Example 1 (Design of Rectangular T

Steel in short direction

Y Positive moment at center
 $M_{\alpha} = \frac{M_{\alpha} \cos f \cdot xq}{2}$ Maximun M_n coef. Example 1 (Design of Rectangular Tank)
Steel in short direction

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Example 1 (Design of Rectangular Tank)

teel in short direction
 $\sqrt{\frac{P_{\text{positive moment at center}}}{1000}}$

M_x = $\frac{M_{\text{x}} \cos f \cdot xq}{1000} \times a^2$ Maximun M_xcoef. = 78 SUIAI TAIIK)

M_{*K*} coef. = 78

DL factors of 1.2 for slab own weight

LL assumed to be 1 kn/m2
 ρ_{min} 1000 and the set of the $M_{tx} = \frac{M_{xu} \, coef \cdot xq}{1000}$, $\times a^2$ ple 1 (Design of Rectangula:

short direction

tive moment at center
 $M_{\kappa u} \cos f . \times q$, $\times a^2$
 1000
 $\times (1.2 \times DL + 1.6 \times LL)$ 2 a set of \sim 3 a set of \sim Maximun M $_{tx}$ coef . = 78 $q_u = S_d \times (1.2 \times DL + 1.6 \times LL)$ $q_u = 1.6 \times (1.2 \times 0.3 \times 1 \times 25 + 1.6 \times 1) = 17$ kn / m **Example 1 (Design of Rectangular Tank)**
 Example 1. (Design of Rectangular Tank)
 Example 1.2 For Space 1.2 *Maximum M_ncoef.* = 78
 $q_u = S_d \times (1.2 \times DL + 1.6 \times LL)$
 $q_u = 1.6 \times (1.2 \times 0.3 \times 1 \times 25 + 1.6 \times 1) = 17kn/m$
 $M = 1.6$ $M = 1.6 \times 78 \times 17 \times (6)^2 / 1000 = 76$ kn.m / m DL factors of 1.2 for slab own weight
LL assumed to be 1 kn/m2 420 $\frac{2.61(10)^6(76)}{2.61(10)^6(76)}$ $\Big|$ – 0.0034 > 0. $\rho = \frac{0.65(50)}{1 - 1 - 1 - 2}$ $\overline{0.85(30)}$ $\overline{11}$ $\overline{1}$ $\overline{2.61(}$ $|1 - 1 - \frac{2.61(10)^{6} (70)}{9} | = 0.0034 > \rho$ $1000(243)^2(30)$ min $A_s = 0.0034 \times 1000 \times 243 = 826$ mm₂ / m $/m$ 1000
 $q_u = S_d \times (1.2 \times DL + 1.6 \times LL)$
 $q_u = 1.6 \times (1.2 \times 0.3 \times 1 \times 25 + 1.6 \times 1) = 17kn / m$
 $M = 1.6 \times 78 \times 17 \times (6)^2 / 1000 = 76 kn.m / m$ DL factors of 1.2 for slab own
 $\rho = \frac{0.85(30)}{420} \left| 1 - \sqrt{1 - \frac{2.61(10)^6 (76)}{1000(243)^2 (30)}} \right| = 0$

Example 1 (Design of Rectangular 7

Steel in long direction
 \checkmark Positive moment at center
 \checkmark A coef $\times a \times a^2$ Example 1 (Design of Rectangular Tank)

vertical in long direction

vertical in long direction

vertical in long and the set of the M_x coef = 51 Example 1 (Design of Rectangular Tank)
Steel in long direction

Example 1 (Design of Rectangular Tank)
\n**Steel in long direction**
\n
$$
\angle
$$
 Positive moment at center
\n $M_{\alpha} = \frac{M_{\alpha\alpha} \cos f . \times q}{1000}$, \angle \angle Maximum $M_{\alpha} \cos f . = 51$
\n $M = 1.6 \times 51 \times 17 \times (6)^2 / 1000 = 50 \text{ km.m/m}$
\n $d = 300 - 50 - 12 - 6 = 232$
\n $\rho = \frac{0.85(30)^{\left[\begin{array}{l}\right]} \left[1 - \sqrt{1 - \frac{2.61(10)^6(50)}{1000(232)^2(30)}}\right]} = 0.0025 < \rho_{\text{min}}$
\n $A_s = 0.0033 \times 1000 \times 232 = 770 \text{ mfp} \end{array} = \frac{1}{m}$
\nUse 8¢12 mm/m for bottom Reinforcement

Example 1 (Design of Rectangular Ta

Moment near corners

Maximum Mtx and Mty Coef. =49

M coef xa xa² Example 1 (Design of Rectangular Tank)

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Example 1 (Design of Rectangular Tank)
\nMoment near corners
\n
$$
M_{\alpha} = \frac{M_{\text{w}} \cos f \cdot xq}{1000}
$$
,
\n $M_{\alpha} = \frac{M_{\text{w}} \cos f \cdot xq}{1000}$,
\n $M = 1.6 \times 49 \times 17 \times (6)^2 / 1000 = 48 \text{kn.m/m}$
\n $d = 300 - 50 - 12 - 6 = 232$
\n $\rho = \frac{0.85(30)^{\Gamma}}{420} \left[1 - \sqrt{1 - \frac{2.61(10)^6(48)}{1000(232)^2(30)}} \right] = 0.0024 < \rho_{\text{min}}$
\n $A_s = 0.0033 \times 1000 \times 232 = 770 \text{ mgn} \frac{1}{m}$
\nUse 8¢12 mm/m for bottom Reinforcement

Example 1 (Design of Rectangular Tank)

Details at Bottom Edge
ables except one are based on the assumption that the bottom

Details at Bottom Edge
All tables except one are based on the assumption that the bottom
edge is hinged. It is believed that this assumption in general is
closer to the actual condition than that of a fixed edge. edge is hinged. It is believed that this assumption in general is **Condition Edge.**
 Condition Edge.

All tables except one are based on the assumption that the bottom

edge is hinged. It is believed that this assumption in general is

closer to the actual condition than that of a fixe **Details at Bottom Edge**

I tables except one are based on the assumption that the bottom

ge is hinged. It is believed that this assumption in general is

seer to the actual condition than that of a fixed edge.

Consider

 \triangleright Consider first the detail in Fig. 9, which shows the wall

Details at Bottom Edge

I Fig. 9 the condition of restraint at the bottom of the footing

- **Details at Bottom Edge**

In Fig. 9 the condition of restraint at the bottom of the footing

is somewhere between hinged and fixed but much closer to

hinged than to fixed. is somewhere between hinged and fixed but much closer to **Details at Bottom Edge**
In Fig. 9 the condition of restraint at the bottom or
is somewhere between hinged and fixed but mucl
hinged than to fixed.
The base slab in Fig. 9 is placed on top of the wa
the bearing surface is
- **The base slab in Fig. 9** is placed on top of the footing is somewhere between hinged and fixed but much closer to hinged than to fixed.

The base slab in Fig. 9 is placed on top of the wall footing and the bearing surface the bearing surface is brushed with a heavy coat of asphalt to break the adhesion and reduce friction between slab and footing. In Fig. 9 the condition of restraint at the bottom of the footing
is somewhere between hinged and fixed but much closer to
hinged than to fixed.
The base slab in Fig. 9 is placed on top of the wall footing and
the bearing A waterstop may not be needed in the construction joints when the vertical joint perfect is brushed with a heavy coat of a
sphalt to break the adhesion and reduce friction between slab and footing.
A metrical joint betwee The base slab in Fig. 9 is placed on top of the wall footing a
the bearing surface is brushed with a heavy coat of asphalt t
break the adhesion and reduce friction between slab and
footing.
The vertical joint between slab
- > The vertical joint between slab and wall should be made adequate.
-

Details at Bottom Edge
Details at Bottom Edge

- \triangleright In Fig. 10 a continuous concrete base slab is provided either **Details at Bottom Edge**
In Fig. 10 a continuous concrete base slab is provided either
for transmitting the load coming down through the wall or for
upward hydrostatic pressure.
In either case, the slab deflects upward in **Details at Bottom Edge**
In Fig. 10 a continuous concrete base slab is provided
for transmitting the load coming down through the wa
upward hydrostatic pressure.
In either case, the slab deflects upward in the middle a
to
- **IN EXECT DEVELO EXECT DEVELO EXECT DEVELO PROPERT OF THE SPECIES UP THE SPECIES UPWARD IN THE MIDDEN OF THE MIDDEN CONTROLL FOR THE MIDDEN AND THE MIDDEN SURVEY THE MIDDEN SURVEY THAT SURVEY THAT THE MIDDEN SURVEY THAT S** to rotate the wall base in Fig. 10 in a counterclockwrse direction.

Fig. 10.

Details at Bottom Edge
he wall therefore is not fixed at the bottom edge and it is

- **Details at Bottom Edge**
 \triangleright The wall therefore is not fixed at the bottom edge and it is
 \triangleright The waterstop must then be placed off center as indicated. **Details at Bottom Edge**
The wall therefore is not fixed at the bottom edge and it is
difficult to predict the degree of restraint
The waterstop must then be placed off center as indicated.
Provision for transmitting shear **The wall therefore is not fixed at the bottom edge and it is

> The wall therefore is not fixed at the bottom edge and it is

+ The waterstop must then be placed off center as indicated.

> Provision for transmitting shea**
-
- **Provision Finding Solution Finding Solution**

Provision for transmitting shear through direct bearing can be

Provision for transmitting shear through direct bearing can be

made by inserting a key as in Fig. 9 or by a sh made by inserting a key as in Fig. 9 or by a shear ledge as in Fig. 10. **DETAILS AT BOTTOM EAGE**
 \rightarrow The wall therefore is not fixed at the bottom edge and it is
 \rightarrow The waterstop must then be placed off center as indicated.
 \rightarrow Provision for transmitting shear through direct bearing ca
- the waterstop and the shear key are not essential. The main thing is to prevent moments from being transmitted from the top of the slab into the wall because the wall is not designed The waterstop must then be placed off cent
Provision for transmitting shear through di
made by inserting a key as in Fig. 9 or by a
Fig. 10.
At top of wall the detail in Fig. 10 may be a
the waterstop and the shear key are

- Tanks Directly Built on Ground
Tanks on Fill or Soft Weak Soil
> The stress on the soil due to weight of the tank and water is
generally low $(-0.6 \text{ kg/cm}^2 \text{ for a death of water of 5m})$ Tanks Directly Built on Ground
Tanks on Fill or Soft Weak Soil
> The stress on the soil due to weight of the tank and water is
generally low $(-0.6 \text{ kg/cm}^2 \text{ for a depth of water of 5m})$
> But it is not recommended to construct a tank dire **Tanks Directly Built on Ground**
 nks on Fill or Soft Weak Soil

The stress on the soil due to weight of the tank and water is

generally low (~0.6 kg/cm² for a depth of water of 5m)

But it is not recommended to cons
- **Fanks Directly Built on Ground**
 Fanks on Fill or Soft Weak Soil

> The stress on the soil due to weight of the tank and water is

generally low (~0.6 kg/cm² for a depth of water of 5m)

> But it is not recommended to unconsolidated soil of fill due to serious differential settlement. **Solut EXACT CONTROLLY DUTE CONTROLLY TO STARE CONTROLLY THE STARKS ON EXACT SUBMARY THE SITE SERVICE THE SIMILAR SOFT A depth of water of 5m)

EXACT SUBMARY SOFT A depth of water of 5m)

EXACT SUBMARY SOFT A depth of wat Inks on Fill or Soft Weak Soil**
The stress on the soil due to weight of the tank and water is
generally low $(\sim 0.6 \text{ kg/cm}^2$ for a depth of water of 5m)
But it is not recommended to construct a tank directly on
unconsoli
-
- Transform Fin 01 Soft Weak Soft

The stress on the soil due to weight of the tank and water is

generally low $(-0.6 \text{ kg/cm}^2 \text{ for a depth of water of 5m})$

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unconsolidated soil of The stress on the soil due to weight of the tank and water is
generally low $(\sim 0.6 \text{ kg/cm}^2 \text{ for a depth of water of 5m})$
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unconsolidated soil of fill due to serious differential
s generally low (~0.6 kg/cm² for a depth of water of 5m)
But it is not recommended to construct a tank directly on
unconsolidated soil of fill due to serious differential
settlement.
Soft weak clayey layers and similar soi

Tanks Directly Built on Ground
Tanks on Fill or Soft Weak Soil
Figures 1. The state of Soft Weak Soil
Figures 1. The state or strip footings if the stiff soil layers are at a reasonable depth **Tanks Directly Built on Ground

Tanks on Fill or Soft Weak Soil**

It is recommended to support the tank on columns and isolated

or strip footings if the stiff soil layers are at a reasonable depth

from the ground surfac **Tanks Directly Built on Ground**
 Inks on Fill or Soft Weak Soil

It is recommended to support the tank on columns and isolated

or strip footings if the stiff soil layers are at a reasonable depth

from the ground surfa **Fanks Directly Built on Ground**
 Inks on Fill or Soft Weak Soil

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or strip footings if the stiff soil layers are at a reasonable depth

from the ground surfa

**Tanks Directly Built on Ground
Tanks on Fill or Soft Weak Soil**
In case of medium soils at foundation level, raft foundation
may be used (see Figure 2). **In the Tanks Directly Built on Ground

In case of medium soils at foundation level, raft foundation

may be used (see Figure 2).** may be used (see Figure 2).

Tanks Directly Built on Ground
Tanks on Fill or Soft Weak Soil
Figure 1: If the incompressible layers are deep or the ground water level
is high one may support the tank on piles. The piles cap may **Tanks Directly Built on Ground

Tanks on Fill or Soft Weak Soil**

If the incompressible layers are deep or the ground water level

is high one may support the tank on piles. The piles cap may

acts as column capitals (see is high one may support the tank on piles. The piles cap may **Tanks Directly Built on Ground**
 Inks on Fill or Soft Weak Soil

If the incompressible layers are deep or the ground water level

is high one may support the tank on piles. The piles cap may

acts as column capitals (s

**Tanks Directly Built on Ground
In Right Foundation.**

- Tanks Directly Built on Ground
Tanks on Rigid Foundation.
Figure 1: If the tank supported by a rigid foundation then it to
reaction of the wall will be resisted by area beneath **If the tank supported and School Tanks Directly Built on Ground

Inks on Rigid Foundation.**

If the tank supported by a rigid foundation then it the vertical

reaction of the wall will be resisted by area beneath it.

The distance L beyond which no defor Tanks Directly Built on Ground
Tanks on Rigid Foundation.

> If the tank supported by a rigid foundation then it the vertical

reaction of the wall will be resisted by area beneath it.

> The distance L beyond which no de **Tanks Directly Built on Ground**
 Inks on Rigid Foundation.

If the tank supported by a rigid foundation then it the vertical

reaction of the wall will be resisted by area beneath it.

The distance L beyond which no de
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Tanks Directly Built on Ground

- Tanks Directly Built on Ground
Tanks on Compressible Soils
Floors of tanks resisting on medium clayey or sandy soils make calculated in the following manner: **Floors of the Suite Conserverse School School Tanks on Compressible Soils**
Floors of tanks resisting on medium clayey or sandy soils may
be calculated in the following manner:
Find the floor may **Tanks Directly Built on Ground**
 nks on Compressible Soils

Floors of tanks resisting on medium clayey or sandy soils may

be calculated in the following manner:

The internal forces transmitted from the wall to the flo
- Tanks Directly Built on Ground
Tanks on Compressible Soils

> Floors of tanks resisting on medium clayey or sandy soils may

be calculated in the following manner:

> The internal forces transmitted from the wall to the f **Tanks Directly Built on Ground**
 nks on Compressible Soils

Floors of tanks resisting on medium clayey or sandy soils may

be calculated in the following manner:

The internal forces transmitted from the wall to the fl Tanks Directly Built on Ground
Tanks on Compressible Soils
> Floors of tanks resisting on medium clayey or sandy soils may
be calculated in the following manner:
> The internal forces transmitted from the wall to the floo **INEX ON COMPPESSIBLE SOIIS**
Floors of tanks resisting on medium clayey or sandy soils may
be calculated in the following manner:
The internal forces transmitted from the wall to the floor may
be assumed to be distributed Floors of tanks resisting on medium clayey or sandy soils may
be calculated in the following manner:
The internal forces transmitted from the wall to the floor may
be assumed to be distributed on the soil by the distanc be calculated in the following manner:
The internal forces transmitted from the wall to the floor may
be assumed to be distributed on the soil by the distance L=0.4
to 0.6H.
The length L is chosen such that the maximum st
- \triangleright The length L is chosen such that the maximum stress σ_1 is smaller than the allowed soil bearing pressure, $\sigma_2 > \sigma_1/2$ on
-

**Tanks Directly Built on Ground
In the Source of Sensing Commence of the Source of Sensing Commences
The Source Source Source of the Source of the Source of Sensing Commence of the Source of the Source of The Source o Tanks Directly Built on Ground
Tanks on Compressible Soils**

Ground
G1 = weight of the wall and roof
G2 = weight of the floor cb
W= weight of water on cb G2 = weight of the wall and roof
G2 = weight of the floor cb
W= weight of water on cb G1 = weight of the wall and roof
G2 = weight of the floor cb
W= weight of water on cb