Concrete
Forming Systems

Bridge Deck Forming and
Hanging Systems

Reinforcing
Bar Supports

Precast Concrete
Products

Rock Anchoring
and Bolt Systems

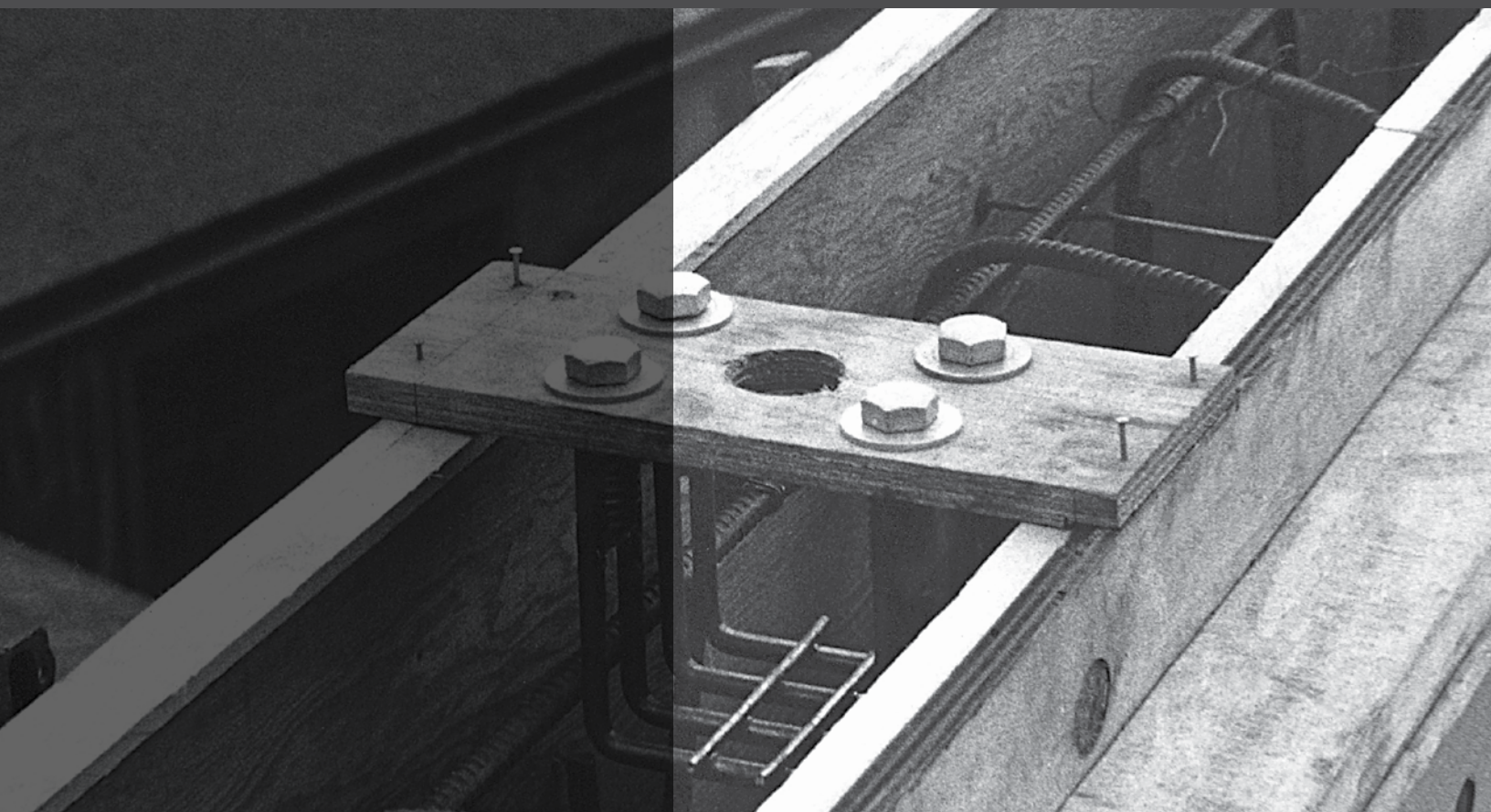
ACROW-RICHMOND

THE HIDDEN STRENGTH™

LA FORCE CACHÉE

CONCRETE ANCHORING SYSTEMS

PRE-SET ANCHORS
RAILINGS
HIGH MAST
OVERHEAD SIGNS



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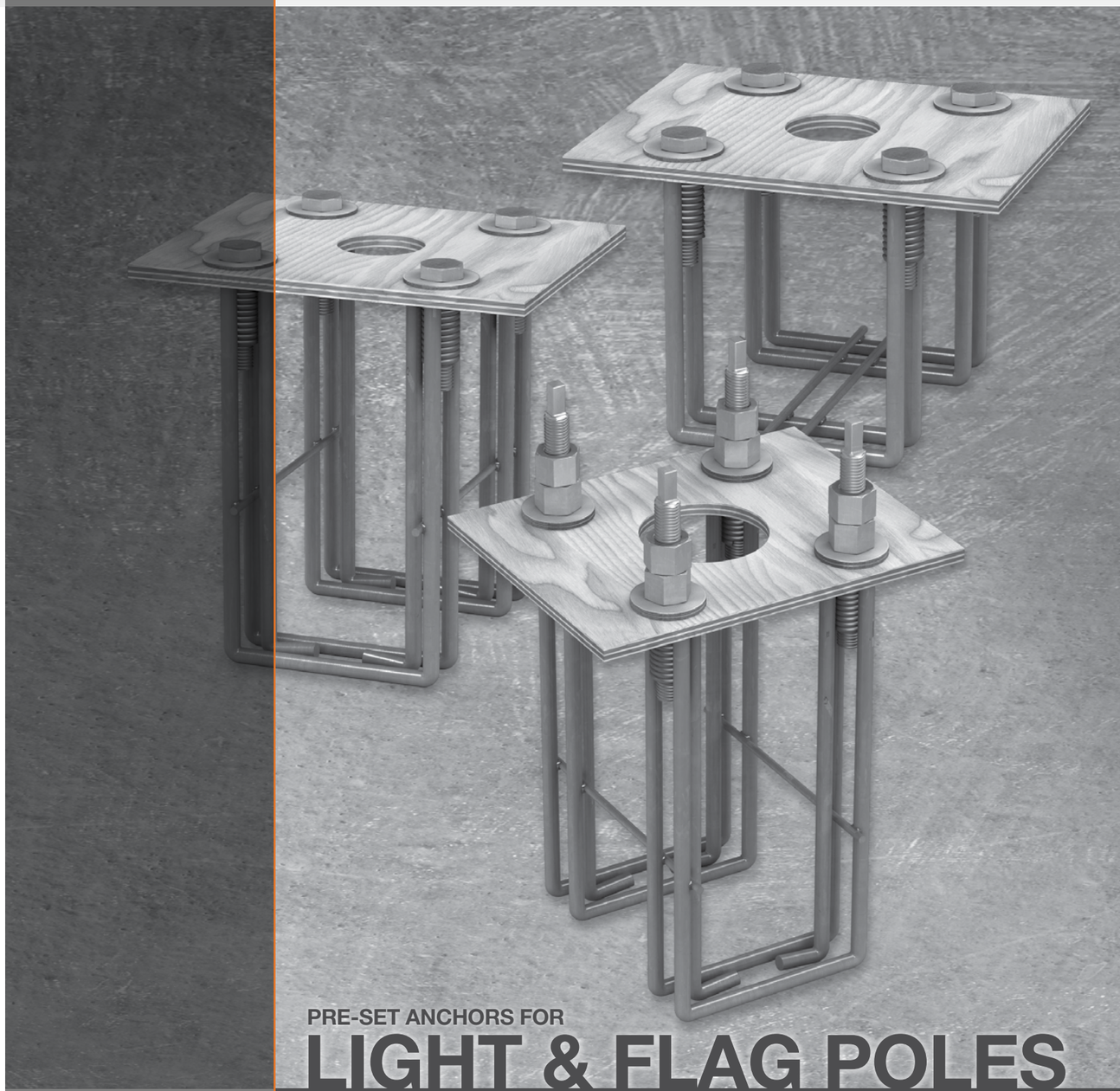


PRE-SET ANCHORS FOR

LIGHT & FLAG POLES

PRE-SET ANCHOR SYSTEM

Pre-Set Anchor System

AR Preset Anchorage System provides a simple, accurate and economical method for anchoring light poles, railings, guard rails and sign posts to structural concrete.

The basic units can be manufactured to conform with any required configuration in size that will accommodate bolts or studs (either hi-strength galvanized or stainless steel) from 13 mm to 38 mm (1/2” - 1 1/2”) in diameter.

Laboratory and field tests have shown that these units have load factors that will exceed published design requirements. It has also been found that the coils have a significant effect in the unit’s anchoring capacity - and that the unit’s design distributes bolt stresses into the concrete. These design features provide more strength per anchorage that can be obtained from most of the conventional materials now used.

This strength and guaranteed “bolt pattern” permit the design engineer to approach the problem of fastening appurtenances to structural concrete with complete assurance of performance and over-all economy.

The same strength, “bolt pattern”, and simplicity of application assure the contractor of and extremely reasonable “first cost” while eliminating many of the problems currently encountered with setting standard anchor bolts.

In addition, there is considerable economy when stainless steel is required for protection from rust stain, because with the Preset Anchorage System only the bolts and washers have to be stainless -since the complete anchoring unit is imbedded in the concrete.

ACHNOWLEDGEMENT:
We wish to thank Morrison Hershfield Limited, Consulting Engineers of Toronto for their advice and engineering services which was invaluable in the preparation of this publication.

PRE-SET ANCHOR SYSTEM

Pre-Set Anchor System

- Bolt pattern cannot be disturbed as with conventional anchor bolts.
- System provides guaranteed bolt pattern to fit any base plate accurately and can be manufactured to conform to any required configuration.
- Installation of pre-set anchor can save up to 75% of normal labour costs.
- Field adjustments can easily be accommodated with various length studs available with the system.
- If threads on studs are damaged, they can be easily replaced (not possible with standard anchor bolts)
- System is more economical if stainless steel is required as only bolts, washers or studs need be of stainless steel.

Pre-Set Anchor - Light Poles

The PRE-SET ANCHOR for light poles is furnished as a complete assembly mounted on a plywood template to facilitate the setting of the anchor.

The Pre-Set Anchor can be supplied with square headed levelling studs to allow for adjustment after installation of the anchor and are designated by the letter “S”, i.e. DGR™-1S or DGR™-2S.

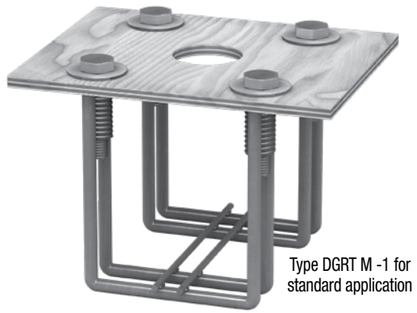
The four Hi-Tensile bolts or studs, four round washers and anchor cage are hot dipped galvanized to ASTM-A 153.

The anchors are available with 20 mm (3/4”), 25 mm (1”), 32 mm (1-1/4”) or 38 mm (1-1/2”) diameter bolts or studs. On request, the bolt can be furnished in stainless steel.

Standard length bolts are supplied to accommodate base plates up to 25 mm (1”) thick. Longer bolts can be supplied for thicker base plates.

Specifications:
PRE-SET™ ANCHOR for light Type DGR™-_____ by Acrow-Richmond shall be used to fasten poles to concrete foundations. Complete unit shall be hot dipped galvanized to ASTM-A 153 Spec. Bolts are to be given a liberal coating of white non-staining grease. A 20 mm (3/4”) thick setting template shall be furnished to accurately position the anchor within the form.

OPS-PMC ACCEPTED FOR USE
Anchorage Assembly, Light Poles
Preset Anchors - DGR
- OPSD 2215.0200 - Anchorage Assembly
- OPSD 2216.0100 - Anchorage Assembly for Pole Footing in Concrete Barrier

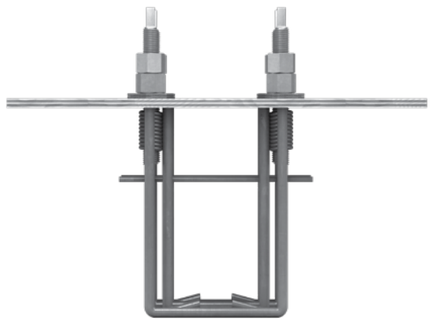


Type DGRT M -1 for standard application

Type DGR -2 for aashto requirements

Type DGR™-2S
(with squared end studs)

Typical Light Poles Installation



Typical installation pre-set anchor with studs as per MTO spec. OPSD 2215.02 & OPSD 2215.02 (Previously known as MTO spec. OPSD 2428.03)

Typcial installation pre-set anchor with bolts as per Toronto spec. 807.015

Light Pole Anchor Ordering Information

TYPE OF ANCHOR.....DGR™- _____

QUANTITY REQUIRED..... _____

BOLT..... _____ STUD..... _____

BOLT OR STUD DISTANCE.....(A) _____

BOLT OR STUD DISTANCE.....(B) _____

DEPTH OF ANCHOR.....(C) _____

BOLT OR STUD DIAMETER.....(D) _____

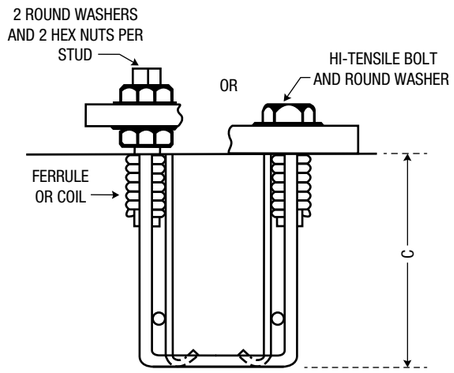
WIDTH OF TEMPLATE.....(E) _____

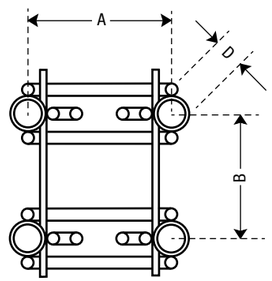
LENGTH OF TEMPLATE.....(L1) _____

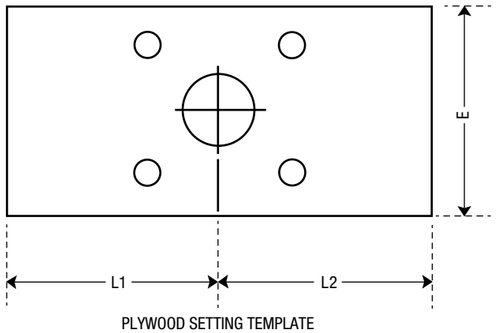
LENGTH OF TEMPLATE.....(L2) _____

LOCK WASHERS..... _____

NYLON BUSHING..... _____





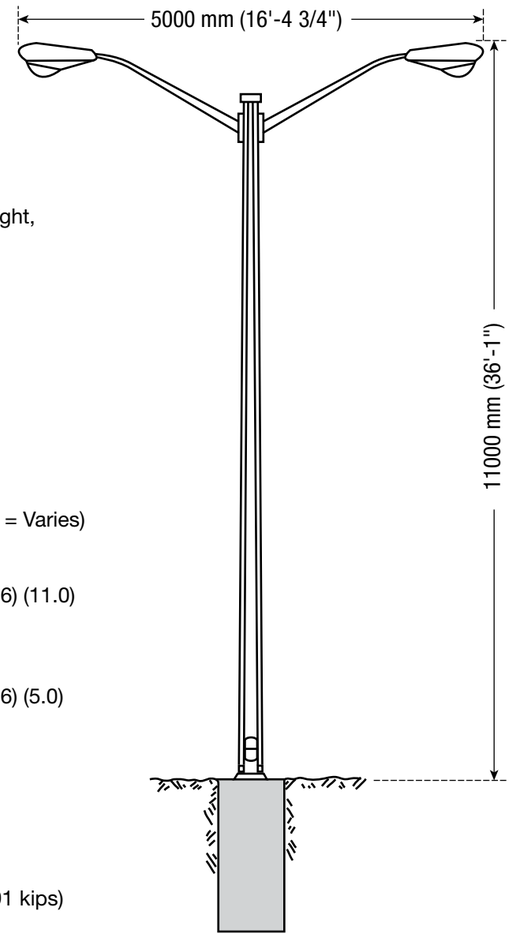


PLYWOOD SETTING TEMPLATE

Pre-Set Anchor Design

A light pole anchor assembly and foundation are required for the 11 m (36' - 1") pole shown. Design for NBC 1995 wind pressure, q 1/30.

Location: Edmonton Allowable lateral soil pressure: 67kPa (1400 psf≈9.72psi)



WIND LOADS:

Q1/30	= 0.40kPa (8.4 psf) = (0.058 psi) Pole Height,
Pole height, hp	= 11.0 m (36'-1")
Radial ice, Ri	= 13 mm (½")
Pole arm, Rp	= 2.5 m (8'-2 ½")
Pole diameter, dp	= 200 mm (8")
Arm diameter, da	= 100 mm (4")
Lamp effective projected area, A_L	= 0.30 m^2 (3.23 sq.ft, = 465 sq.in)
Wind pressure, W	= q Ce Cg Cf

Ce = 1.0 (average from Table 4.1.8A NBC 1995)
Cg = 2.5 (for small elements NBC 1995)
Cf = 1.1 (Figure B-15 Supplement NBC 1995) Say C_f =1.1, (C_f = Varies)

Wind force on pole, W_p $= q\ C_e\ C_g\ C_f\ (\frac{dp + 2 \times R_i}{1000}) \times hp$
= (0.40) (1.0) (2.5) (1.1) (0.20+0.026) (11.0)
= 2.74 kN (0.62 kips)

Wind force on arms, W_A $= q\ C_e\ C_g\ C_f\ (d_a + \frac{2 \times R_i}{1000}) \times hp$
= (0.40) (1.0) (2.5) (1.1) (0.10+0.026) (5.0)
= 0.69 kN (0.16 kips)

Wind force on lamps, W_L $= q\ C_e\ C_g\ C_f\ A_L \times 2$
= (0.40) (1.0) (2.5) (1.0) (0.3) (2)
= 0.60 kN (0.13 kips)

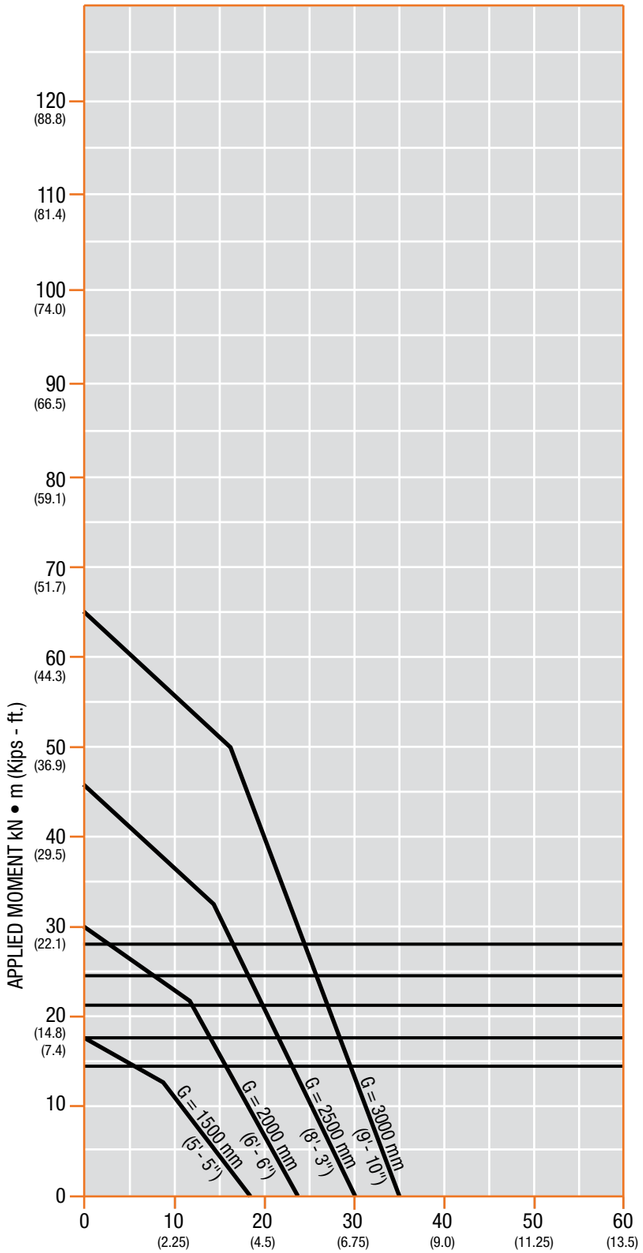
Total Applied Base Shear, V $= W_p + W_a + W_L$
= 2.74 + 0.69 + 0.60 = 4.0 Kn (0.91 kips)

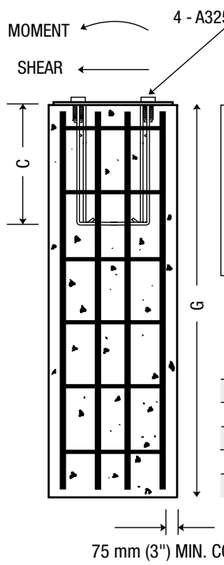
Total Applied Base Moment, M $= (W_p \times hp/2 + W_A + hp + W_L \times hp)/1000$
= (2.74) (11.0) (0.5) + (0.69) (11.0) + (0.60) (11.0)
= 29.0 kNm (257 kip-inch) = (21.42 kip-ft)

NOTE: Torsion produced by unbalanced wind load will be neglected.
SOLUTION: Try using a DGR™-2 AR Pre-Set Anchor and a 600 mm (2') diameter bored concrete pile. Enter Design Aid Sheet, with base shear = 4.0kN and base moment = 29.0 kNm.

For pile diameter	= 600 mm (2'-0")
Use pile depth	= 2500 mm (8' - 2 1/2")
The bolt circle diameter	= 300 mm (1'-0")
Minimum anchor length	= 400 mm (16")
Minimum bolt size	= 25 mm (1") dia. A325

Forces From Specified Load

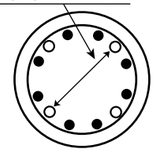




Anchor Type: DGR-1™
Strut Material: C-1030
Bored Concrete
Pile Diameter: 600 mm (24")
Min. Bolt Size: 20 mm (3/4")
Allowable Lateral
Soil Pressure: 67 kPa
(1400 psf)

Bolt Circle Diameter	Minimum Anchor Length C
400 (15 3/4")	450 (17 3/4")
350 (13 3/4")	450 (17 3/4")
300 (11 3/4")	400 (15 3/4")
250 (9 7/8")	350 (13 3/4")
200 (7 7/8")	300 (11 3/4")

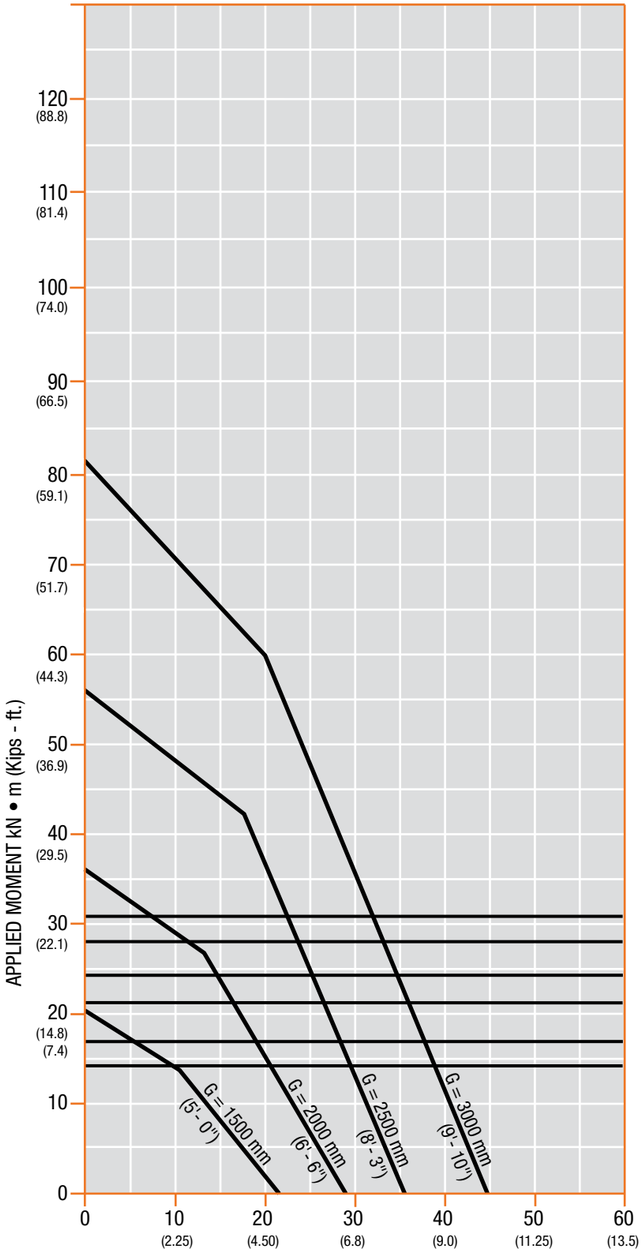
BOLT CIRCLE DIAMETER

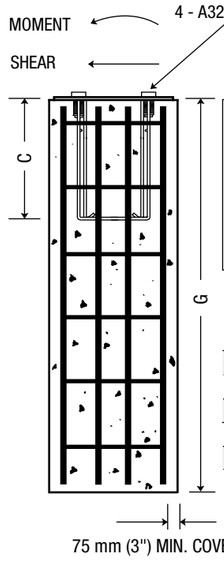


BORED CONCRETE PILE
REINFORCING: 8-20 M BARS (8 - #6 BARS)
10 M TIES AT 400 mm (#4 @ 16")
MATERIALS: CONC. f'c = 20 MPa (3000 psi)
REINF. = 400 MPa (60000 psi)

BOLT CIRCLE DIAMETER
400 mm (15 3/4")
350 mm (13 3/4")
300 mm (11 3/4") **PILE DIAMETER = 600 mm (24")**
250 mm (9 7/8")
200 mm (7 7/8")

Forces From Specified Load

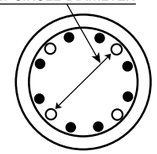




Anchor Type: DGR-1™
Strut Material: C-1030
Bored Concrete
Pile Diameter: 750 mm (29 1/2")
Min. Bolt Size: 20 mm (3/4")
Allowable Lateral
Soil Pressure: 67 kPa
(1400 psf)

Bolt Circle Diameter	Minimum Anchor Length C
450 (17 3/4")	450 (17 3/4")
400 (15 3/4")	450 (17 3/4")
350 (13 3/4")	450 (17 3/4")
300 (11 3/4")	400 (15 3/4")
250 (9 7/8")	350 (13 3/4")
200 (7 7/8")	300 (11 3/4")

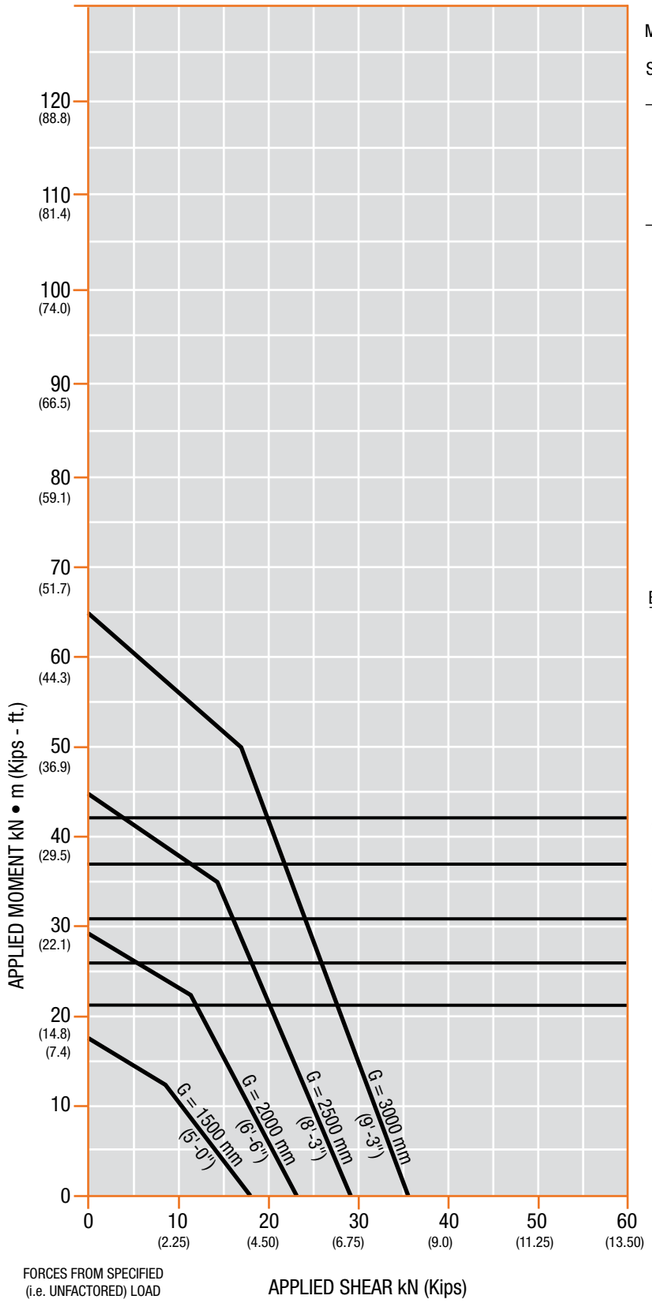
BOLT CIRCLE DIAMETER

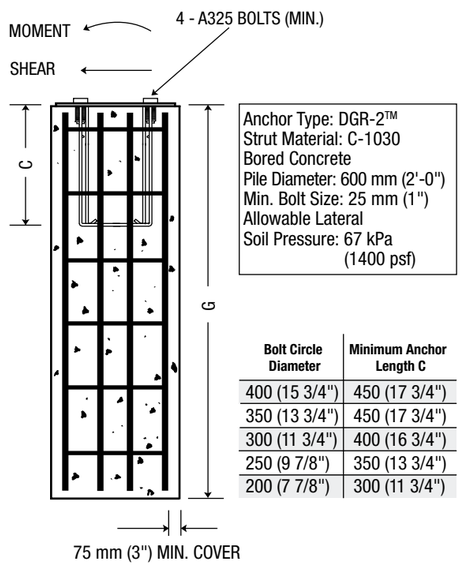


BORED CONCRETE PILE
REINFORCING: 8-20 M BARS (8 - #6 BARS)
10 M TIES AT 400 mm (#4 @ 16")
MATERIALS: CONC. f'c = 20 MPa (3000 psi)
REINF. = 400 MPa (60000 psi)

BOLT CIRCLE DIAMETER
450 mm (17 3/4")
400 mm (15 3/4")
350 mm (13 3/4") **PILE DIAMETER = 750 mm (29 1/2")**
300 mm (11 3/4")
250 mm (9 7/8")
200 mm (7 7/8")

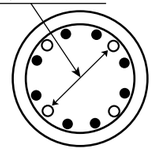
Forces From Specified Load





Anchor Type: DGR-2™
Strut Material: C-1030
Bored Concrete
Pile Diameter: 600 mm (2'-0")
Min. Bolt Size: 25 mm (1")
Allowable Lateral
Soil Pressure: 67 kPa
(1400 psf)

Bolt Circle Diameter	Minimum Anchor Length C
400 (15 3/4")	450 (17 3/4")
350 (13 3/4")	450 (17 3/4")
300 (11 3/4")	400 (16 3/4")
250 (9 7/8")	350 (13 3/4")
200 (7 7/8")	300 (11 3/4")



BORED CONCRETE PILE
REINFORCING:
8-20 M BARS
10 M TIES AT 400 mm (15 3/4")

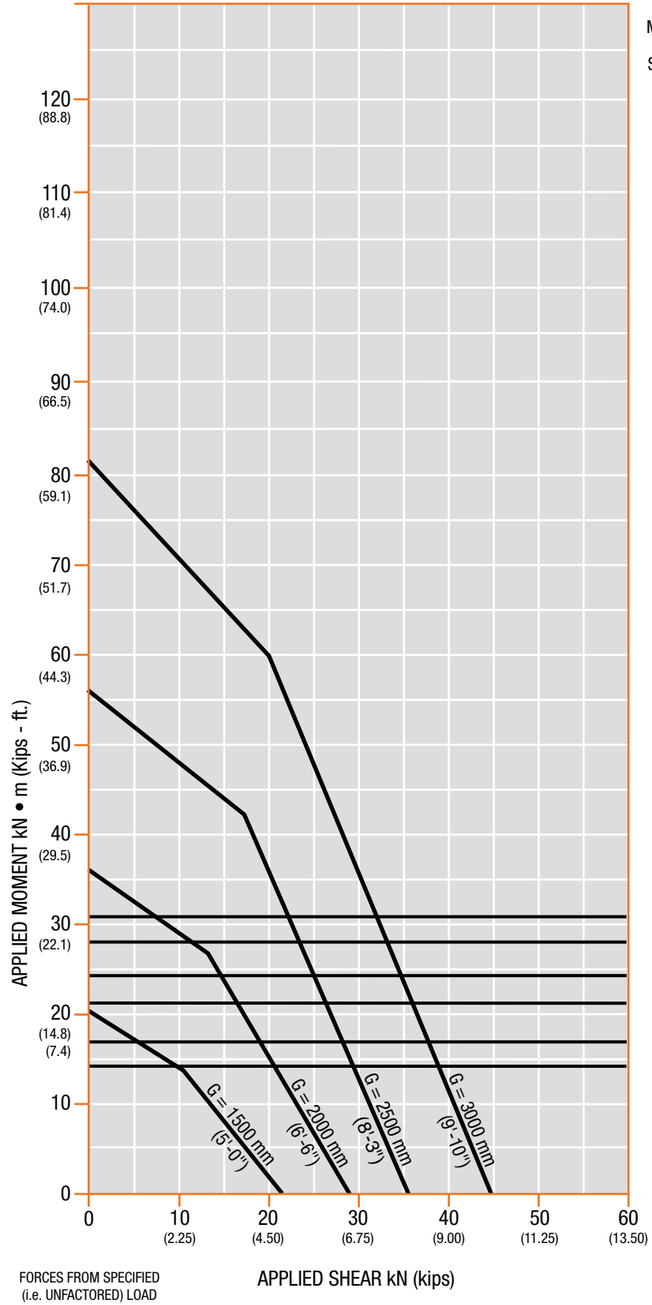
MATERIALS:
CONC. f'c = 20 MPa (3000 psi)
REINF. f'c = 400 MPa (60000 psi)

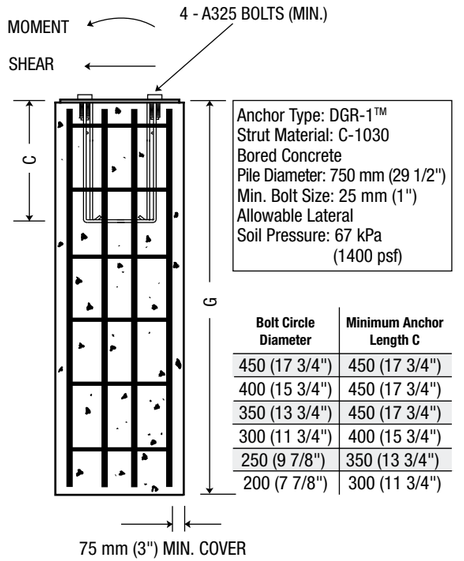
BOLT CIRCLE DIAMETER

400 mm (15 3/4")
350 mm (13 3/4")
300 mm (11 3/4")
250 mm (9 7/8")
200 mm (7 7/8")

PILE DIAMETER = 600 mm (24")

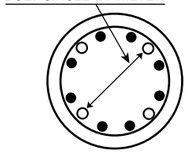
Forces From Specified Load





Anchor Type: DGR-1™
Strut Material: C-1030
Bored Concrete
Pile Diameter: 750 mm (29 1/2")
Min. Bolt Size: 25 mm (1")
Allowable Lateral
Soil Pressure: 67 kPa
(1400 psf)

Bolt Circle Diameter	Minimum Anchor Length C
450 (17 3/4")	450 (17 3/4")
400 (15 3/4")	450 (17 3/4")
350 (13 3/4")	450 (17 3/4")
300 (11 3/4")	400 (15 3/4")
250 (9 7/8")	350 (13 3/4")
200 (7 7/8")	300 (11 3/4")

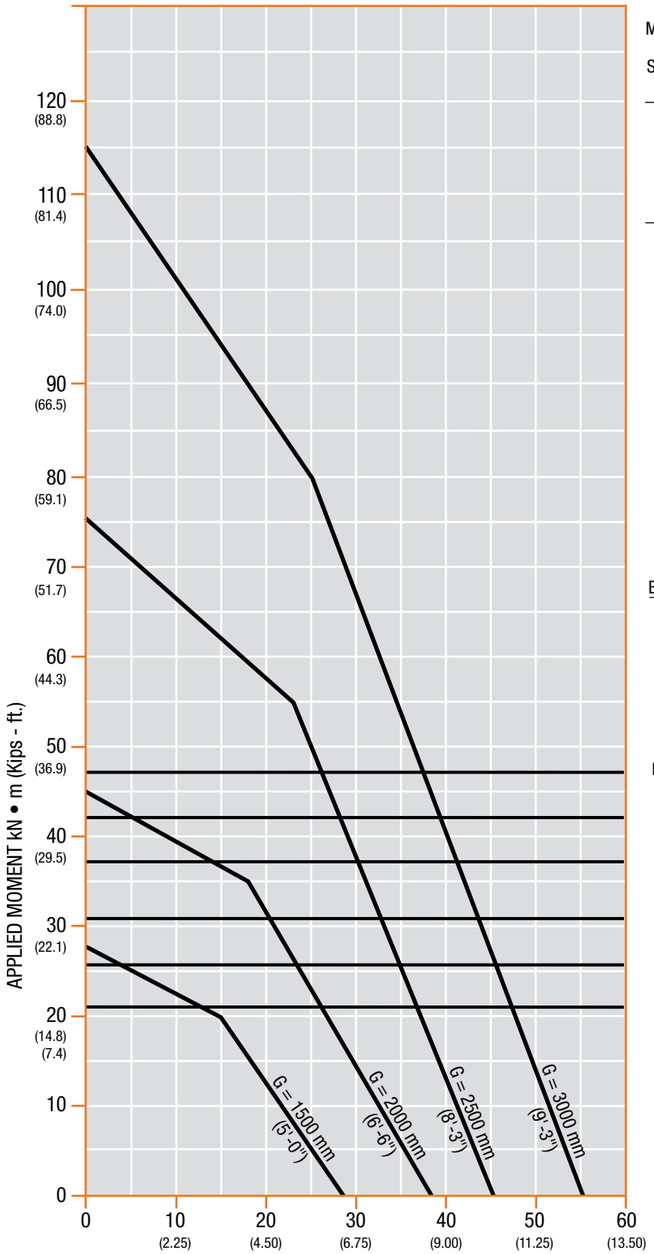


BORED CONCRETE PILE
REINFORCING: 8-20 M BARS (8 - #6 BARS)
10 M TIES AT 400 mm (15 3/4")
MATERIALS: CONC. f'c = 20 MPa (3000 psi)
REINF. = 400 MPa (60000 psi)

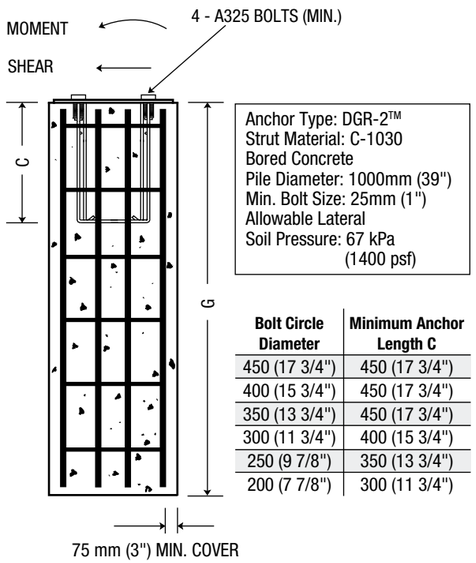
BOLT CIRCLE DIAMETER

450 mm (17 3/4")
400 mm (15 3/4")
350 mm (13 3/4") **PILE DIAMETER = 750 mm (29 1/2")**
300 mm (11 3/4")
250 mm (9 7/8")
200 mm (7 7/8")

Forces From Specified Load

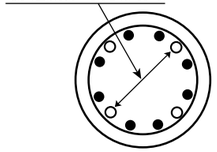


FORCES FROM SPECIFIED (i.e. UNFACTORED) LOAD



Anchor Type: DGR-2™
Strut Material: C-1030
Bored Concrete
Pile Diameter: 1000mm (39")
Min. Bolt Size: 25mm (1")
Allowable Lateral
Soil Pressure: 67 kPa
(1400 psf)

Bolt Circle Diameter	Minimum Anchor Length C
450 (17 3/4")	450 (17 3/4")
400 (15 3/4")	450 (17 3/4")
350 (13 3/4")	450 (17 3/4")
300 (11 3/4")	400 (15 3/4")
250 (9 7/8")	350 (13 3/4")
200 (7 7/8")	300 (11 3/4")



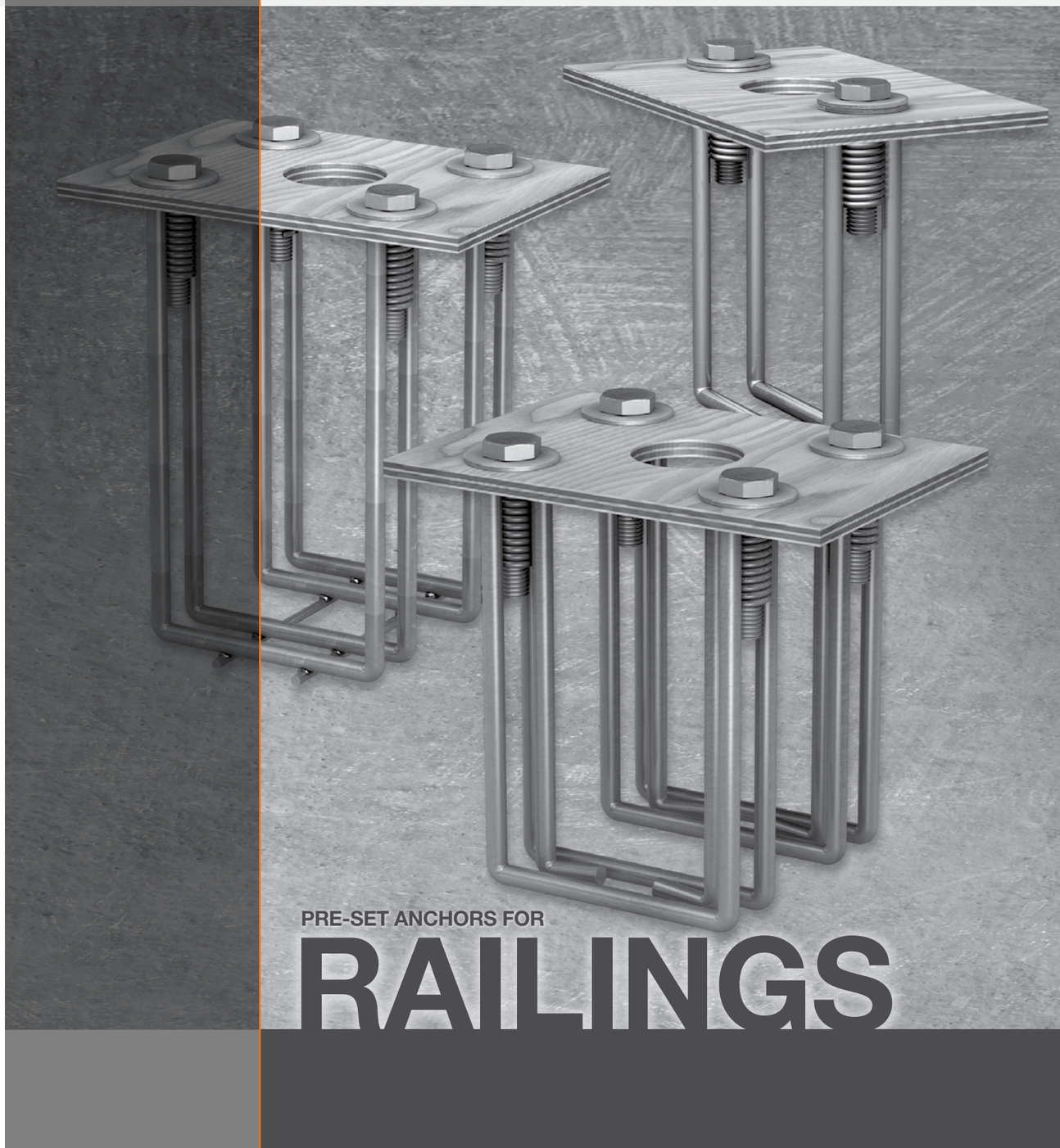
BORED CONCRETE PILE
REINFORCING:
8-20 M BARS
10 M TIES AT 400 mm (15 3/4")

MATERIALS:
CONC. f'c = 20 MPa (3000 psi)
REINF. f'c = 40 MPa (60000 psi)

BOLT CIRCLE DIAMETER

450 mm (17 3/4")
400 mm (15 3/4")
350 mm (13 3/4")
300 mm (11 3/4")
250 mm (9 3/4")
200 mm (7 3/4")

PILE DIAMETER = 1000mm (40")



PRE-SET ANCHORS FOR

RAILINGS

Pre-Set Anchor For Railings

The PRE-SET ANCHOR for railings is furnished as a complete assembly mounted on a plywood template to facilitate the setting of the anchor.

The four Hi-Tensile bolts, four round washers and the anchor cage are hot dipped galvanized to ASTM-A 153.

The anchors are available with 12 mm (1/2”), 20 mm (3/4”) or 25 mm (1”) diameter bolts and on request, bolts and washers can be furnished in stainless steel.

Nylon bushings in conjunction with galvanized finished bolts are recommended when used with aluminum guard rails to prevent any chemical reaction.

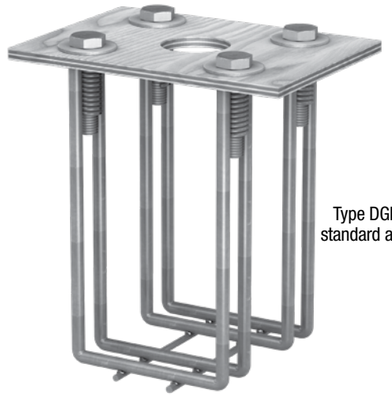
PRE-SET ANCHORS for railings can be furnished in bright wire upon request.

SPECIFICATIONS FOR ANCHOR

PRE-SET™ ANCHOR for railings TYPE DGR™____ by AR or an approved equal shall be used to secure guard rails or railings to the concrete. Hi-Tensile bolts and round washers shall be hot dipped galvanized to ASTM-A 153 and be given a liberal coating of white non-staining grease. A 12 mm (1/2”) thick setting template shall be furnished with the anchor for accurate positioning.

OPS-PMC ACCEPTED FOR USE
Anchorage, Barrier Wall Railing
Preset Anchors - DGR & SGR
- OPSS 908 - Steel Barrier Rail & Pedestrian Handrail
- SS110-21 - Railing For Barrier/Parapet Wall

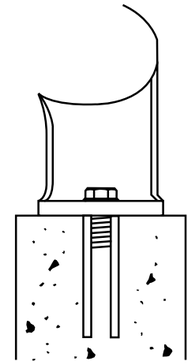
Type SGR™ for 2 hole railing posts



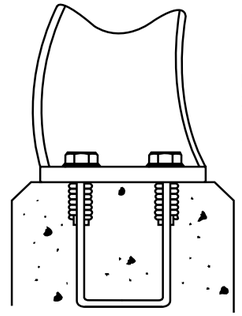
Type DGR™ -1 for standard applications

Type DGR™-2 for Aashto requirements

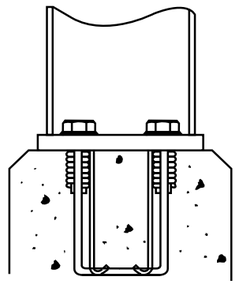
Railing Anchor



SGR™-1
12 mm (1/2”) Ø BOLT
300 mm (11 7/8”) DEEP



DGR™-1
20 mm (3/4”) Ø BOLT
150 mm (6”) DEEP
180 mm (7”) X 300 mm (11 7/8”)



20 mm (3/4”) Ø ST. ST. BOLT
150 mm (6”) DEEP
180 mm (7”) X 300 mm (11 7/8”)

Railing Ordering Information

TYPE OF ANCHOR.....

QUANTITY REQUIRED.....

BOLT DISTANCE.....(A)

BOLT DISTANCE.....(B)

DEPTH OF ANCHOR.....(C)

BOLT DIAMETER.....(D)

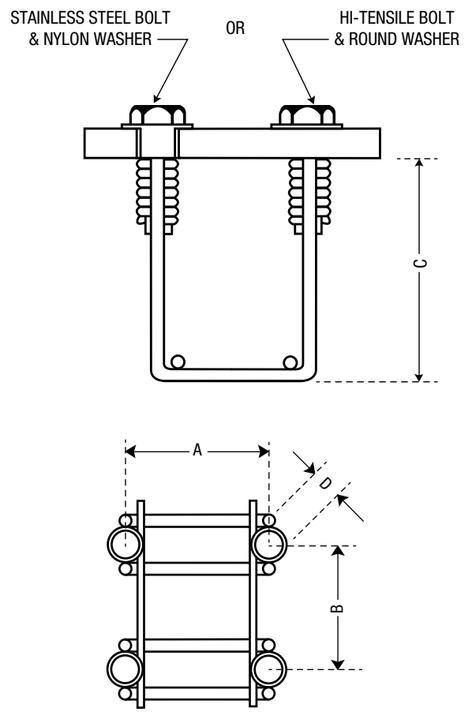
WIDTH OF TEMPLATE.....(E)

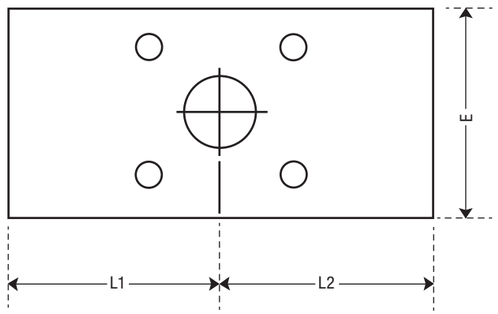
LENGTH OF TEMPLATE.....(L1)

LENGTH OF TEMPLATE.....(L2)

STAINLESS STEEL BOLT.....

NYLON BUSHING.....





Railing Design

A railing anchorage is required for the Guard Rail shown, loaded in accordance with CAN3-S6-00, design for highway bridges.

Total applied base shear: 45kN (10.1 kips)
Total applied base moment: 23.6 kN.m (208.9 kips - inch)

Referring to CAN-S6-00 Limit states design
4LS Combination 1

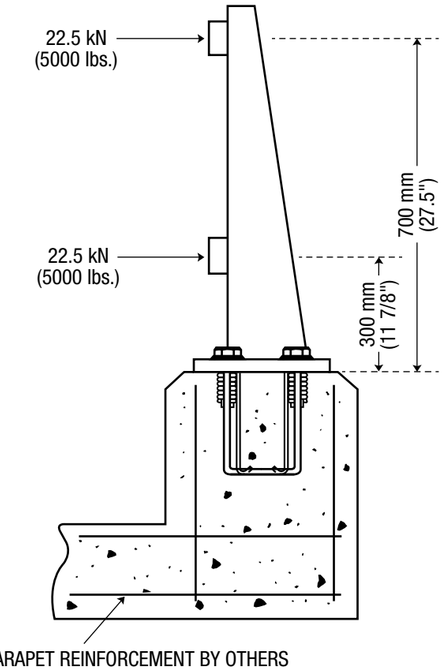
$P_f = 1.7 \times L / 0.95 = 1.79 \times L$

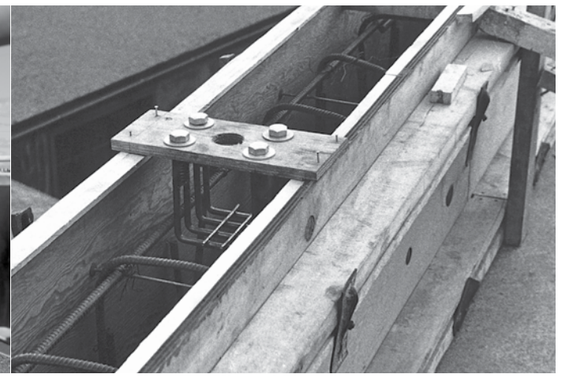
This indicates a load factor of 1.79, which is greater than the load factor of 1.7 used in the AR design aids.*
Therefore increase the applied base shear and base moment by 1.79/1.7 = 1.05.

Total applied base shear now becomes
(45) (1.05) = 47.25 kN (10.62 kips)
Total applied base moment now becomes
(23.6) (1.05) = 31.71kN.m (280.7 kips - inch)

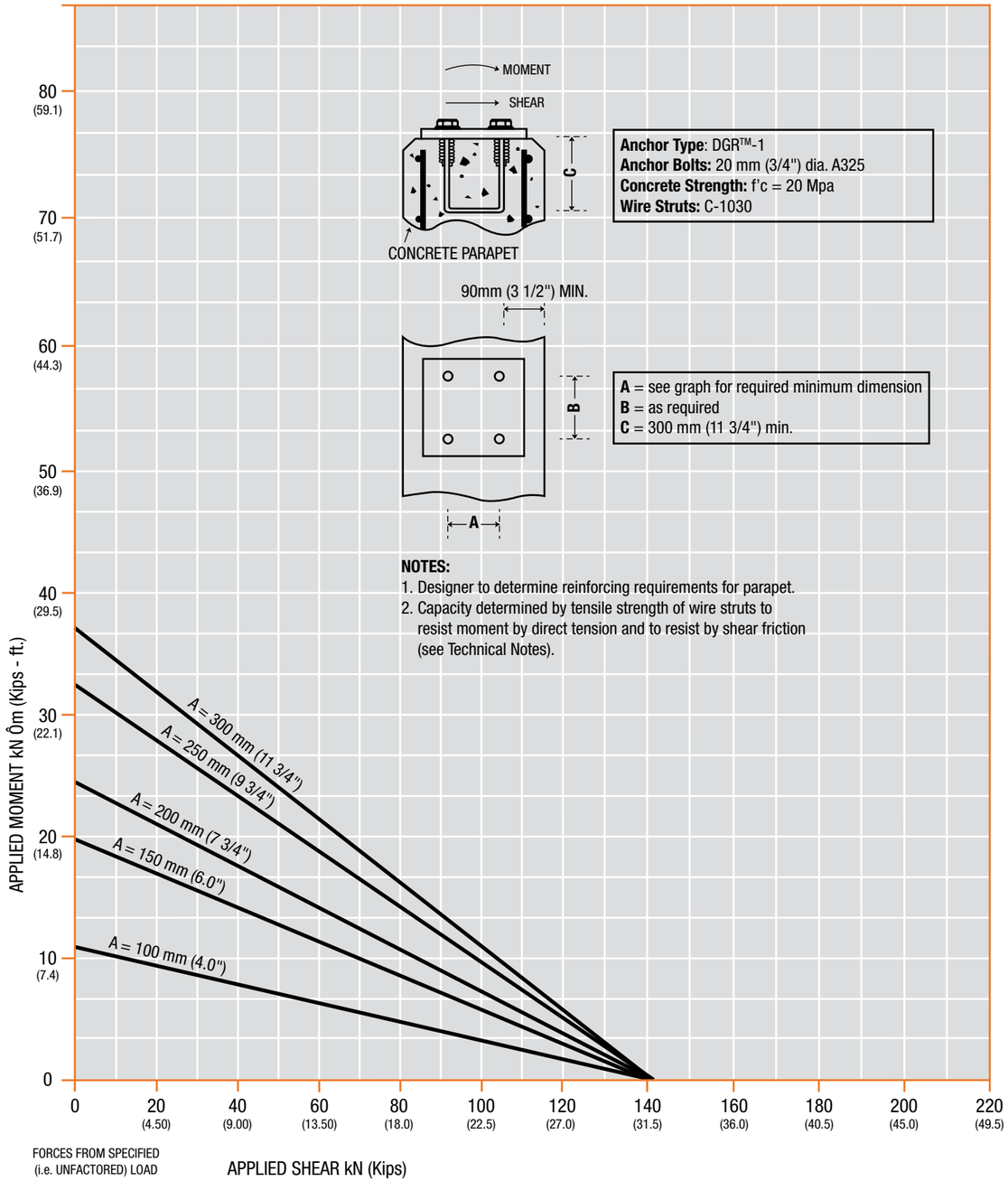
* see technical notes pg 22.

SOLUTION
Try using a DGR™-2 AR Pre-Set Anchor with 4 – 20 mm diameter A325 Bolts. Enter design aid sheet, page 21, with base shear 47.25 kN (10.62 Kips) and base moment 31.71kN.m (280.7 kips - inch).
Minimum center to center bolt spacing: 250mm (9 3/4”).
Minimum anchor Depth: 300mm (11 7/8”).

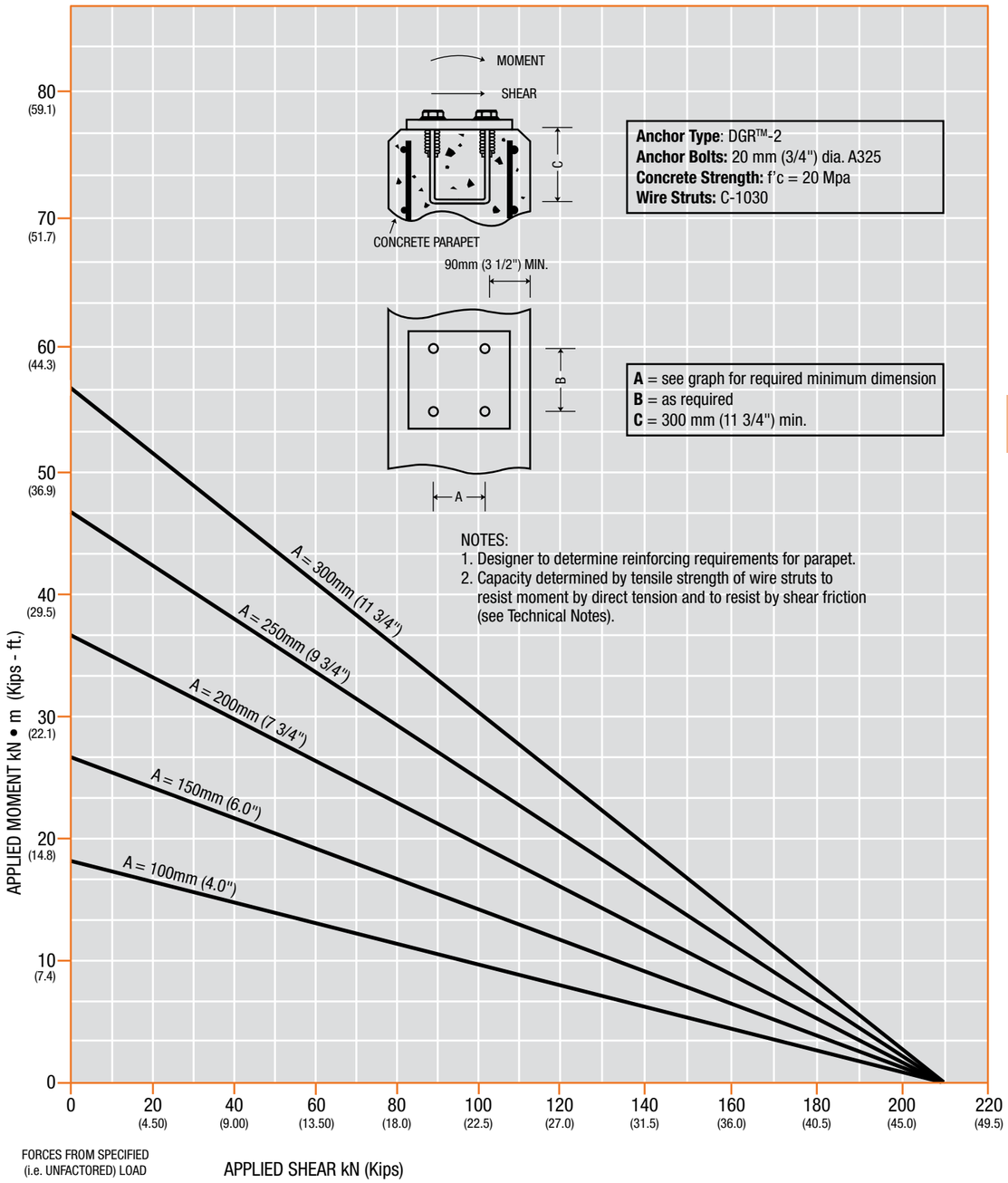




Forces From Specified Load



Forces From Specified Load



Slab And Parapet Reinforcement

The design aids developed for the Acrow-Richmond guardrail anchors do not include guidelines for the general reinforcement of the parapet or slab to which the guardrails are attached. Therefore, the designer is required to detail the necessary reinforcement in the parapet or slab by standard methods.

Guardrail Anchor Capacities

Several possible failure mechanisms were considered in the development of the design aids.

These included:

a) Failure of the ASTM-A325 fasteners in combined shear and tension

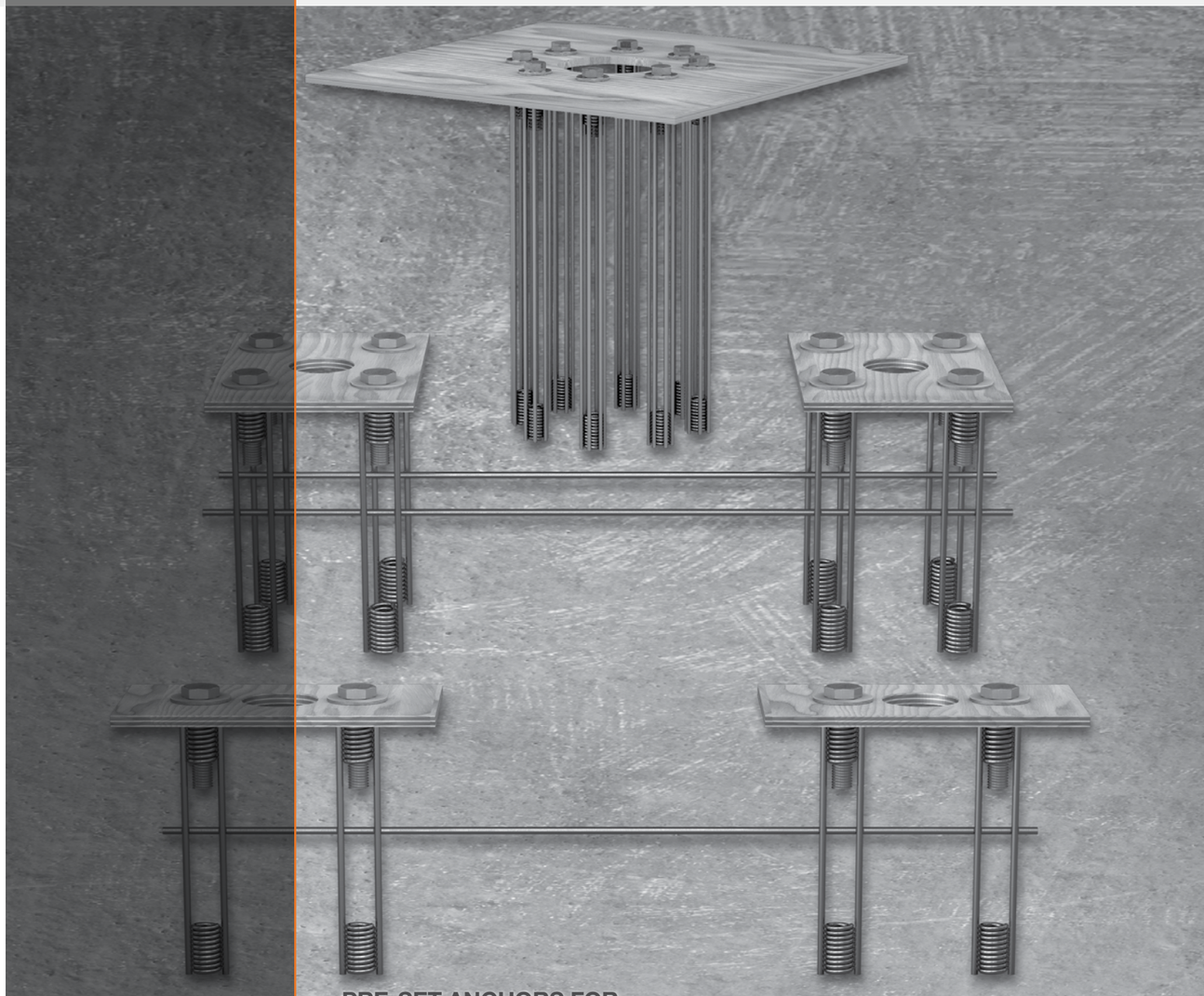
b) Anchorage failure in the concrete associated with the embedment length and edge distance of the anchor struts.

c) Tensile failure of the anchor struts due to applied shear and moment.

It was found that the latter failure mechanism, tensile failure of the anchor struts was critical. In this failure mode, it is assumed that the anchor struts must resist both tension forces due to overturning moments and tension forces due to shear. The tension forces caused by shear correspond to the “shear friction” concept set forth in CSA Standard A23.3-94. In this model, the applied shear is resisted across the plane between the base plate and the concrete parapet by friction. The clamping force necessary to create the required frictional shear forces is provided by the DGR™ anchor struts which are perpendicular to the assumed slip plane.

Load Factors

The capacities of the DGR™ type guardrail anchors are given by a series of sloping lines in design aids.
The capacities were computed by dividing the theoretical ultimate resistance of the anchors by a factor of 1.79, which corresponds to the live load of and resistance factor of 0.95 specified in CSA Standard CSA-S6-00. When using design standards other than CSA S6-00, it is still possible to utilize the AR design aids by multiplying the unfactored loads by the ratio L_f/1.79 and entering the design charts with these modified values (L_f is equal to the load factor in a design standard other than CSA CSA-S6-00).



PRE-SET ANCHORS FOR

OVERHEAD SIGN STRUCTURES

Miscellaneous Pre-Set Anchors

The PRE-SET ANCHOR for sign posts and overhead sign supports is furnished as a complete assembly mounted on plywood templates to facilitate the setting of the anchor. A 20 mm (3/4”) lagstud maintains correct spacing of anchorage.

The Hi-Tensile bolts, round washers and the anchor are hot dipped galvanized to ASTM-A 153.

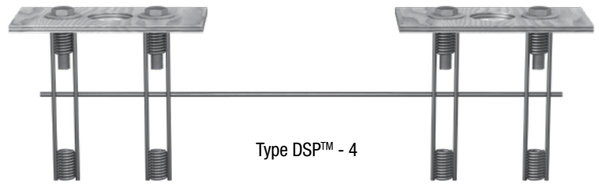
The anchors are available with 20 mm (3/4”), 25 mm (1”), 32 mm (1-1/4”) and 38 mm (1-1/2”) diameter bolts or square headed leveling studs. On request the bolts or studs can be furnished in stainless steel.

The OSP Type Pre-Set Anchor is used to secure high mast light poles or sign posts. Special configurations are available upon request. Send a detailed drawing of anchor required to AR Technical Department.

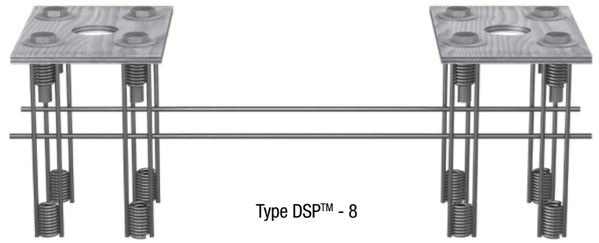
SPECIFICATIONS FOR ANCHOR

PRE-SET ANCHOR, Type _____by AR or an approved equal shall be used to secure sign posts to the concrete. Hi-Tensile bolts and round washers shall be hot dipped galvanized to ASTM-A 153 and be given a liberal coating of white non-staining grease. A 20 mm (3/4”) thick setting template shall be furnished with the anchor for accurate positioning.

OPS-PMC ACCEPTED FOR USE
Anchorage Assembly, Sign Support, Trichord Preset Anchors - OSP
- OPSS 915 - Sign Support Structures



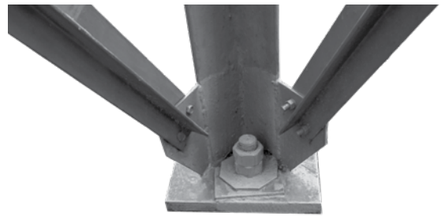
Type DSP™ - 4

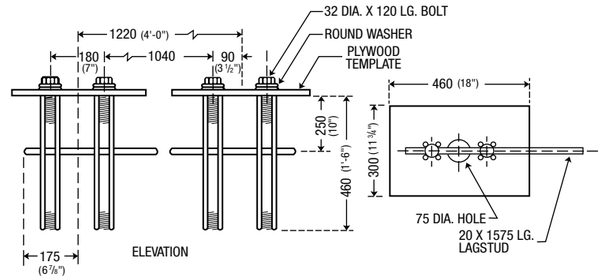


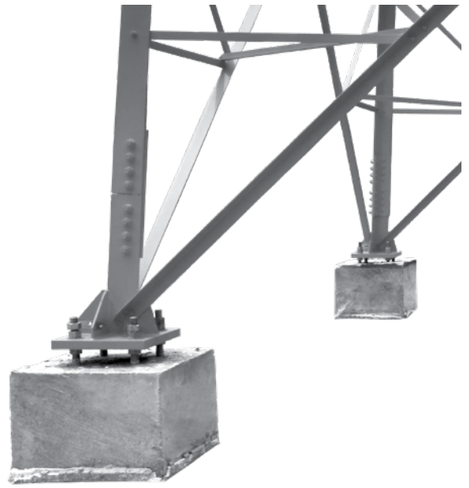
Type DSP™ - 8

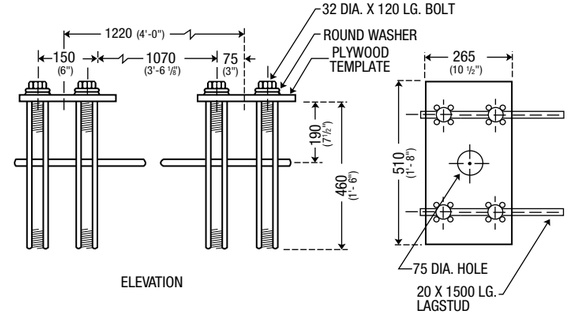
Type OSP™ - 8

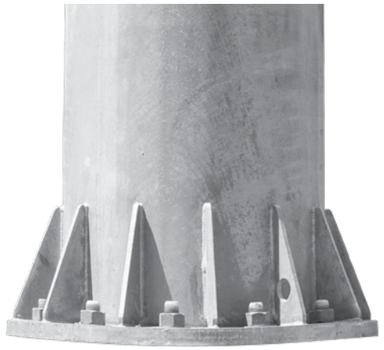
Specifications For Anchor

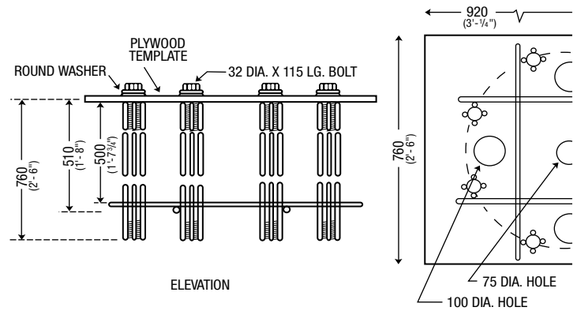












Overhang/High Mast Anchor Order Form

TYPE OF ANCHOR .....

QUANTITY REQUIRED .....

BOLT.....or STUD.....

BOLT OR STUD DISTANCE .....(A)

BOLT OR STUD DISTANCE .....(B)

DEPTH OF ANCHOR .....(C)

ANCHOR SPACING .....

BOLT CIRCLE DIAMETER .....(BCD)

BOLT OR STUD DIAMETER .....(D)

WIDTH OF TEMPLATE .....(G)

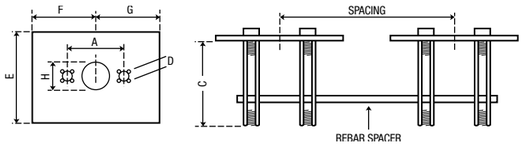
LENGTH OF TEMPLATE .....(E)

LENGTH OF TEMPLATE .....(F)

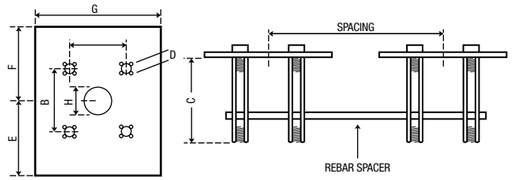
REBAR SPACER LENGTH .....

LOCK WASHERS .....

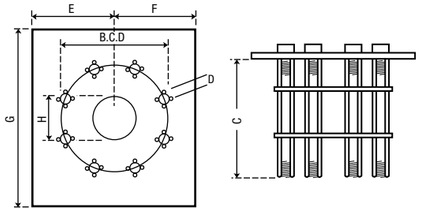
NYLON BUSHING .....



Type DSP™ - 4



Type DSP™ - 8



Type OSP™ - 8

High Mast Anchor Design Example

A light pole anchor assembly and foundation
are required for the 30.5 m (100 foot) pole shown.
Use NBC 1995 wind pressure, q 1/30.

Location: Calgary
Allowable lateral soil pressure: 67 kPa (1400 psf 9.72 psi)

WIND LOADS:
Q1/30, q = 0.46kPa (9.6 psf = 0.07 psi) Pole Height, hp = 30.50 (100')
Radial Ice, R = 13 mm (1/2")
Pole diameter, dp = 330 mm (1'-1")
Lamp effective, A_L
Projected area = 0.75 m^2 (1162 sq.in.)

Wind Pressure, Wp = q Ce Cg Cf
Ce = 1.1 (average from table 4.1.8 NBC 1995)
Cg = 2.5 (for small elements NBC 1995)
Cf = 1.1 (Figure B-18 Supplement NBC 1995) CAN/CSA 537-01 (C Varies)

Wind force on pole, Wp $= q \times Ce\ Cg\ Cf \times \frac{(dp + 2 \times Ri) \times hp}{1000}$
Cf = 1.1 Wp = (0.46) (1.1) (2.5) (Cf) (0.33+0.026) (30.5)
= 15.1 kN (3.40 kips)
Wind force on lamps, Wp = (0.46) (Cf) (2.5) (1.0) (0.75)
Cf = 1.1 Wp = 1.0kN(0.225 kips)

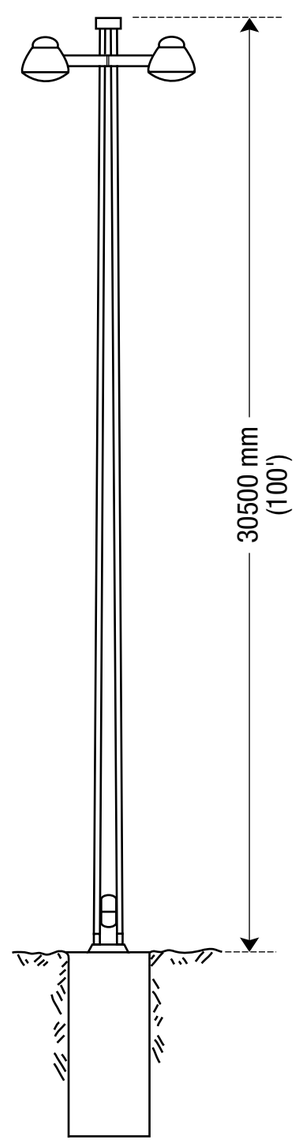
Total Applied Base Shear, V = Wp + W2
V = 15.1 + 1.0 = 16.1kN (3.625 kips)
Total Applied Base Moment, M = Wp x hp/2 + W2 x hp
=(15.l) (30.5) (0.5) + (1.0) (30.5)
M =261kNm (192.5 kips)

NOTE: torsion produced by unbalanced wind load will be neglected.

SOLUTION: Try using a OSP-8 AR Pre-Set Anchor and a
1200 mm(3'-11 1/4") diameter bored concrete pile.

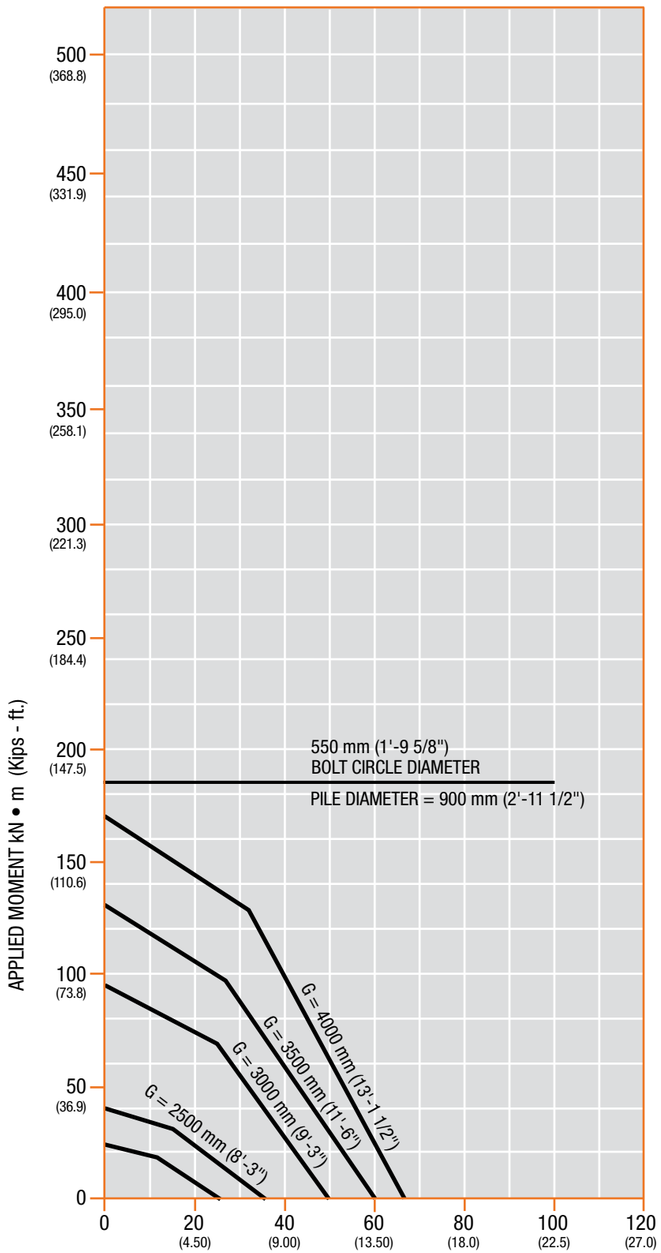
Enter Design Aid Sheet, page 31, with base shear = 16.1kN
and base moment = 261 kNm.

For pile diameter = 1200 mm (3'-11 1/4")
Use pile depth = 4500 mm (14'-9 1/8")
Use bolt circle diameter = 750 mm (2'-5 1/2")
Minimum anchor length = 850 mm (2'-9 1/2")
Minimum bolt size = 38 mm (1 1/2") dia. A325



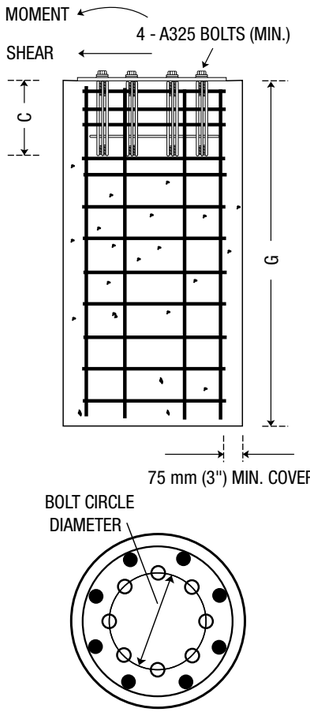
Anchorage Assembly, High Mast Light Poles Preset Anchors - HM
- MTOD 2453.0500 - High Mast Lighting Pole Anchorage Assembly Details
- OPSD 2216.0100 - Anchorage Assembly for Pole Footing in Concrete Barrier
- OPSD 2456.0110 - High Mast Lighting Pole Anchorage Assembly Details
- OPSS 2474 - High Mast Pole Anchorage Assembly
- OPSS 631 - Concrete Footings - High Mast Poles

Forces From Specified Load



FORCES FROM SPECIFIED
(i.e. UNFACTORED) LOAD

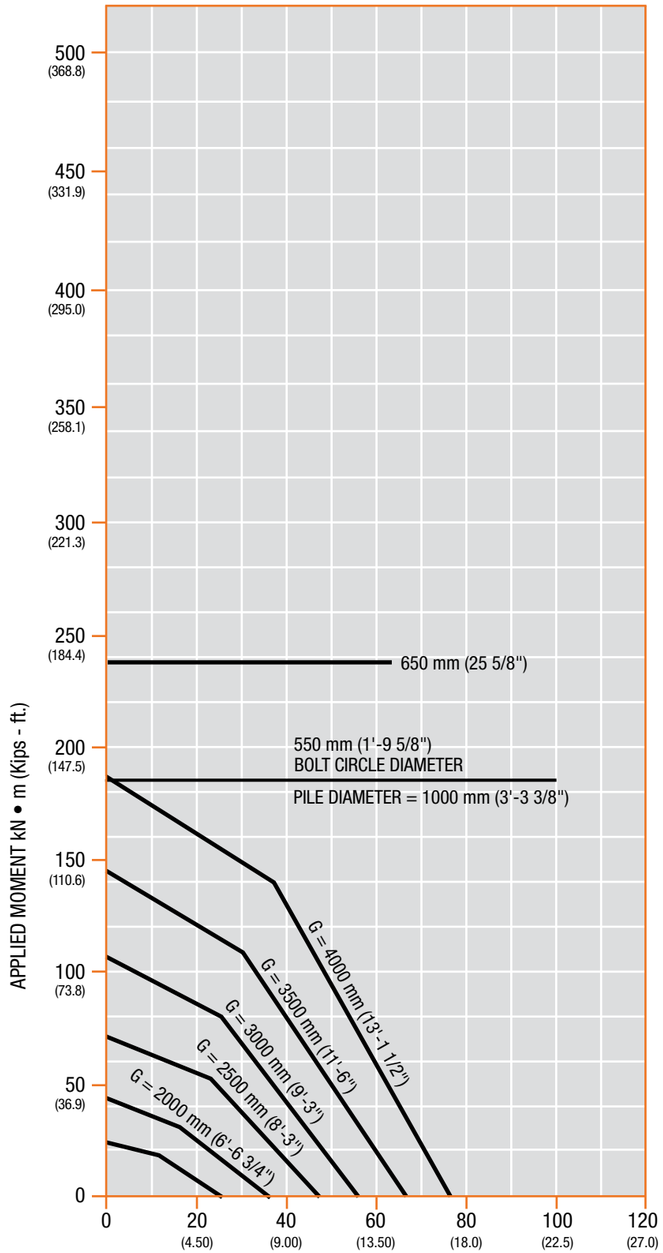
Anchor Type: OSP™-8
Strut Material: C-1030
Bored Concrete
Pile Diameter: 900 mm (35.5")
Allowable Lateral
Soil Pressure: 67 kPa (1400psf)



BORED CONCRETE PILE
REINFORCING: 8-25 M BARS
6-10 M TIES AT 200 mm (7 7/8")
REMAINDER AT 400 mm (15 3/4")
MATERIALS: CONC. f'c = 20 MPa (3000psi)
REINF. = 400 MPa (60000psi)

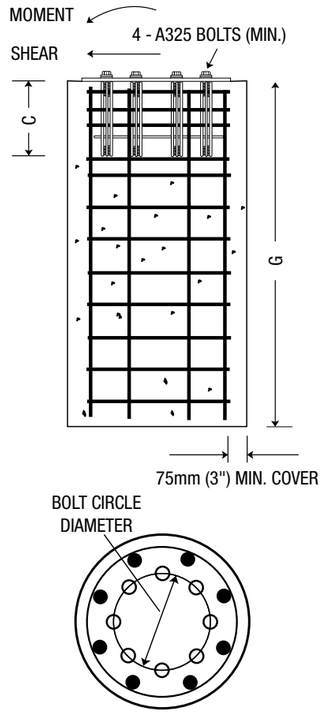
Bolt Circle Diameter	Bolt Diameter	Min. Anchor Length C
550 (21 5/8")	32 (1 1/4")	850 (33 1/2")

Forces From Specified Load



FORCES FROM SPECIFIED
(i.e. UNFACTORED) LOAD

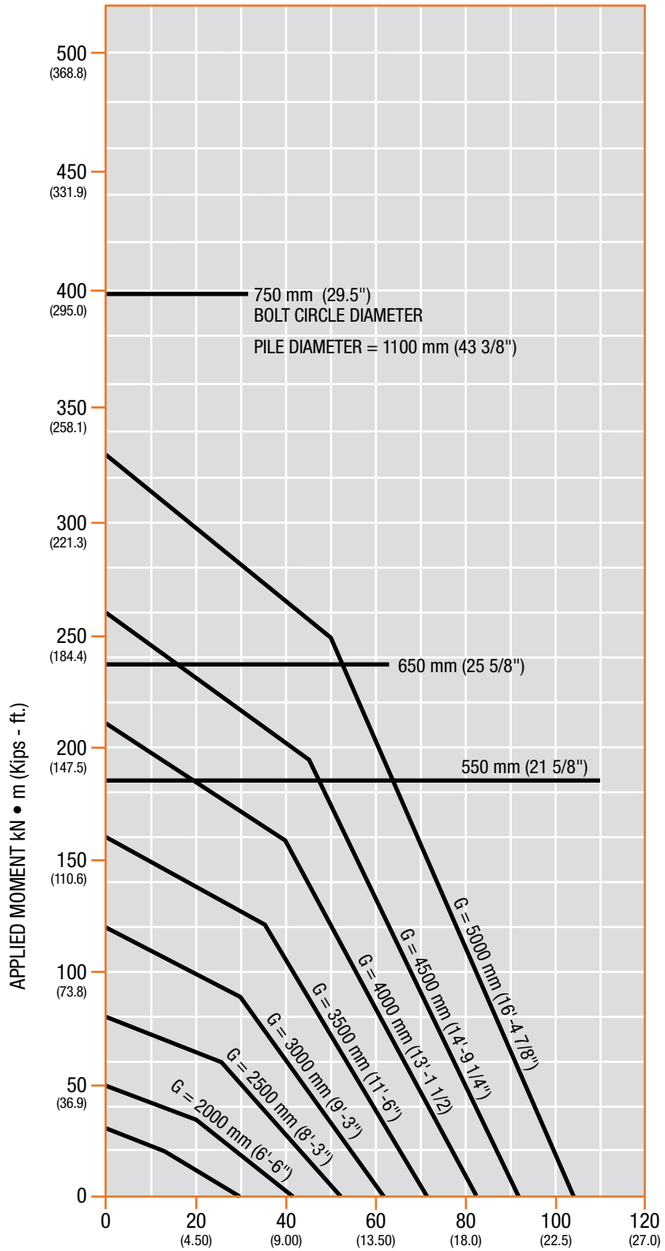
Anchor Type: OSP-8™
Strut Material: C-1030
Bored Concrete
Pile Diameter: 1000 mm (39")
Allowable Lateral
Soil Pressure: 67 kPa (1400psf)



BORED CONCRETE PILE
REINFORCING: 8-25 M BARS
6-10 M TIES AT 200 mm (7 7/8")
REMAINDER AT 400 mm (15 3/4")
MATERIALS: CONC. f'c = 20 MPa (3000psi)
REINF. = 400 MPa (60000psi)

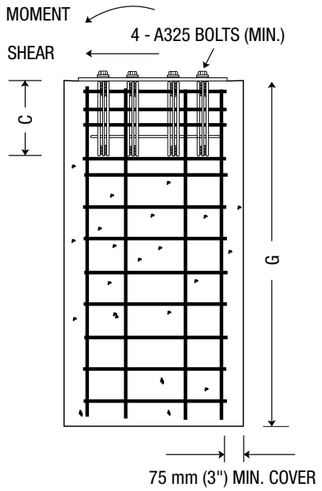
Bolt Circle Diameter	Bolt Diameter	Min. Anchor Length C
550 (21 5/8")	32 (1 1/4")	850 (33 1/2")
650 (25 1/2")	32 (1 1/4")	850 (33 1/2")

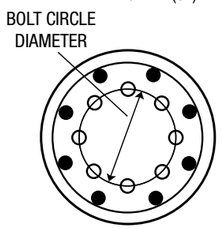
Forces From Specified Load



FORCES FROM SPECIFIED
(i.e. UNFACTORED) LOAD

Anchor Type: OSP™-8
Strut Material: C-1030
Bored Concrete
Pile Diameter: 1100 mm (43 3/8")
Allowable Lateral
Soil Pressure: 67 kPa (1400psf)

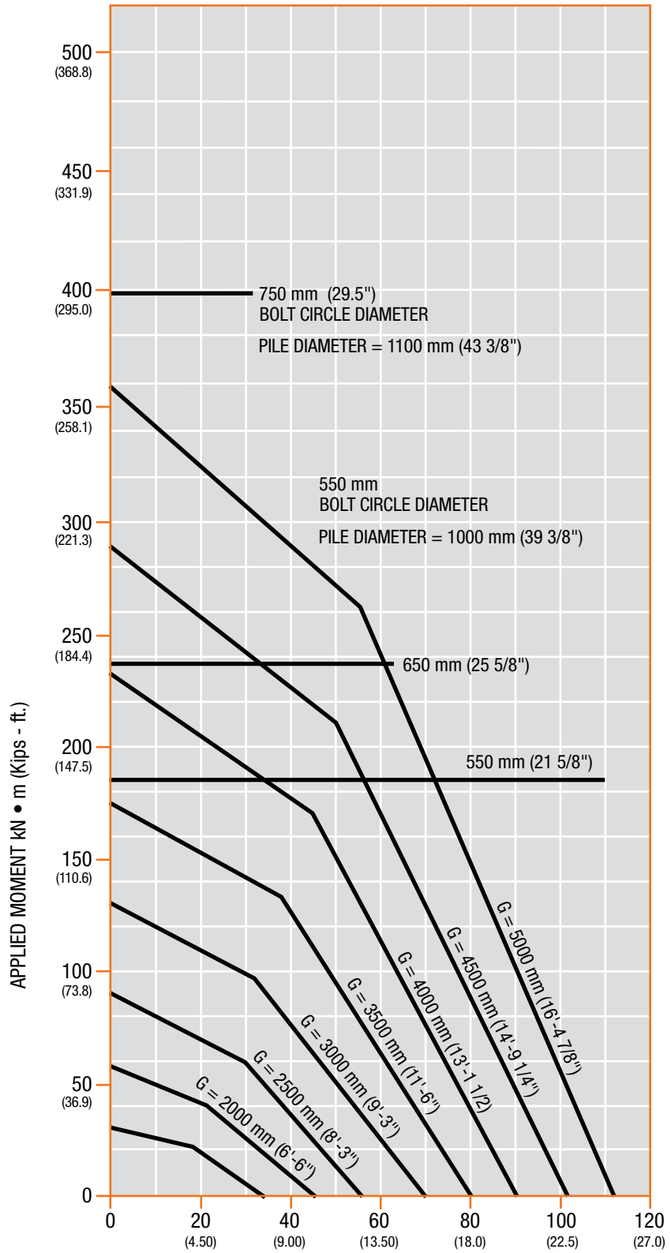




BORED CONCRETE PILE
REINFORCING: 10-25 M BARS
6-10 M TIES AT 200 mm (7 7/
REMAINDER AT 400 mm (15 3
MATERIALS: CONC. f'c = 20 MPa (3000psi)
REINF. = 400 MPa (60000psi

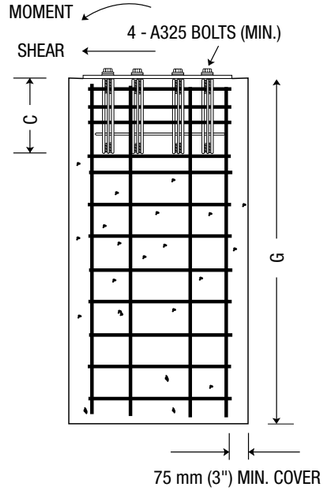
Bolt Circle Diameter	Bolt Diameter	Min. Anchor Length C
550 (21 5/8")	32 (1 1/4")	850 (33 1/2")
650 (25 1/2")	32 (1 1/4")	850 (33 1/2")
750 (29 1/2")	38 (1 1/2")	850 (33 1/2")

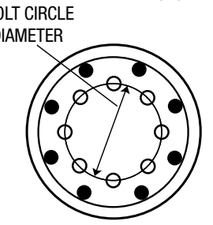
Forces From Specified Load



FORCES FROM SPECIFIED
(i.e. UNFACTORED) LOAD

Anchor Type: OSP™-8
Strut Material: C-1030
Bored Concrete
Pile Diameter: 1200 mm (47 1/4")
Allowable Lateral
Soil Pressure: 67 kPa (1400psf)





BORED CONCRETE PILE
REINFORCING: 10-25 M BARS
6-10 M TIES AT 200 mm (7 7/
REMAINDER AT 400 mm (15 3
MATERIALS: CONC. f'c = 20 MPa (3000psi)
REINF. = 400 MPa (60000psi

Bolt Circle Diameter	Bolt Diameter	Min. Anchor Length C
550 (21 5/8")	32 (1 1/4")	850 (33 1/2")
650 (25 1/2")	32 (1 1/4")	850 (33 1/2")
750 (29 1/2")	38 (1 1/2")	850 (33 1/2")

Foundation Design

The stress distribution assumed for a rigid cylindrical foundation, subject to a lateral load is shown in Fig. 1. This elastic stress distribution is as given in Reference 1, and is that assumed in developing the equation in Section 5.7 of the Ontario Highway Bridge Design Code 1983 (Ref. 4).

From this stress distribution the following design equations can be developed:

$S1 = 1.5S$

$$S2 = \frac{\overline{(2.12H+0.72D)S}}{(H+0.9D)}$$

$$S = \frac{\overline{2.36P(D + 1.11H)}}{bD^2}$$

Where: S1 = lateral soil pressure at one third of footing embedment
S2 = average lateral soil pressure over bottom third of the footing
S = average lateral soil pressure over top two thirds of footing embedment.

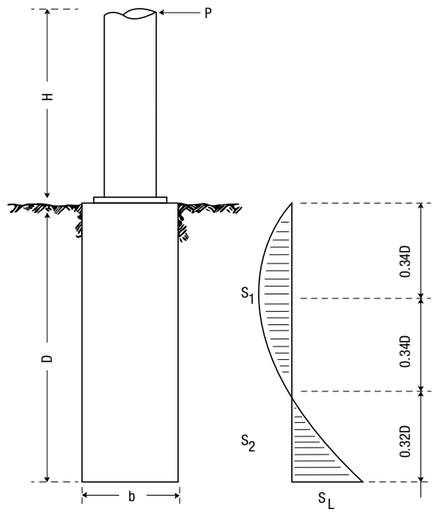


FIGURE 1. ASSUMED STRESS DISTRIBUTION S2 = SL/2

In developing the design aids an assumed allowable lateral soil pressure of 67.0kPA for a cohesive soil has been used for S1 and S2. i.e. S1 = S2 = 67.0kPa

For many situations, these assumed values have resulted in foundations which are acceptable for both strength and serviceability. For specific applications the validity of these assumptions should be judged by a qualified geotechnical engineer. A list of references has been provided which gives other sources of information concerning this elastic solution as well as plastic analysis in cohesive and cohesionless soils (Rev. 2,3).

ANCHOR DESIGN

1) DGR™ Type Pre-Set™ Anchors
The anchor bolt configuration and direction of load assumed are shown in Fig. 2. The shear and overturning moment are assumed to act such that the neutral axis (N.A.) passes through two bolts on the same diameter. Therefore only one bolt is in tension. The tensile bolt load = Tb

$$Tb = \frac{M}{B.C.D.}$$

Where B.C.D. = bolt circle diameter

This tensile force must be resisted by:
i) the bolt
ii) the anchor struts

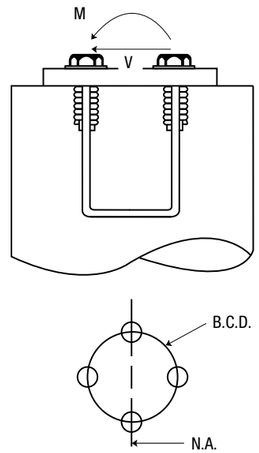


FIGURE 2 ANCHOR CONFIGURATION

Foundation Design

Allowable tensile bolt stress for an A325 bolt = Ft = 303 Mpa (44000 psi) (Ref.5)
Allowable tensile anchor strut stress = $Ft = \frac{0.95\ Fy}{1.65}$
Where: 1.7 = load factor for wind load (Ref. 4) or SAE–1030 material: $Ft = \frac{0.95 \times 596}{1.65} = 343$ Mpa (49747.9 psi)
Note: for SAE C-1030 cold drawn wire Fy (yield strength) depends on the amount of cold working.
For wires supplied for these anchor struts Fy is approximately equal to 596 Mpa (86442.5 psi).
These design aids consider the use of two anchor types: DGR-1; 2, 11.2 mm dia. strut per bolt
DGR-2; 3, 11.2 mm dia. strut per bolt
The following allowable tensile loads per anchor can then be determined. As recommended in Reference 6, a 12% increase in the anchor load had been allowed to reflect the contribution of the coils in transmitting the load to the foundation.
DGR-1; C-1030 material Tall = $\frac{343\ Mpa\ (197\ mm^2)\ (1.12)}{1000} = 75.7.7kN$ (17.0 kips)
DGR-2; C-1030 material Tall = $\frac{343\ Mpa\ (296\ mm^2)\ (1.12)}{1000} = 113.7kN$ (25.6 kips)
The anchor type and bolt circle diameter are than chosen to satisfy: Tb < Tall And
Tb < allowable tensile bolt load

2) OSP -8 Type Pre-Set Anchors
These anchor assemblies have an eight bolt configuration and are available in bolt circle diameters of 550 mm, 650 mm and 750 mm. The 550 and 650 mm assemblies use 32 mm diameter ASTM A325 fasteners and have four 11.2 mm diameter SAE C-1030 steel struts per bolt. The 750 mm assemblies use 38 diameter ASTM A325 Fasteners and have six 11.2 mm diameter SAE C-1030 struts per bolt.

The capacity of the OSP -8 pre-set anchor assemblies for resisting overturning moments caused by wind forces on the light pole was determined by assuming that the assembly and concrete pile foundation behave similar to a reinforced concrete beam. A yield stress of 596 MPA was used for the SAE C-1030 steel struts and a compressive strength of 20 MPA was used for the pile concrete. The tensile capacity of the A325 fasteners was also checked to ensure that tension in the bolts caused by the overturning moment did not exceed the bolt tensile capacity.

LOAD FACTORS
The moment capacities for AR DGR and OSP -8 type pre-set anchor assemblies are shown as a series of horizontal lines on the design aid charts. These capacities have been computed by dividing the ultimate overturning moment resistance of the assembly by a factor of 1.74, which corresponds to the live load factors of 1.65 as specified by CSA standard CSA-S6-00 (Ref. 4). When using design standards other than CSA CSA-S6-00, it is still possible to utilize the AR Design Aids by multiplying the unfactored wind moment by the ration LF/1.7 and entering the design charts with this modified value.
(LF is equal to the wind load factor in a design standard other than CSA S6-00).

The foundation design curves (sloping lines in the design aids) are based on an assumed allowable lateral soil pressure of 67 kPa. Therefore, for the purpose of determining foundation capacities, the design charts should be entered using unfactored shears and moments.

REFERENCES:
1. Ivey, D.L., and Hawkins, L., “Signboard Footings to Resist Wind Load”, Civil Engineering, ASCE, VOl. 36, No. 12 , December 1966.
2. Broms, B.B., “Lateral Resistance of Piles in Cohesionless Soils”, Journal of the Soil Mechanics and Foundation Division, ASCE, Vol. 90, No. SM2, May 1964.
3. Broms, B.B., “Lateral Resistance of Piles in Cohesionless Soils”, Journal of the Soil Mechanics and Foundation Division, ASCE, Vol. 90, No. SM3, May 1964.
4. Canadian Highway Design Code CSA-S6-00.
5. CSA Standard S16-01 Limited States Design of Steel Structures
6. “Report on the Investigation and Testing of Richmond Guardrail Inserts”, Morrison, Hershfield, Millman and Huggins, Ltd., Consulting Engineers, December 1968.
7. CAN3 – A23.3-94 “Code for Design of Concrete Structures”.
8. CSA Code S37-01, Antennas, Towers and Antenna Support Structures.

Test Results

Morrison Hershfield Limited, Consulting Engineers, of Toronto, Ontario were retained to investigate and test anchorage assemblies intended for the anchorage of light poles, sign posts and guardrails. The large number of tests required to analyse all possible bolt circle diameters and bolt sizes would have been prohibitive and even then may not have covered all possible cases. Therefore, three sizes determined to be most common, were selected: 20 mm (3/4”), 25 mm (1”), 32 mm (1-1/4”).

A first test, conducted in 1968, investigated the behaviour and strength of anchorages designed to support railings and light standards. Three anchor applications were analysed and tested to determine their relative strengths when subjected to A.A.S.H.O. 1965 Division 1, Section 1 requirements.

The following specimens were tested:

a) Specimen #1 was designed to simulate the installation of an Alcan 1 or 2 Railer to a parapet wall. For the purpose of the test, the worst of the two conditions, the 2 Railer was used.

b) Specimen #2 was designed to simulate the installation of an Alcan 3 Railer Hand Rail connected to a 200 mm (8”) concrete sidewalk slab.

c) Specimen #3 simulated the base connection of a typical light standard. Two loading conditions, wind and collision impact, were investigated. The loading which resulted in the maximum moment and shear of the anchor was the impact condition taken as 44.5 kN (10,000 lbs.) applied 600 mm (24”) from the base.

The results of the tests are found in Table 1.

The six test performed showed that the pre-set anchors were capable of developing load factors in excess of twice the design requirement of A.A.S.H.O. 1965. There is apparently a greater capacity in the anchors than would be expected when considering only the ultimate strength of the struts. The test indicated that the steel coils at the top of the insert have significant influence on the tensile capacity of the unit. This additional strength was concluded to be due to the anchorage of the coils to which the struts are welded. The exact increase in computed capacity is difficult to determine as the test results ranged from 12% to 41%. However, the lower figure of 12% would be a very conservative estimate of this contribution since the test specimen failed due to a weakness in the concrete.

SPECIMEN	ANCHOR TYPE & SIZE mm (inch)	BOLT DIAMETER mm (inch)	WORKING LOADS AT ANCHOR		COMPUTED FAILURE LOAD kN (KIPS)	40mPa (6000psi CONCRETE) Pu kN (KIPS)	TYPE OF FAILURE	LOAD FACTOR Pu/Pw
			MOMENT kN.m (ft-lbs)	Pw SHEAR kN (KIPS)				
1	DGR™-1 90 x 127 x 381 (3½'' x 5'' x 15'')	20 (¾'')	7.9 (5826.7)	24 (5.4)	116 (26.1)	147 (33)	BOND	6.1
2	DGR™-2 90 x 127 x 178 (3½'' x 5 x 7)	25 (1'')	27.8 (20504)	45 (10.1)	82 (18.4)	110 (24.7)	CONCRETE	2.5
3	DGR™-2 197 x 197 x 547 (7¾'' x 7¾'' x 18'')	25 (1'')	27.1 (19988)	45 (10.1)	125 (28.10)	173 (38.9)	CONCRETE	3.9

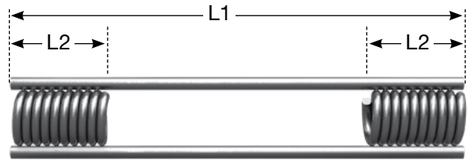
Test Results

A second test, conducted in 1975 subjected individual strut anchors, rather than a complete assembly, to axial and shear leads. Strut anchors were cast into concrete specimens 300 mm x 300 mm in cross-section. For each anchor size, six tests were conducted. One test in pure tension, one in pure shear, two tests with selected values of tension plus shear, one to investigate the effects of increasing the concrete strength and one to investigate the effect of increasing the embedment length of the anchor.

Tests were carried out on eighteen specimens with 25 mm, 32 mm and 38 mm diameter. Details of anchors tested are listed in Table 2. The test shows that ultimate loads on the anchors can be predicted with reasonable accuracy using established engineering analysis. From the ultimate loads, working or allowable loads per anchor can be determined using appropriate factors of safety.

The results of the tests are summarized in Table 3. The load applied to a particular anchor in an anchor assembly is of course determined through an analysis of the pole base as a moment connection. In the case where a higher strength concrete was used a slight increase in the capacity of the anchor was obtained. This was due to the increased stiffness of the system with the higher strength concrete providing increased bond length for the struts. No increase in the capacity was noted where a longer embedment length was used (Speciment D and E).

ANCHOR	ANCHOR SIZE mm (inch)	L_1 mm (inch)	L_2 mm (inch)	NUMBER OF STRUTS	NUMBER OF ANCHORS TESTED
A	25 (1")	381 (15")	64 (2½")	3	5
B	32 (1¼")	508 (20")	64 (2½")	4	5
C	38 (1½")	310 (12¼")	76 (3")	6	5
D	25 (1")	762 (30")	64 (2½")	3	1
E	32 (1¼")	864 (34")	64 (2½")	4	1
F	38 (1½")	864 (34")	76 (3")	6	1



It is our belief that the pre-set anchors are not affected by shear loading. The shear capacity of the assembly, however, is limited by the bearing capacity of the concrete in contact with the top coil of the anchor and the shear capacity of the concrete section. As the bearing capacity of the concrete with the top coil of the anchor is sensitive to the edge distance available, the minimum edge distance recommended with these anchors is 150 mm (6”).It is a matter of course that the concrete into which any anchor is cast should be adequately designed and reinforced to resist the loads that the anchor is required to carry.

SPECIMEN	ANCHOR SIZE mm (inch) (KIPS)	ULTIMATE TENSILE LOAD kN (KIPS)	ULTIMATE SHEAR LOAD kN (KIPS)	TYPE OF FAILURE	TENSILE STRESS IN STRUTS MPa (PSI)	TENSILE STRESS IN BOLTS MPa (PSI)	SHEAR STRESS IN BOLTS MPa (PSI)
D	25 (1") (51.7)	230 (48,800)	115 (25.9)	ED	750 (108,778)	435 (63,075)	225 (32,633)
E	32 (1¼") (64.1)	285 (63,500)	120 (27.0)	ED	730 (105,878)	360 (52,200)	150 (21,755)
F	38 (1½") (91.0)	405 (95,300)	140 (31.5)	ED	695 (100,801)	360 (52,200)	125 (18,130)

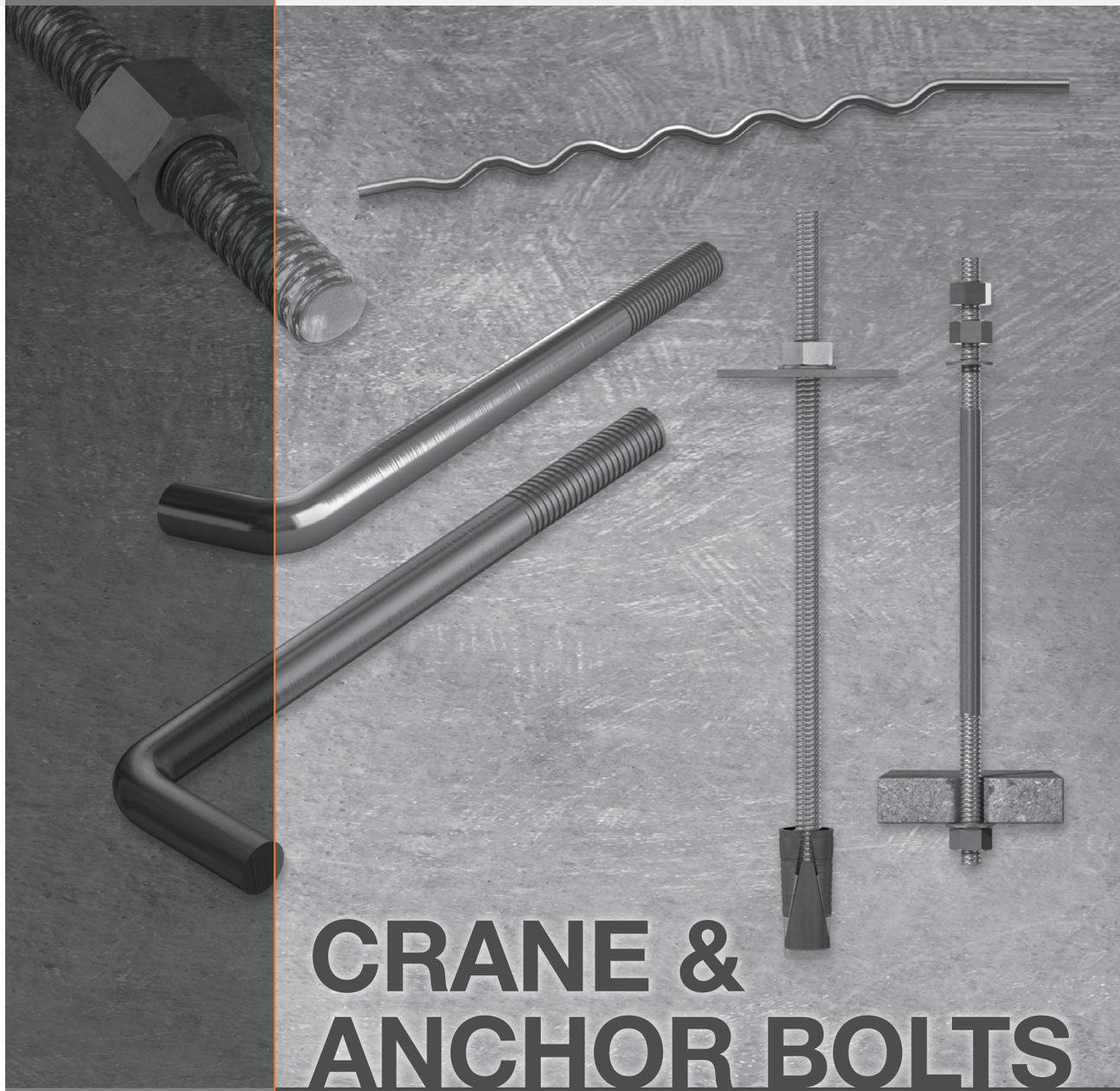
Notes:

1) A = Failure of anchor strut(s)
ED = Extensive deformation of anchor, test stopped at approx. 20 mm extension of anchor.
S = Shear failure in concrete

2) **Tensile Stress in Struts** $= \frac{\text{Ultimate Tensile Load}}{\text{Area of Strut X Number of Struts}}$

Tensile Stress in Bolt $= \frac{\text{Ultimate Tensile Load}}{\text{Nominal Area of Bolt}}$

Shear Stress In Bolts $= \frac{\text{Ultimate Shear Load}}{\text{Nominal Area of Bolt}}$



CRANE & ANCHOR BOLTS

Crane Bolts

STANDARD GRADE (Yellow - For Summer)

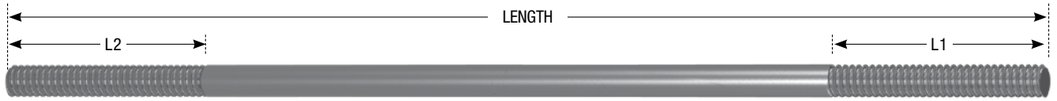
· All crane anchor bolts supplied shall conform to CAN/CSA-G4021-98
· Suitable for all standard crane application
· Minimum yield strength of 44,000 psi
· All crane anchor bolts shall be 8 Threads Per Inch
· Nuts to be 2H heavy hex 8 Threads Per Inch (TPI)
· Mill certificate to accompany shipment upon request

COLD WEATHER GRADE (Black - For Winter)

· All crane anchor bolts supplied as Cold Weather Grade shall have a minimum Charpy value of 15 ft.lb. @ -20∞F/(-28∞C)
· Recommended and meets specification for applications where v-notch toughness at low temperature is a design requirement
· Minimum yield strength of 60,000 psi
· All crane anchor bolts shall be 8 Threads Per Inch
· Nuts to be 2H heavy hex 8 Threads Per Inch (TPI)
· Mill certificate to accompany shipment upon request

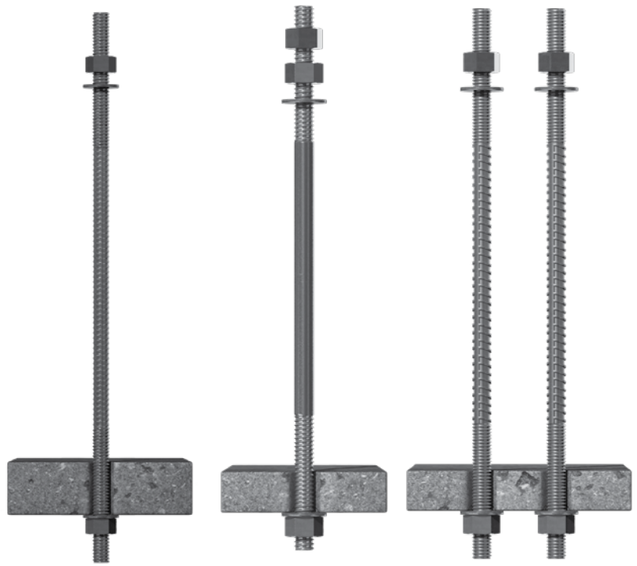
DIAMETER	LENGTH	L1	L2
1½" (38 mm)	48" (1219 mm)	8" (203 mm)	14" (356 mm)
1½" (38 mm)	40" (1016 mm)	8" (203 mm)	8" (203 mm)
1¾" (45 mm)	48" (1219 mm)	8" (203 mm)	14" (356 mm)
1¾" (45 mm)	40" (1016 mm)	8" (203 mm)	8" (203 mm)

Other sizes available on request



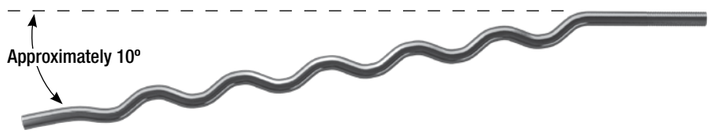
Anchor Bolt

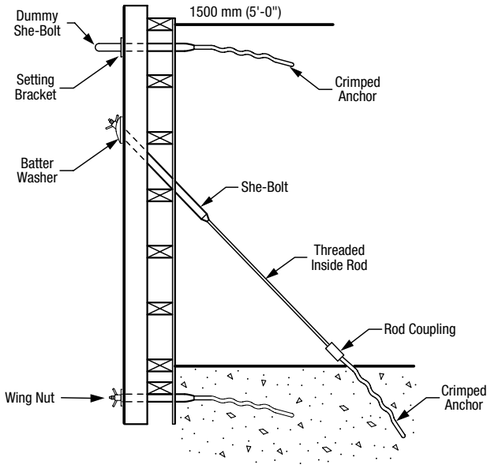
AR can manufacture a wide variety of Anchor Bolts to suite individual custom requirement. Anchor Bolts can be supplied in various material grades and diameters, supplied as black, coated, and hot dipped galvanized. Alternative steel grades available including grade 400, ASTM 615-grade 75, ASTM A722-150Ksi, B-7, Stainless etc.



Crimped Anchor

AR Crimped Anchors are used for form anchoring in mass concrete construction. Manufactured in the diameter and lengths shown with either national coarse thread or lag thread.





APPROXIMATE SAFE WORKING LOAD 2:1

To order, please specify the following information

EXAMPLE
Name ..... Crimped Anchor
Diameter ..... 13 mm (½")
Length ..... 30 mm (12")
Type of Thread ..... NC
Quantity 200

Crimped Anchor Safe Working Loads

Diameter	Safe Working Load		Ultimate	
13 mm (½")	40 kN	(9,000 lbs)	80 kN	(18,000 lbs)
20 mm (¾")	80 kN	(18,000 lbs)	160 kN	(36,000 lbs)
25 mm (1")	165 kN	(37,500 lbs)	330 kN	(75,000 lbs)

Hook Anchor Bolt

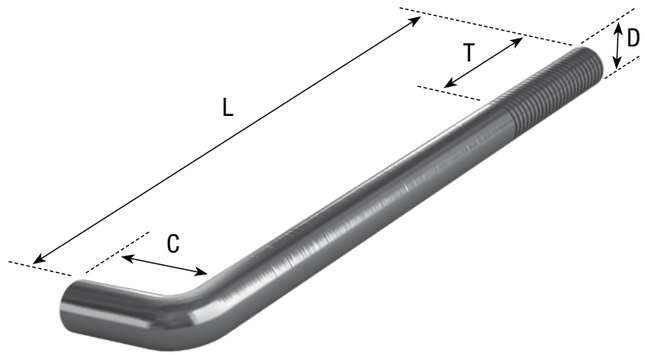
The AR Hook Anchor Bolt is manufactured with either lag thread or national course threads and is typically supplied with a 90∞ radius. AR can supply custom bent bolts when provided with detailed specifications and drawings. Available in 13 mm, 20 mm, 25 mm and 32 mm (½", ¾", 1" and 1¼") diameter.

To order, please specify the following information

EXAMPLE
Name ..... Hook Anchor Bolt
Diameter ..... 25 mm (1")
Quantity 200

Wall Plate Anchor

AR Wall Plate Anchors are manufactured with Unified National Coarse (UNC) thread and are supplied complete with a nut and washer. AR can accommodate special orders in black, plated, hot dipped galvanized or stainless steel. Available in 10 mm to 50 mm (3/8” to 1/2”) diameters. Custom orders available on request.



To order, please specify the following information

EXAMPLE

Name	Wall Plate Anchor
Diameter	13 mm (½")
Length	200 mm (8")
Thread	UNC
Type of steel	mild black steel
Quantity	200

All Thread Bar

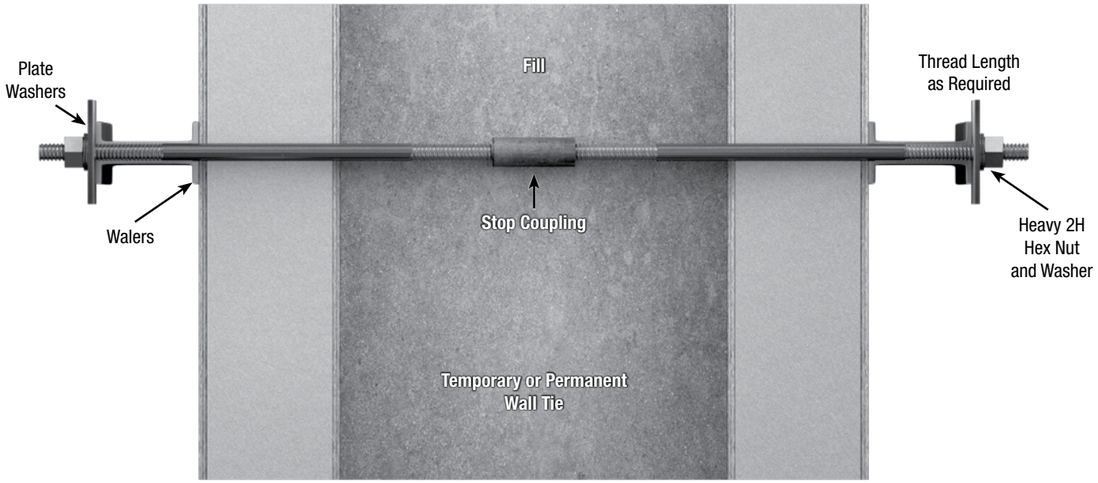
AR All Thread Bars conform to ASTM A722 and ACI 318. The deformation complies with ASTM A615. All Thread Bars are available in grade 60, 75, 95, and 150 to satisfy requirement for tyback, reinforcing connections and rock bolting. All Thread Bars can be supplied as plain, hot dipped galvanized or epoxy coated. Consult the AR Technical Department for available bar diameters.

AR Corrosion Protection Products

AR provides a wide range of corrosion protection systems and sealants. They include hot dip galvanizing, coatings, rust inhibitor lubricants/grease, sealants, profiling mastics and tapes. Consult the AR Technical Department for application recommendation and details.

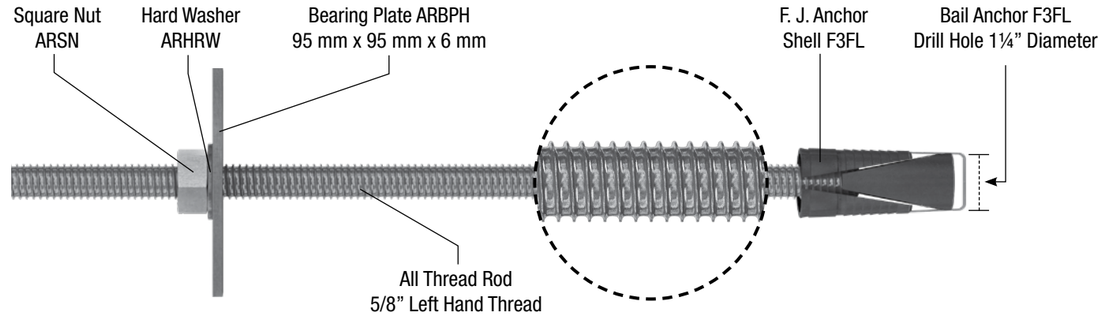
Through Wall Ty Bar

All AR bar products in this publication can be considered for Through Wall Ty applications. AR Standard Deform Bar (SDR) Continuous Threaded Lag (SCT-L) and our Solid Smooth Threaded (SST) products provide a wide range of economical solutions for tie back requirements. Refer to SDR, SCT-L or SST for material selection. AR engineered approach provides an innovative method to achieve the full working load requirement. When design loads exceed published values, consult the AR Technical Department.



Mesh Pin (ARMP)

The AR Mesh Pin (ARMP) is typically supplied as a (5/8”) fully threaded left hand assembly consisting of a heavy square nut, round flat washer, a small bearing plate and a F3FL anchor assembly. The AR Mesh Pin wasdeveloped to be used to hold wire, chain link, or fencing type materials in place against a rock or concrete surface prior to shotcrete. The AR Mesh Pin can also be supplied with right hand thread typically in lengths are 500, 600, 1000 or 1500mm (19”, 23”, 39” or 59”). Larger diameters and length are available if required. Please contact AR for additional information.



GENERAL INFORMATION

1. A qualified person must accurately calculate the applied loads and select the appropriate products and determine compatible spacings.
2. For anchoring and form tying operations, proper installation practices must be maintained. Guidelines for setting mechanical anchors and tensioning procedures for rock bolts are detailed AR Rock Anchoring and Bolt Systems publication. Failure to follow approved practices, may result in failure.
3. The applied safety factor for a product will depend on the degree of hazard or risk involved in the product application. This safety factor is governed by national codes, local codes and/or by design professionals. Onsite conditions such as poor installation practices or inproper use of equipment could increase the degree of risk. If such conditions exist, the user must increase the safety factor to compensate.
WARNING : Improper, careless and/or haphazard use of the products shown in this document can expose workers to extreme danger, injury and death. If uncertain about installations or use of any AR product, contact the nearest AR Sales office or Technical Department for explanations and/or recommendations.
Acrow-Richmond products are manufactured according to strict specifications and are subject to numerous tests under a stringent quality control program. These products are designed to be capable of meeting or exceeding all necessary safety requirements for the concrete construction, anchoring and forming industry. All product test data shown, were obtained through an independent testing facility or tests conducted by AR. However, the performance of a quality product can be affected by the manner in which it is used in
the field. Therefore, the following precautions should be taken by all involved persons.
4. Any welding required should be performed by a certified welder. Bending or welding of high tensile steel products should not be permitted.
Note: AR does not warrant any product that has been welded, altered or modified in any way after leaving an AR plant or warehouse.
5. Never exceed listed product safe working loads. Note that all product load ratings shown in this bulletin are ratings for new or “as new” products only. Extreme caution must be exercised when using any product that is in other than new condition. Any reusable product that shows wear, misuse, overloading, corrosion or any other factor that would compromise its safe working load should be discarded. It is the user’s responsibility to continually inspect working hardware for wear, and to discard the parts when wear is noted. DO NOT straighten bent bolts, rather discard and replace.
6. AR products are not to be applied or installed until the user and/or the installer has a clear understanding of the information contained within the appropriate product publication. All contractors must instruct their employees in the appropriate use and installation of AR products.
To avoid injury and possible form tie problems DO NOT CLIMB ON FORM TIES.
8. Do not interchange products supplied by other manufacturers with those supplied by AR. AR cannot guarantee that products supplied by others will be compatible and/or interchangeable with AR’s quality concrete accessories.
9. Drawings and/or sketches shown in this bulletin are for illustrative purposes only. Check actual conditions for specific applications. Metric values listed are a soft conversion of imperial values.

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ACROW-RICHMOND

THE HIDDEN STRENGTH™

LA FORCE CACHÉE

Acrow Richmond specializes in manufacturing hardware and accessories for the concrete construction industry. With our in-house engineering departments and over 100,000 square feet dedicated to manufacturing, we produce high quality Canadian made products.

We manufacture a full line of:

· Concrete forming hardware products for a wide range of forming systems
· Preset Anchoring systems ranging from street signs to high mast light systems
· Precast products for forming, lifting and connecting
· Rock Bolts for reinforcing severe slopes and tunnels
· Bridge deck forming hardware

In addition to a full line of traditional configurations and sizes, we offer custom fabrication services to meet the most demanding specifications or creative designs. Our team of experts can work with your project drawings to provide cost effective solutions that meet your load demands.

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