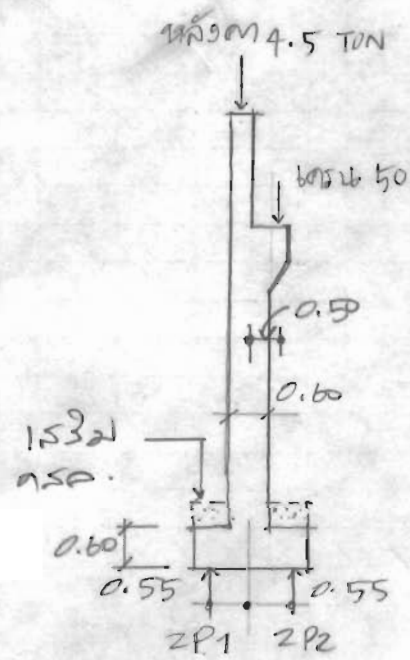
การออกแบบแก้ไขฐานราก เนื่องจาก STRENGTH ของคอนกรีตต่ำกว่ากำหนด

โดยการเสริมความหนาของฐานราก. (วิศวกรตรวจสอบ : เทพพล นิ่มพวง)



ออกแบบเสริมกำลังฐานราก F4.

- คานรับเครน CAPACITY = 38 TON.

  IMPACT 30% = 38×1.3 = 50 TON.

- ฐานเสาเข็มรับ SAFE LOAD 40 TON/PILE (MAX)

- $f'c$ = 160 KSC (MIN)

(1.) ตรวจสอบฐานรากเดิม

MOMENT ของเสา = 40 × 0.25 × 2 = 20 TON-M

$f'c$ = 160 KSC fs = 1700 KSC j = 0.894
R = 10.229 KSC

$$d = \sqrt{\frac{20\times1000}{1.50\times10.229}} = 36.10 \text{ cm} < 54 \text{ cm} \quad \underline{ok}$$

$$A_S = \frac{20\times1000\times100}{1700\times0.894\times54} = 24.36 \text{ cm}^2$$

USE 11 DB 20 $A_S = 31.24 \text{ cm}^2 > 24.36 \text{ cm}^2$ ok

(2) ออกแบบฐานรากที่เสริมบน คิดรับ MOMENT เท่ากับฐานรากเดิม

MOMENT = 20 TON-M และ $f'c$ = 280 KSC
ค่า d = 45 cm > 36.10 cm
A_S = 31.24 cm² > 24.36 cm²

- หาค่าแรงเฉือนที่ถ่ายแรงระหว่างฐานรากเดิมและฐานรากที่เสริมใหม่

$V_u = \phi V_n$; $V_n = A_{vf} \cdot f_y \cdot \mu$ (μ = 1 → ที่ผิวขรุขระ 6 มม.)

A_{vf} = เนื้อที่ของเหล็กรับแรงเฉือน (cm²)

f_y = ≤ 4000 KSC

ϕ = 0.85

$V_n = 0.29\sqrt{f'c} = (0.29\sqrt{280})(150\times170)$ (หน้าตัดคอนกรีต) = 123,742 kg

$V_n \ngtr 0.2 f'c A_c = 0.20\times280\times150\times170$ (ตาม ว.ส.ท.) = 1,428,000 kg

USE 123,742 kg

$$\therefore A_{vf} = \frac{123{,}742}{4{,}000\times0.85} = 36.40 \text{ cm}^2$$ USE BOLT ϕ 16 MM (A = 1.77 cm²/ตัว)

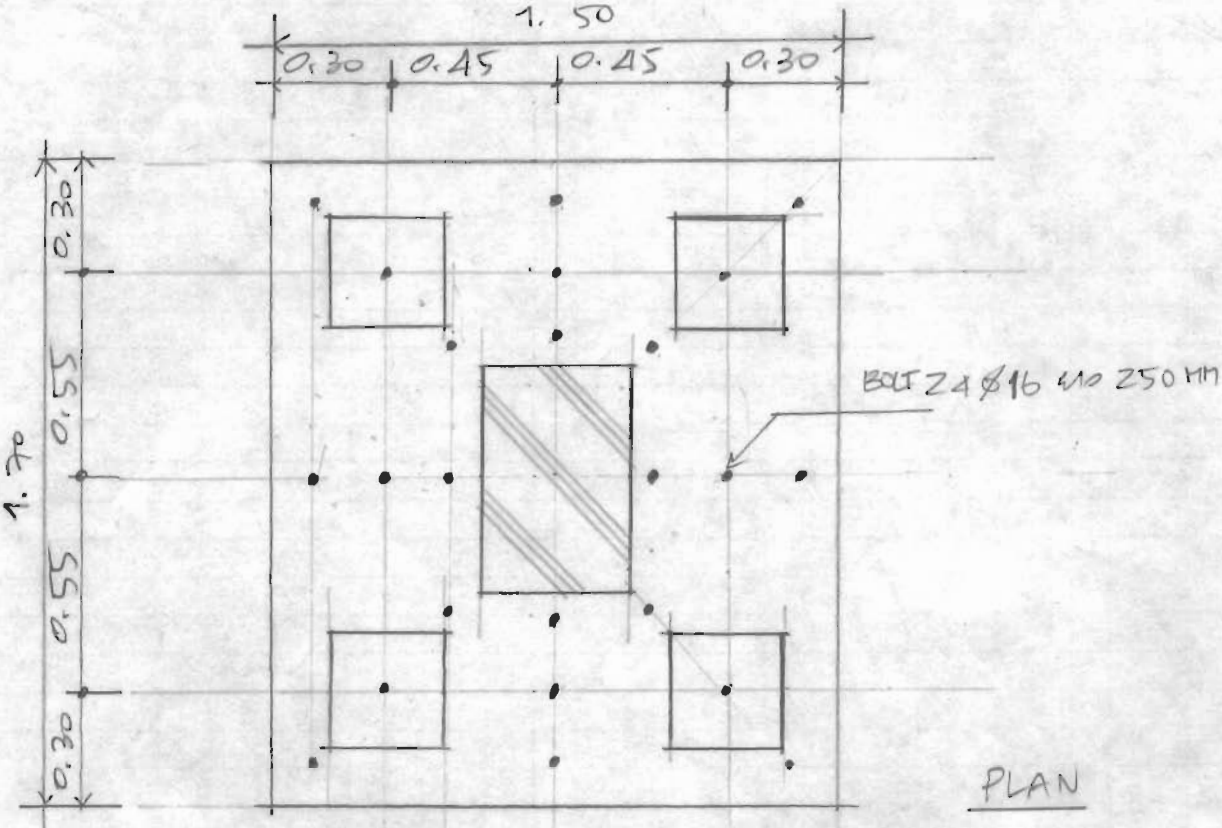
USE 24 BOLT ϕ16 @ 250 MM.

ภย.6751.

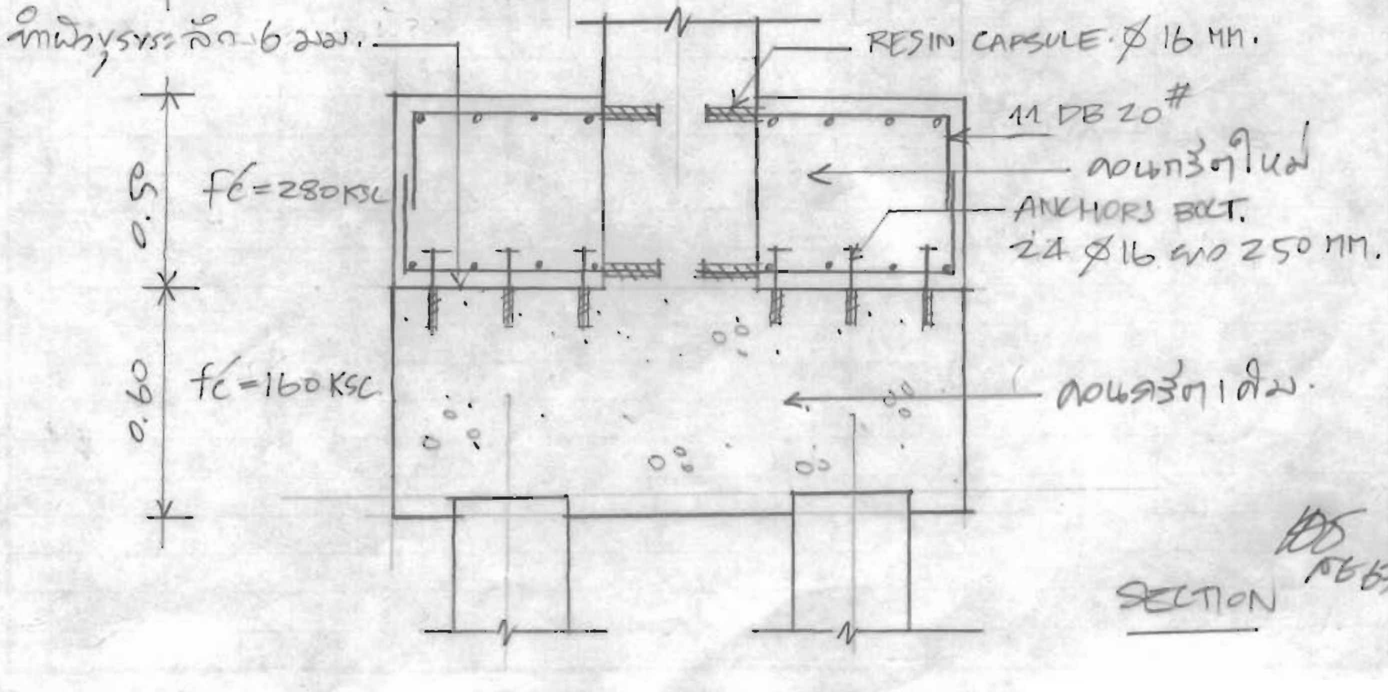
ขอความเห็นชอบแก้ไขฐานราก F4 ซึ่งมีคอนกรีตมีค่า fc' น้อยกว่าเกณฑ์กำหนด

วิธีการแก้ไข (มาตรฐานอาคารคอนกรีตเสริมเหล็ก โดยวิธีกำลัง ข้อ 4407.)

1. กำหนดให้เสาเข็มรับน้ำหนักบรรทุก 40 TON / PILE
2. แก้ไขฐานรากโดยวิธีเพิ่มความหนาของฐานราก.
3. ให้เนื้อคอนกรีตใหม่และเก่าถ่ายแรงเฉือนโดยใช้สลักเกลียวรับแรงเฉือน



PLAN



SECTION

ข้อมูลเหล็กและคอนกรีต

USE fc' = 280.00 ksc.
Steel fy = 4,000.00 ksc.
fy = 2,400.00 ksc.
fc = 126.00 ksc.
fs = 1,700.00 ksc.
fs = 1,200.00 ksc.
Ec = 2.55E+05
Es = 2.04E+06 (DB)
n = 8.015 Use n = 9
k = 0.400
j = 0.867
R = 21.847 ksc.
vc = 4.853 ksc.

ข้อมูลเหล็กและคอนกรีต

USE fc' = 160.00 ksc.
Steel fy = 4,000.00 ksc.
fy = 2,400.00 ksc.
fc = 72.00 ksc.
fs = 1,700.00 ksc.
fs = 1,200.00 ksc.
Ec = 1.92E+05
Es = 2.04E+06 (DB)
n = 10.603 Use n = 11
k = 0.318
j = 0.894
R = 10.229 ksc.
vc = 3.668 ksc.

ข้อมูลเหล็กและคอนกรีต

USE fc' = 200.00 ksc.
Steel fy = 4,000.00 ksc.
fy = 2,400.00 ksc.
fc = 90.00 ksc.
fs = 1,700.00 ksc.
fs = 1,200.00 ksc.
Ec = 2.15E+05
Es = 2.04E+06 (DB)
n = 9.484 Use n = 10
k = 0.346
j = 0.885
R = 13.780 ksc.
vc = 4.101 ksc.

ข้อมูลเหล็กและคอนกรีต

USE fc' = 230.00 ksc.
Steel fy = 4,000.00 ksc.
fy = 2,400.00 ksc.
fc = 103.50 ksc.
fs = 1,700.00 ksc.
fs = 1,200.00 ksc.
Ec = 2.31E+05
Es = 2.04E+06 (DB)
n = 8.844 Use n = 9
k = 0.354
j = 0.882
R = 16.157 ksc.
vc = 4.398 ksc.

NO675/

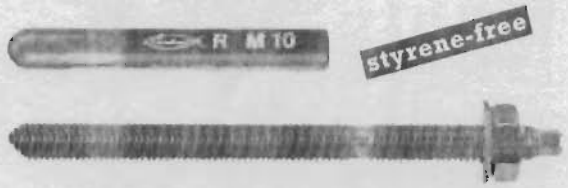
fischer R resin anchor

For stress-free resin anchoring.

1 Resin capsule RM

2 Threaded rod RGM

Material: zinc plated and passivated steel, A4 stainless steel, and highly corrosion-resistant stainless steel, material 1.4529



Approvals

Suitability

Suitable for:
concrete ≥ B15, dense natural stone.

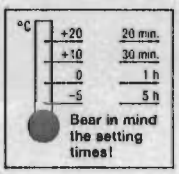
For fixing:
steelwork in general, supports, rails, head and base plates, warehouse racking, consoles, railings, windows, protective planks, scaffolding, sign bridges, routing devices, machines, facades, shuttering etc.

Description/Installation

- High permissible loads in the concrete compressive zone (= uncracked concrete).
- Well-accepted product for synthetic resin fixing.
- Reduced axial and edge spacings.
- Styrene-free material (low odour).
- Simple installation.
- Extensive range of threaded rods.

Blow-out device for drill-hole cleaning

Machine setting tool RA-SDS



Technical data

Ultimate loads [kN] (mean values, non-cracked concrete) of single anchors[3]

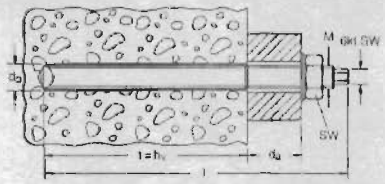
Reaction anchor R			R 8	R 10	R 12	R 16	R 20	R 24	R 30
Tensile load	B25 gvz[1]	$N_{u,m}$	19.0*	30.2*	43.8*	66.4*	122.8	174.0	230.0
	A4	$N_{u,m}$	22.2	33.0	48.6	66.4	122.8	174.0	–
	≥ B45 gvz[1]	$N_{u,m}$	19.0*	30.2*	43.8*	81.6*	127.4*	183.6*	286.0
	gvz[2]	$N_{u,m}$	25.0	36.4	55.0	84.0	163.0	218.0	286.0
	A4	$N_{u,m}$	25.0	36.4	55.0	84.0	163.0	218.0	–
Shear load	≥ B25 gvz[1]	$V_{u,m}$	11.4*	18.1*	26.3*	49.0*	76.4*	110.1*	175.0*
	gvz[2]	$V_{u,m}$	17.6*	27.8*	40.5*	75.4*	117.6*	169.4*	269.3*
	A4	$V_{u,m}$	15.4*	24.4*	35.4*	65.9*	102.9*	105.6*	–

* The load-bearing capacity of the steel is decisive.
[1] When using fischer anchor rods of strength class 5.8 (standard anchor rods).
[2] When using fischer anchor rods of strength class 8.8 (special sizes, not part of the stand. range).
[3] These ultimate loads apply to room temperature.
We recommend the use of an appropriate safety factor.
For ultimate loads in cracked concrete refer to Combi resin bonded anchor FCR.

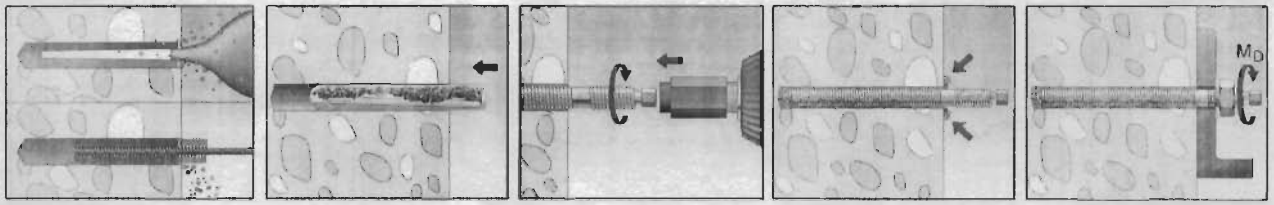
Recommended load F_{rec} [kN] in accordance with CC-method for single anchors with large axial and edge spacings, calculated with $\gamma_F = 1.40$[1) 2) 6)]

Reaction anchor R			R 8	R 10	R 12	R 16	R 20	R 24	R 30
Tensile load non-cracked concrete[5]	B25 gvz[3]		5.1	7.6	11.3	15.4	28.6	40.5	53.8
	A4[3]		5.1	7.6	11.3	15.4	28.6	40.5	–
	B45 gvz[4]		5.8	8.5	12.8	19.5	37.9*	50.7	66.5
	A4[4]		5.8	8.5	12.8	19.5	37.9	50.7	–
Shear load	B25 gvz[4]		5.5*	8.7*	12.6*	23.5*	36.8*	52.9*	84.1*
	A4[3]		5.9*	9.3*	13.6*	25.2*	39.4*	31.6*	–

[1] Corresponding axial and edge spacings: * The load-bearing capacity of the steel is decisive
Tensile load: $s \geq s_{cr,sp}$ $c \geq c_{cr,sp}$
Shear load: In the case of shear loads the corresponding neighbouring axial and edge spacings affect each other and additionally depend on the thickness of the structural component and the edge reinforcement. For this reason no values can be given.
[2] The value $\gamma_F = 1.40$ applies to the relationship between dead load and service load. For deviating partial safety factors the recommended load must be changed accordingly.
[3] Un-reinforced and normal reinforced concrete.
[4] These values apply to the use of fischer anchor rods of strength class 5.8.
[5] These values apply to the use of fischer anchor rods of strength class A4-70.
[6] For a permanent temperature of ≤ +50 °C in the anchorage substrate, in the area around the resin. For a short time the temperature may rise to ≤ +120 °C.



Installation diagram



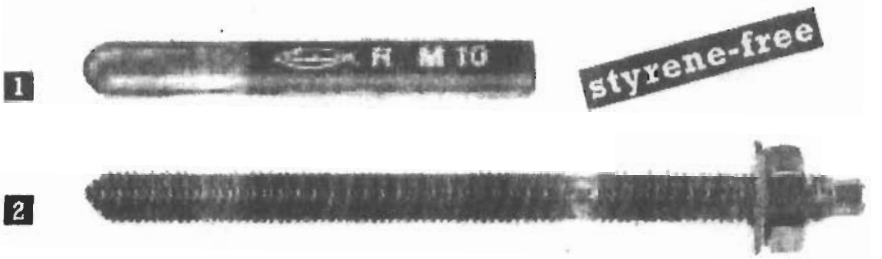
STEMS

A4 stainless steel,
el, material 1.4529

and base plates,
dows, protective
levices, machines,

compressive zone

in fixing.



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	A4[5)]		5.8	8.5	12.8	19.5	37.9	50.7	-
Shear load	B25 gvz[4)]		5.5*	8.7*	12.6*	23.5*	36.8*	52.9*	84.1*
	A4[5)]		5.9*	9.3*	13.6*	25.2*	39.4*	31.6*	-

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