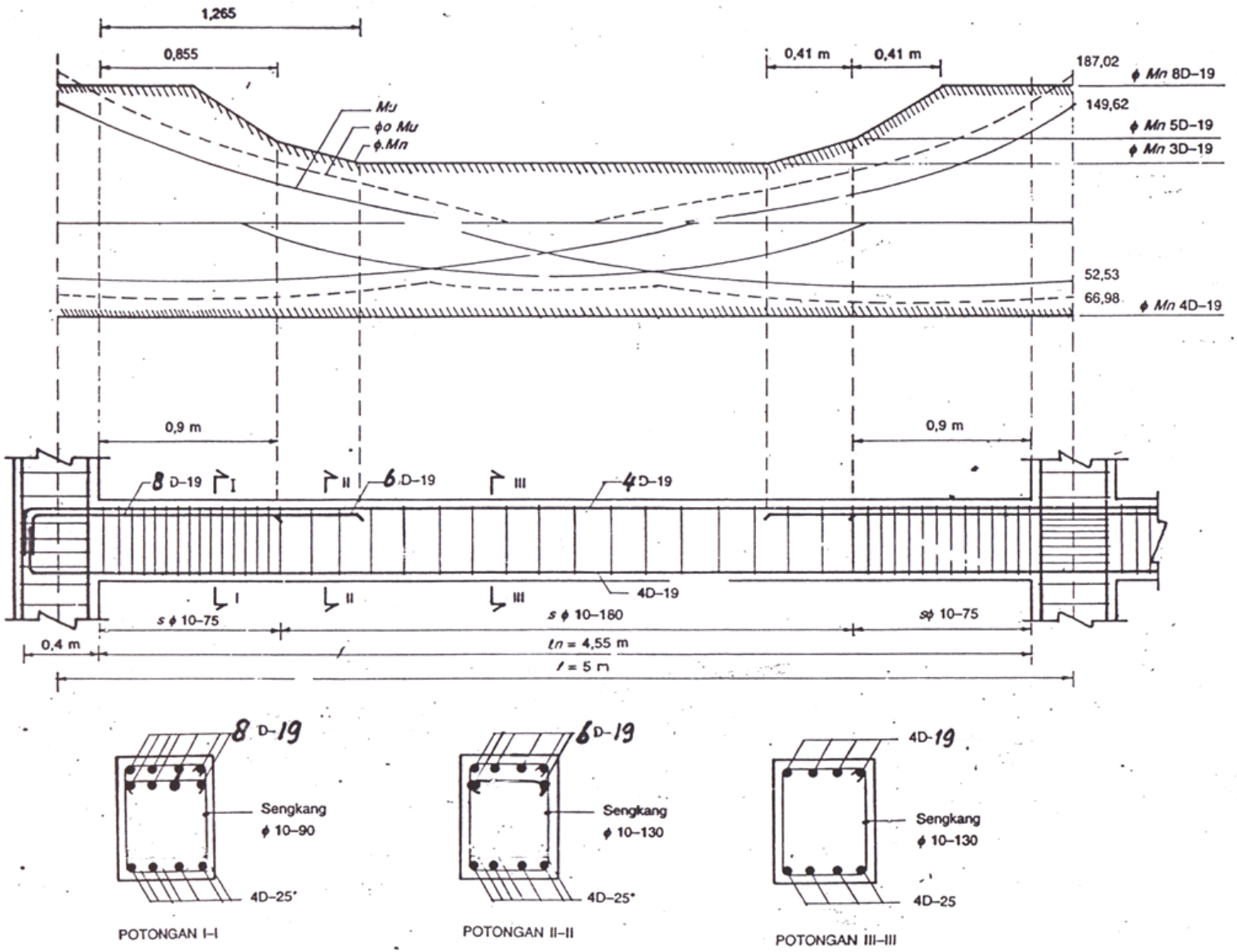
F. untuk daerah zone 1-4 sambungan lewatan harus berada di luar sendi plastis dan diambil dari harga terbesar dari
   1. panjang penjangkaran yang dihitung
   2. 30 x f untuk f_y = 400 MPa
   3. 20 x f untuk f_y = 240 MPa

G. untuk beban-beban yang tidak membutuhkan pengekangan khusus syarat-syarat jarak minimum seperti pada catatan C

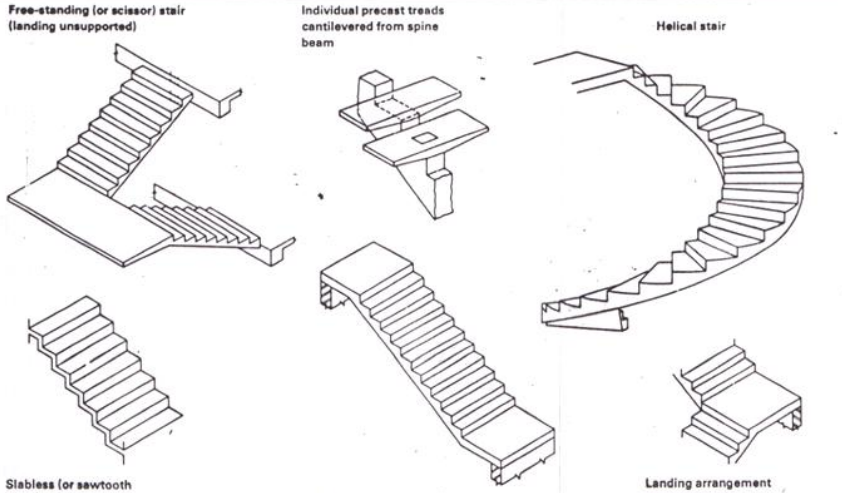
H. f tulangan ikatan tambahan = f tulangan sengkang

J. sambungan harus dikekang oleh minimum 3 sengkang

K. diameter dari sengkang dan sengkang pengikat
   ϕ < 20 mm → ϕ 6 mm
   ϕ < ϕ < 24 → 10 mm
   ϕ < 32 → 12 mm


1,265
0,855
0,41 m
0,41 m
187,02
ϕ Mn 8D–19
149,62
ϕ Mn 5D–19
ϕ Mn 3D–19
Mu
ϕo Mu
ϕ.Mn
52,53
66,98
ϕ Mn 4D–19
0,9 m
0,9 m
8 D–19
6 D–19
4 D–19
I
II
III
4D–19
s ϕ 10–75
s ϕ 10–180
sϕ 10–75
0,4 m
ℓn = 4,55 m
ℓ = 5 m
8 D-19
Sengkang
ϕ 10–90
4D–25*
POTONGAN I–I
6 D-19
Sengkang
ϕ 10–130
4D–25*
POTONGAN II–II
4D-19
Sengkang
ϕ 10–130
4D–25
POTONGAN III–III

Types

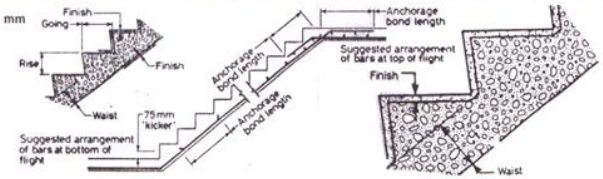


General information

Optimum dimensions for stairs (BS 5395) in mm

Usage	Going	Rise	Min. width
Public	300	150	1,000
Semi-public	275	165	1,000
Private	250	175	800

Genera. optimum dimensions:
2 × rise + going = 600 mm



Free standing stairs

If flights are freely-supported at A and A':

$$H = \frac{n_f(b_1 + b)\left(1 + \frac{1}{2}\frac{b}{a}\sec\phi\right) + n_f \cos\phi}{2\tan\phi}$$

If flights are fully fixed at A and A':

$$H \simeq \frac{n_f(b_1 + b)\left(4 + 3\frac{b}{a}\sec\phi\right) + 3n_f a\cos\phi}{2\tan\phi\left[4 + \dfrac{3(b_1/z)^2}{\dfrac{0.72}{1 + (h_f/b)^2} + \dfrac{1}{K}}\right]}$$

$$M_0 \simeq \frac{Hb_1\tan\phi - \frac{1}{8}n_f(b_1^2 - b^2)}{\dfrac{1.44K}{1 + (h_f/b)^2} + 2}$$

where $K = \left(\dfrac{h_f}{z_f}\right)^3\left(\dfrac{b_1}{a}\right)\sec^2\phi$

Then for OB, at any point distance y from O:

$M_x = -M_0 - \frac{1}{2}n_f y^2 \qquad M_y = -H_y \qquad T = -\frac{1}{2}n_f by$

for BC, at any point distance y from O:

$M_x = -\frac{1}{2}n_f[\frac{1}{2}(b_1 + b) - y]^2 \qquad M_y = 0$

$T = -\frac{1}{2}n_f b[\frac{1}{2}(b_1 + b) - y]$

for AB, at any point distance x from B:

$M_x = Hx\sin\phi - \frac{1}{2}n_f(b_1 + b)(x\cos\phi + \frac{1}{2}b) - \frac{1}{2}n_f x^2\cos^2\phi$

$M_y = -\frac{1}{2}Hb_1\cos\phi - [M_0 + \frac{1}{8}n_f(b_1^2 - b^2)]\sin\phi$

$T = -\frac{1}{2}Hb_1\sin\phi + [M_0 + \frac{1}{8}n_f(b_1^2 - b^2)]\cos\phi$

Additional notation

a: length of flight.
b: width of flight and landing.
b_1: distance between centrelines of flights.
H, M_0: horizontal restraint force and restraint moment at cut, respectively
h_f, h_l: slab depth of flight and of landing, respectively.
M_y, M_x, T: horizontal and vertical bending moments and torsional moment at any point, respectively.
n_f, n_l: ultimate load per unit length on flight and on landing, respectively.
x, y: distances measured along flight and along Y-axis respectively.
ϕ: slope of flight measured from horizontal.