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December 15, 2014

Beatty Development Group
1300 Thames Street, Suite 10
Baltimore, MD 21231

Attention: Mr. Jonathan Flesher

Re: Plaza Garage Concentric Pile Work Plan – RTC from EPA
Exelon Tower and Plaza Garage
Baltimore, Maryland
MRCE File No.11896A

Gentlemen:

A proposed Plaza Garage Concentric Pile Work Plan prepared by the contractor was previously submitted for review to the United States Environmental Protection Agency (USEPA) and Maryland Department of the Environment (MDE). The plan was returned with general comments and questions regarding drilling methods, air monitoring logistics, and materials handling procedures. A copy of the comments is attached. The following general response to the comments was developed with the contractor and ERM.

Concentric Pile Obstruction Probing Work Plan

A majority of concentric pile locations have a low probability of obstructions. Locations of moderate probability (approximately 15 locations) and high probability (approximately 15 locations) were identified. The means and methods developed by Armada Hoffler provide a drilling-based method for obstruction probing and demolition. A principle benefit of this plan is that it reduces the size of excavations by replacing open excavation with dry auger and wet coring methods. This plan adds an alternate to the currently accepted Detailed Development Plan (December 2013), specifically Sections 5.1.3 – Obstruction Removal and 6.2.2 – Foundation Penetrations and Repair and subsequent Minor Modifications (March and July 2014); the approved Materials Handling and Management Plan (December 2013), and Construction Air Monitoring Plan (CAMP, March 2014). All previously approved plans will continue to be used to support the proposed means and methods, except where specifically indicated herein.

Attachments

Comments from USEPA on Initial Submittal
Drawing F1.31A and Detail 1A (Proposed Alternates)
Figure 5
Photo 1 – HDPE Dam Mockup
Equipment Data Sheets

Obstruction Probing (Drawing F1.31 Proposed Alternate, Panel 1A)

The plan proposes to use an 18 inch diameter single flight auger mounted on an excavator to drill through obstructions. Compressed air and wash water circulation will not be used to clear cuttings. The auger will be advanced through the Fill stratum to approximately Elev. +1 to confirm the absence of an obstruction. The auger will be extracted in a counterclockwise direction to return spoils to the subsurface and below the liner. Any spoils remaining in the HDPE pipe will be removed by hand before the pile is driven and managed in accordance with the Material Handling and Management Plan (MHMP) for the project.

If an obstruction is encountered which the auger cannot advance through without deviating from the plan location, an 18 inch core barrel will be used to cut and remove the obstruction. Water will be applied to the core bit at the base of the drill string to cool the cutting teeth. The water will be pumped through the drill rods. Drill water will not be allowed to rise to the top of the HDPE pipe, it will be removed and handled as contact water in accordance with the MHMP. Periodically, the core barrel will be removed from the hole and core spoils will be deposited in a lined roll off located adjacent to the rig. Coring will continue until the obstruction is cleared. Drill water and spoils generated as part of coring will be managed in accordance with the MHMP for the project.

The rig, HDPE pipe, roll off container, areas between each, and all areas a minimum of 5 feet around each item will be covered in polyethylene plastic sheeting and secured with sandbags. A temporary soil berm will be constructed at the edges of the plastic as a contingency measure to contain materials. Upon completion, all plastic sheeting will be disposed off site in accordance with the MHMP. The roll off containers will be placed in temporary secondary containment (i.e., a collapsed-container) until removed from the site for proper off-site disposal.

Rig specifications and data sheets are attached.

Dust Suppression

Potable water will be used for dust suppression utilizing a portable water tank and pressure washer with a fine water spray nozzle to ensure that there are no fugitive dust emissions generated during auger or core drilling, as required. These procedures are consistent with the procedures used throughout the project for dust suppression as specified in the MHMP.

Work Zone Air Monitoring

Real-time particulate monitoring will be performed in accordance with the approved CAMP, specifically QAPP-Appendix D, Figure 5 (March 2014), as subsequently modified by the 25 September and 3 October 2014 letters received from EPA. Four single, concentric pile locations

will be grouped into one work zone approximately 60 feet by 60 feet (concentric pile locations are 30 feet apart on center), consistent with the spacing shown in Figure 5 (attached). As such, four work zone monitors at 90 degrees will be deployed for each work zone based upon the daily forecasted prevailing wind direction, upwind, downwind and crosswind. Only one concentric pile location will be probed at a time as there will only be one rig and crew performing this work.

MMC Restoration (Drawing F1.31 Proposed Alternate, Panel 3)

Upon completion of pile driving in locations where the HDPE pipe is the temporary liner dam, clean cover soil will be removed and the permanent dam will be installed. The capillary break area disturbed by probing and/or pile driving will be excavated and the MMC restored in accordance with DDP Drawings F1.30 and F1.31. Testing and QA/QC requirements remain as shown on Drawing F1.03.

Summary

The proposed modification, which reduces the area of liner removed for obstruction removal, is intended to reduce exposure and volume removed from below the MMC. The HDPE pipe serves three functions: temporary liner dam, isolation casing for contaminated spoils and water, and reduced area of geomembrane cut. There are several environmental benefits from the proposed work plan, including reduced volume of waste generated, reduced truck traffic for disposal, reduced potential for particulate emissions, and reduced worker exposure.

Very truly yours,

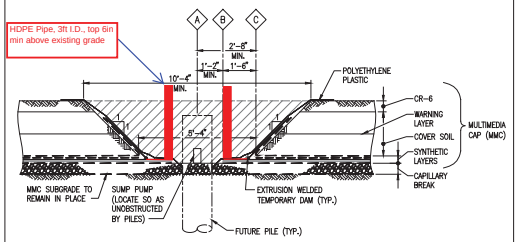
MUESER RUTLEDGE CONSULTING ENGINEERS

By: _____
Peter W. Deming, P.E.

AMD:JB(ERM):LR(ERM):GS:PWD:Final_Plaza Garage Concentric Pile Work Plan RTC from EPA

Drawing F1.31A and Detail 1A
(Proposed Alternates)

1 EXCAVATE AND CUT SYNTHETIC LAYERS



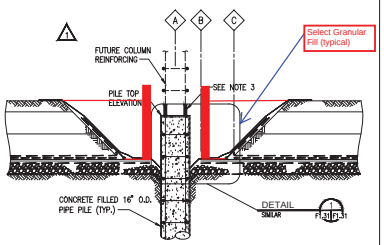
1. Survey and mark pile location.
2. Excavate CR-6 and Cover Soil at 1H:1V slope or flatter. Place toe of slope at synthetic layers at Location C.
3. Edge cut and dispose Cover Geotextile between Location B and Location C. Edge cut and dispose Drainage Net inboard of Location C.
4. ~~Extrusion weld geomembrane dam and secure with wire staple to divert clean water around excavation.~~
5. *Edge cut and dispose Geomembrane, GCL, and Geotextile Cushion inboard of Location B to expose Capillary Break gravel.*
6. *Cover* work area *with polyethylene plastic.* ~~*Probe for obstructions. If obstructions are encountered, expand excavation and protect MMC using Pile Cap Construction Sequence on Drawing F1.30. Demolish or remove obstructions.*~~

remove obstructions as shown on Panel 1A.

Extrusion weld HDPE pipe with pre-made boot a minimum of 6 inches inboard of Location C. Cover exposed geomembrane with Cover Geotextile. Backfill around perimeter with cover soil to existing grade. Restore warning layer as necessary.

Probe for obstructions with auger drill. Collect spoils and handle in accordance with the MHMP.

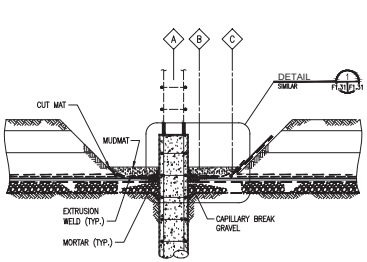
2 CONSTRUCT DRIVEN PILES



Select Granular Fill (typical)

1. *Survey and mark pile location.*
2. *Drive pile.*
3. *Cut pile* Bush with HDPE pipe. *Place concrete fill and column reinforcing bars.* ~~*Leave enough bar stick-up to accommodate future rebar coupler. Protect bar threads by wrapping.*~~
4. *Clean pile surface free of concrete or mortar spillage at and above boot elevation.*

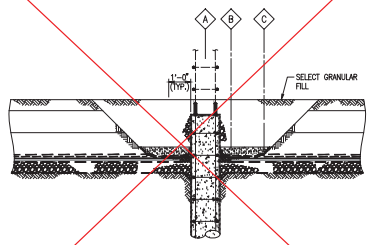
3 REPLACE MMC SYNTHETIC LAYERS



1. ~~*Remove polyethylene plastic.*~~
2. *Place imported Capillary Break gravel around pile to restore original elevation.*
3. *Place mortar around pile for boot connection subgrade (Detail 1).*
4. *Cover mortar with new Geotextile Cushion. Cut Geotextile Cushion within 1/2" of pile wall; use pre-made panel with overlap joints.*
5. *Place pre-made boot over pile. Extrusion weld boot to existing Geomembrane at Location C. Place gasket and clamp boot to pile wall.*
6. Perform Quality Control and Quality Assurance testing of geomembrane and boot.
7. Place Cover Geotextile to protect boot. Overlap with Cover Geotextile at Location C.
8. Place mudmat to cover synthetic layers around pile to Location C. Place 6 mil. plastic sheet bond breaker below mud mat if mud mat is to be removed for column construction.
9. Cut geomembrane dam at top of mud mat.

4 ~~PLACE INTERIM CAP~~

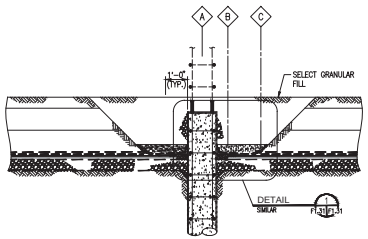
Deleted, see Plaza Garage Work Plan.



1. Cover pile and reinforcing bars with polyethylene plastic and secure to pile.
2. Place and compact select granular fill to restore grade.

1. Remove polyethylene plastic and re-excavate cover soil.
a. Excavate cover soil, use hand tools within 6 inches of geomembrane.
b. Extrusion weld permanent geomembrane dam at Location C.
c. Edge cut and dispose of HDPE Pipe and pre-made boot.
d. Lower subgrade around pile as necessary.
e. Cut pile to design elevation, clean pile and reinforcing steel with compressed air or water as necessary.
f. Place high strength epoxy grout or steel plate.

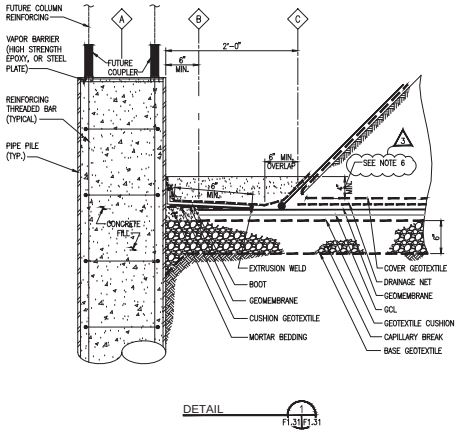
5 COLUMN CONSTRUCTION (FUTURE STAGE)



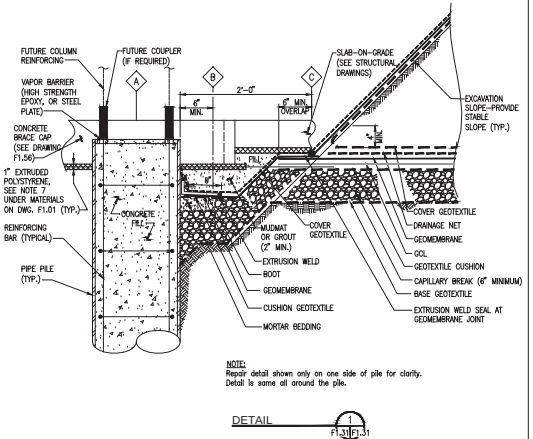
1. Excavate cover soil to column subgrade.
2. Construct brace cap.
3. Clean top of pile concrete with compressed air or water.
4. Place column reinforcing and couple to existing pile reinforcing using standard couplers.
5. Place vapor barrier (high strength epoxy
6. Place column formwork and construct column.

Deleted, see Plaza Garage Work Plan.

6 MMC REPAIR



7 MMC REPAIR AT LOCATIONS WHERE MEMBRANE HAS TO BE LOWERED LOCALLY (SEE NOTE 6)



NOTES:

1. For General and Technical notes, see drawings F1.01, F1.02 and F1.03.
2. Steps in italic require Level D-Modified PPE.
3. For Potential Obstructions, see drawing F1.13.
4. Excavation for Central Plaza Garage Slab-On-Grade.

Deleted, see Plaza Garage Work Plan.

~~the deck work is completed, the MMC will be excavated for slab-on-grade garage floor construction. The excavation will be advanced below the warning layer over the southern half of the garage footprint. Final excavation methods will be determined by the Contractor and submitted in a Work Plan for Plaza Garage Floor Excavation for review and approval. Excavation and concrete placement, and inspection of the work will be required to include the following:~~

B. Equipment may only operate on areas having 12" or more fill over the MMC synthetic layers.

C. Excavation below the warning layer will have labor assistance. Excavation buckets shall have smooth edge, without teeth. Machine excavation will be controlled by labor observation to prevent exposure and damage of the synthetic layers. Soil removal within 2" of the synthetic layers will be performed by labor only using hand rakes, hoe, and square shovel.

D. Excavation work will be observed by HDG inspection.

E. Locations where the machine operated bucket encounter the synthetic layers will be marked for examination, testing, and repair prior to placing cover fill or concrete. Each location will be identified, investigated, and reported. Repair work will be performed under HDG inspection:

a. Observe for mechanical damage to the cover geotextile. Visible permanent stretch / abrasion / tear constitute damage.

b. Remove damaged cover geotextile and observe for mechanical damage to the drainage net. Visible tear or indentation constitutes damage.

c. Remove damaged drainage net and perform visual examination and vacuum box test of underlying geomembrane. Repair geomembrane as directed by the HDG Inspector.

5. "Concentric Piles" are referred to as "Plaza Garage support piles" on Foundation Plan drawings.
6. Where sufficient depth is not available to provide 4" mud mat, it may be replaced with 2" grout (sand-cement). At locations where reduction in mud mat thickness is not sufficient, the membrane lowering detail shown in 7 may be used.

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T P 410-332-1100

consultants
design consultant:
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T 617.426.7502 F 617.426.1300

structural engineer:
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T P 301-587-1820

mep & fp engineer:
Vanderweil
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T P 410-235-6001

environmental engineer:
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Annapolis, Maryland 21401
T P 410 266-0006

interior designer:
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Baltimore, Maryland 21230
T P 410-783-1000

project
EXELON BLDG & PLAZA GARAGE

ISSUED FOR CONSTRUCTION 12/23/13

REVISION 12 08/08/14

key plan

seal

issued	date	description

revision	date	description
4	06/10/2014	REVISION 4
11	06/27/2014	REVISION 11
12	08/08/2014	REVISION 12

title
CONCENTRIC PILE CONSTRUCTION SEQUENCE

drawn by: K.J.
checked by: D.J.G.
scale: N.T.S.
project number: 09709.00

sheet number
F1.31

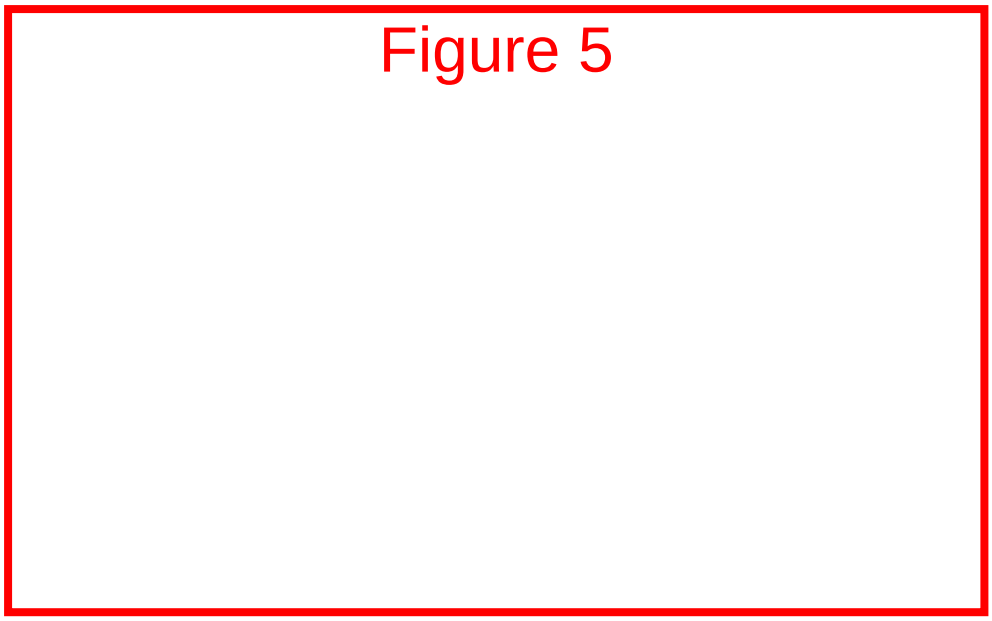
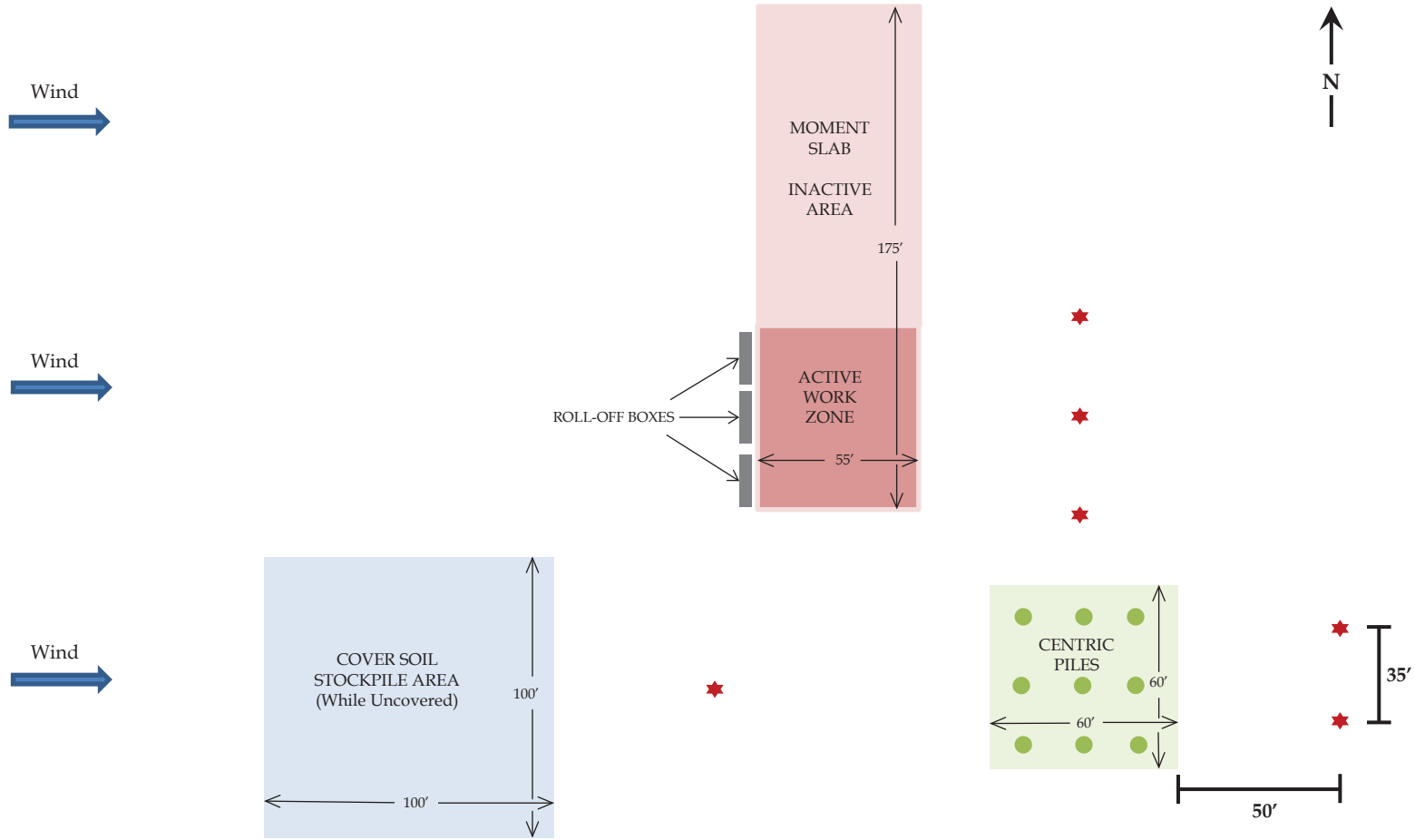


Figure 5

Figure 5
Response Actions and Notifications to Action Level Exceedances
MOBILE STATIONS (✸)
(Westerly Wind Direction Example)



SHEET 1 OF

MUESER RUTLEDGE CONSULTING ENGINEERS

FILE 11896

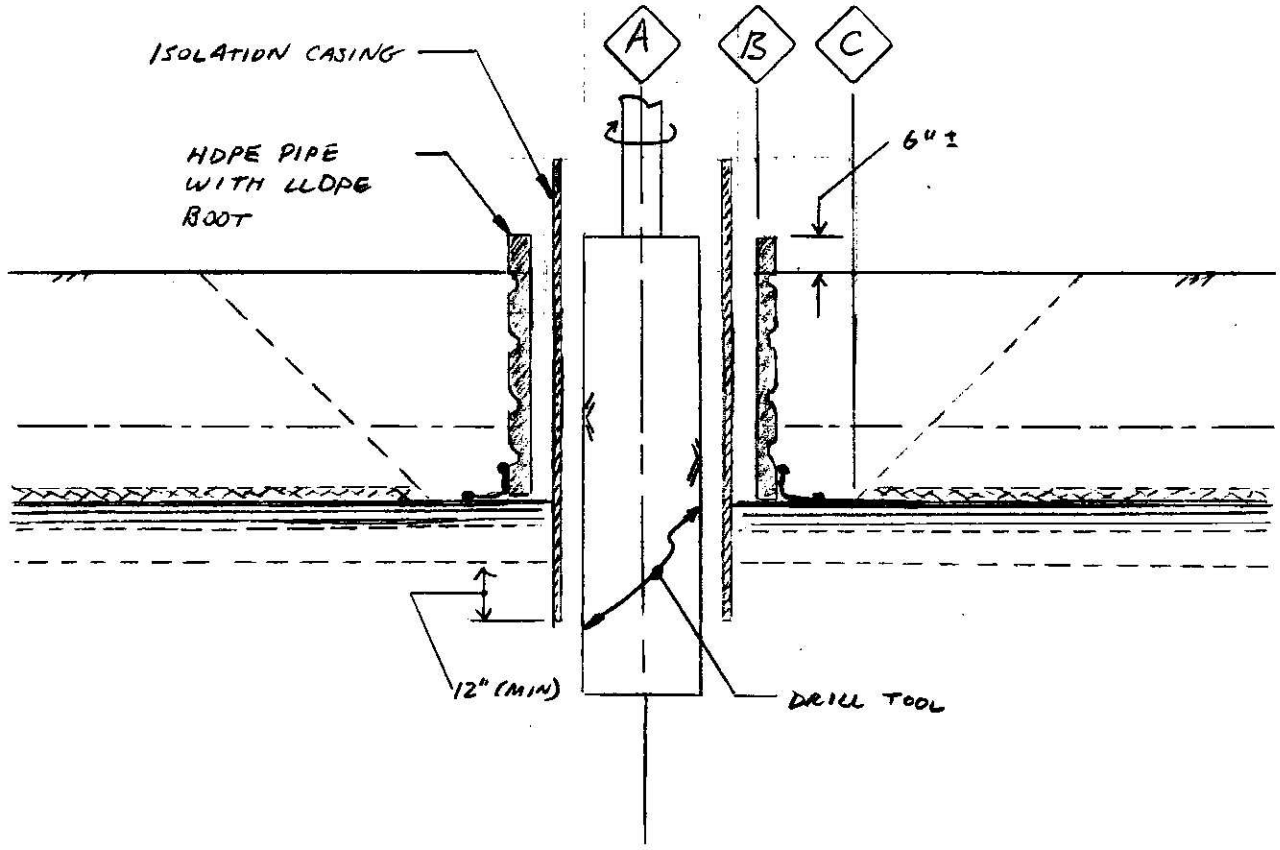
MADE BY AMD DATE 11/07/14

PROJECT EXELON TOWER & TF GARAGE

CHECKED BY DATE

SUBJECT OBSTRUCTION REMOVAL FOR CONCENTRIC PILE BY CORING

PANEL 1A: (DWG F1.31)



1. USE IN LOCATIONS WHERE AN OBSTRUCTION IS ENCOUNTERED WITH AUGER BIT. PLACE POLYETHYLENE PLASTIC OVER WORKING AREA. RE-SURVEY PILE LOCATION, USE OFFSETS AS NECESSARY TO VERIFY LOCATION.
2. INSTALL TEMPORARY STEEL ISOLATION CASING TO A MINIMUM OF 12 INCHES BELOW CAPILLARY BREAK STONE TO PREVENT RAVELING AND FOULING OF IN PLACE CAPILLARY BREAK
3. DRILL 18" DIAMETER HOLE TO CLEAR OBSTRUCTION. APPLY WATER TO CONTROL DUST AND COOL DRILL BIT AS NECESSARY. EXTRACT SPOILS AND DEPOSIT IN CONTAINER PLACED ON POLYETHYLENE PLASTIC. HANDLE MATERIALS IN ACCORDANCE WITH A HMP.
4. PLACE COVER OVER HDPE PIPE WHEN NOT BEING WORKED ON.

Photo 1 - HDPE Dam Mockup


WILLIAMS
SCOTSMAN
800.782.1500
www.willscot.com

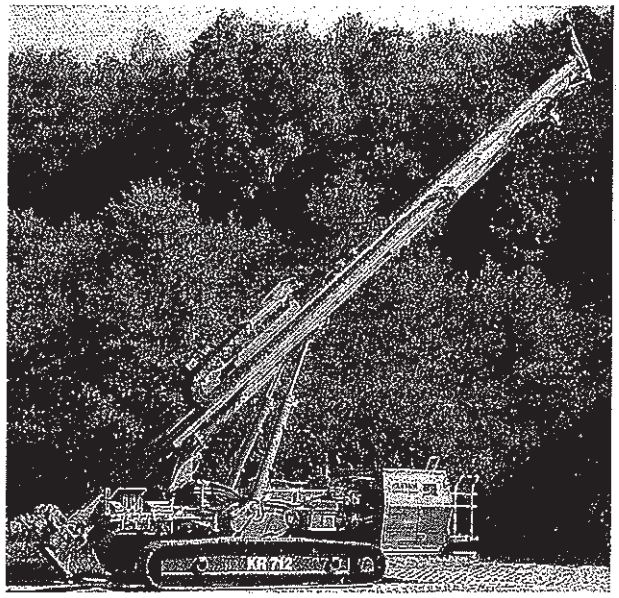
Equipment Data Sheets

Rig option 1

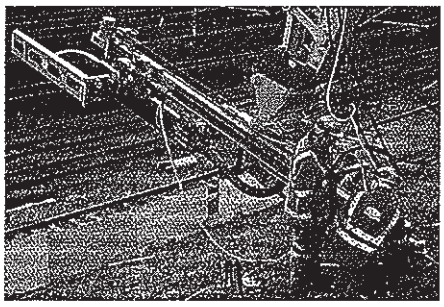
Bohrgeräte für HDI-Einsätze und Vernagelungen

Drill rigs for High Pressure Grout Injections and Soil Nailing

KR 401-1		
Einsatzgewicht	*total weight*	10,0 t
Antriebsleistung	*power rating*	86 kW */118 hp*
Haupthydraulikkreise	*hydraulic circuits*	2x96 l/min
KR 712		
Einsatzgewicht	*total weight*	21,0 t
Antriebsleistung	*power rating*	181 kW */248 hp*
Haupthydraulikkreise	*hydraulic circuits*	1x430 l/min (load-sensing) 1x70 l/min (load-sensing)
Bohrtiefe	*drilling depth*	max. 20 m
Lafette 140		
Gesamtlänge	*total length*	6200 mm
Verfahrweg Schlitten	*stroke*	4500 mm
Andruckkraft bei 200 bar	*feed force at 200 bar*	23 kN
Vorschub	feed rate	13,0 m/min



KR 712 für HDI
KR 712 for HPI



Lafette Typ 140
mast type 140

Pumpen und Mischanlagen für Verankerungs- und Injektionstechnik im Niederdruck- und Hochdruckbereich

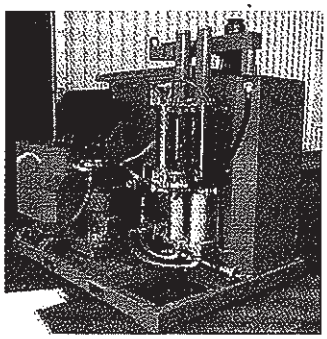
Pumps and mixing plants for anchoring and injections in the low and high pressure range

In unserem Standardprogramm finden Sie:

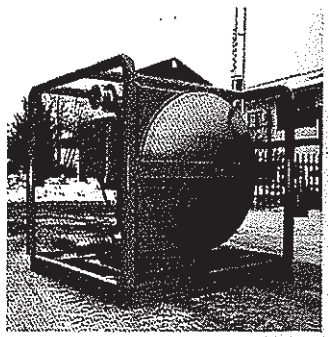
Our standard programme includes:

Chargen-Suspensions-mischanlagen	***Batch-slurry-mixer plants***	
Nennvolumen Mischer	*volume mixer*	1,0 - 2,5 m³
Mischleistung:	*mixing capacity*	10–15 – 20-30 m³/h

Misch-container
Mixing and batching plant



Injektionsanlagen	***Injection plants***	
Förderleistung	*output rate*	60 - 180 dm³/min
Förderdruck	*output pressure*	100 - 120 bar
Schlauchpumpen	***Hose pumps***	
Förderleistung	*output rate*	15 - 70 m³/h
Förderdruck	*output pressure*	8 - 25 bar



Injektionsanlage Typ IMP 10/25/50 MF

Schlauchpumpe Typ HP 50-0F30

(7)

KR 712-1 // Specifications

Motor

Diesel engine, water cooled		Deutz TCD 2013 L6 2V EEC 97/68 EC Stage 3A USA EPA / CARB ANIMAL 3
Power kW / r / min (DIN ISO 3046)		173/2300
Diesel tank		400 l

Hydraulic system

Hydraulic pumps	First cycle	load-sensing 270 l / min
	Second cycle	load-sensing 270 l / min
	3rd cycle	load-sensing 65 l / min
	Fourth cycle	30 l / min
	Fifth circuit	20 l / min
Hydraulic tank		600 l
System pressure		330 bar

Undercarriage (Tele)

Drive	FL 6
Force max.	210/105 kN
Travel speed max.	1.77 / 3.54 km / h
Total width	2500 mm
telescopic	2500 - 3700 mm
3-grouser shoes	500 mm
Length of the undercarriage	4270 mm
esp. Ground pressure	6 - 8 N / cm

Undercarriage (rigid)

Drive	FL 6
Force max.	210/105 kN
Driving speed	1.77 / 3.54 km / h
Total width	3000 mm
3-grouser shoes	600 mm
Ground clearance	450 mm
Length of the undercarriage	3545 mm
esp. Ground pressure	5-7 N / cm

Drill mount type 313/10 with 2-stage feed drive

permissible torque (max.)	32 kNm
Total length (max.)	14600 mm
Rod length	12000 mm
Feed force	130/65 kN
Retraction force	130/65 kN
Feed rate	9.9 / 19.8 m / min
Withdrawal speed	9.9 / 19.8 m / min
Advancing rapidly	21.0 / 42.0 m / min
Retreat quickly	21.0 / 42.0 m / min

Hydraulic Hammer

recommended	KD 1624 R, 1828 R KD

Rotary drive (only for vertical drilling, filing, without frame)

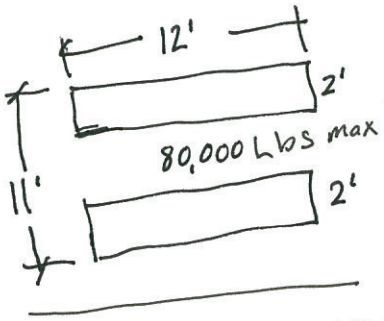
recommended	KH 16, KH 27, KH 43

HDI

recommended	KH 12 SK, 3x3 m lattice tower
Depth / drill diameter (max.)	20 m / 133 mm
Drop the gun carriage	without linkage

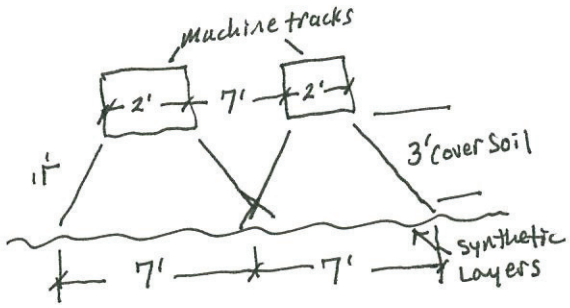
Winch

Traction	10 kN
Cable outlet	800 mm



2'x12'x2 = 48 ft²

80,000/48 = 1.67 KSF



hydr. foldable	Transport

Winch (only for KH 43 with laterally movable carriage)

Traction	34 kN
Cable outlet (in peak height)	460 mm
hydr. foldable	Transport

Drill mount type 316 with 2-stage feed drive

permissible torque	50 kNm
Total length (max.)	12000 mm
Rod length (max.)	10000 mm
Feed force	160/80 kN
Retraction force	160/80 kN
Feed rate	7.8 / 15.6 m / min
Withdrawal speed	7.8 / 15.6 m / min
Advancing rapidly	16.5 / 33 m / min
Retreat quickly	16.5 / 33 m / min

Rotary drive (only for vertical drilling, filing, without frame)

recommended	KH 50

Winch

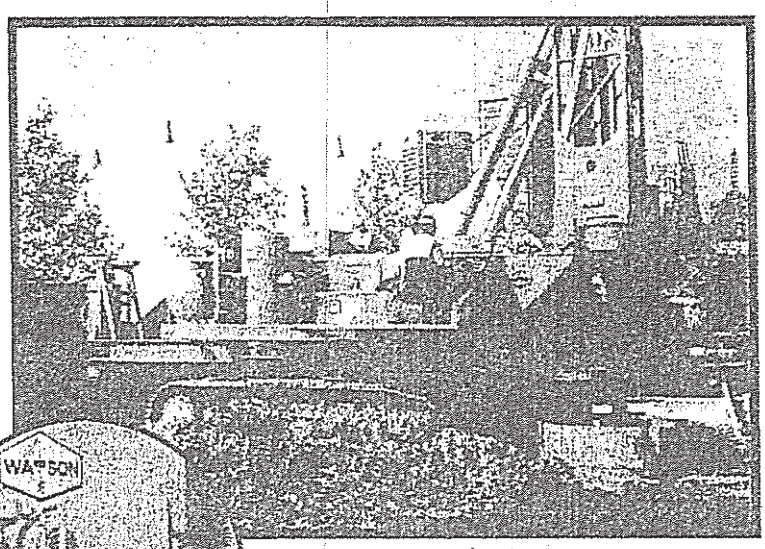
Traction	34 kN
Cable outlet	1200 mm
hydr. foldable	Transport

Weight

Weight	23-25 t — 50,000 LB's

Model 3100CM (HP)

Rig option 2

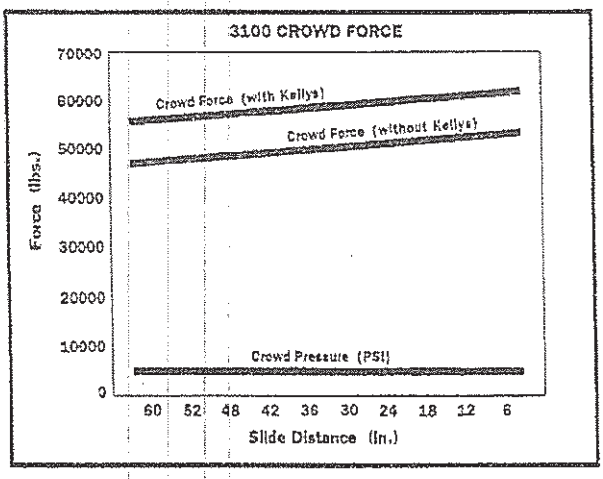


The Model **3100CM (HP)** *was developed in conjunction with Atlantic Caisson Corporation of Glen Rock, Pennsylvania. The Model 3100CM (HP) is a new version of Watson's Model 3100 and incorporates a 60,000 lb crowd system to address the need for a high performance foundation drilling machine to meet challenging rock conditions.*

SPECIFICATIONS

CAPACITY:
- Typical hole diameters: 48" (122cm) — 96" (244cm)
- Maximum hole diameter: 108" (274cm)
- Hole depth: to 120' (36.6m)

PERFORMANCE:
- Torque: 113,000 lb ft (153,680Nm)
- Hoist: 25,000 lbs (111kN)
- Crowd: 60,000 lbs (267kN) ÷ (see reference chart at right)



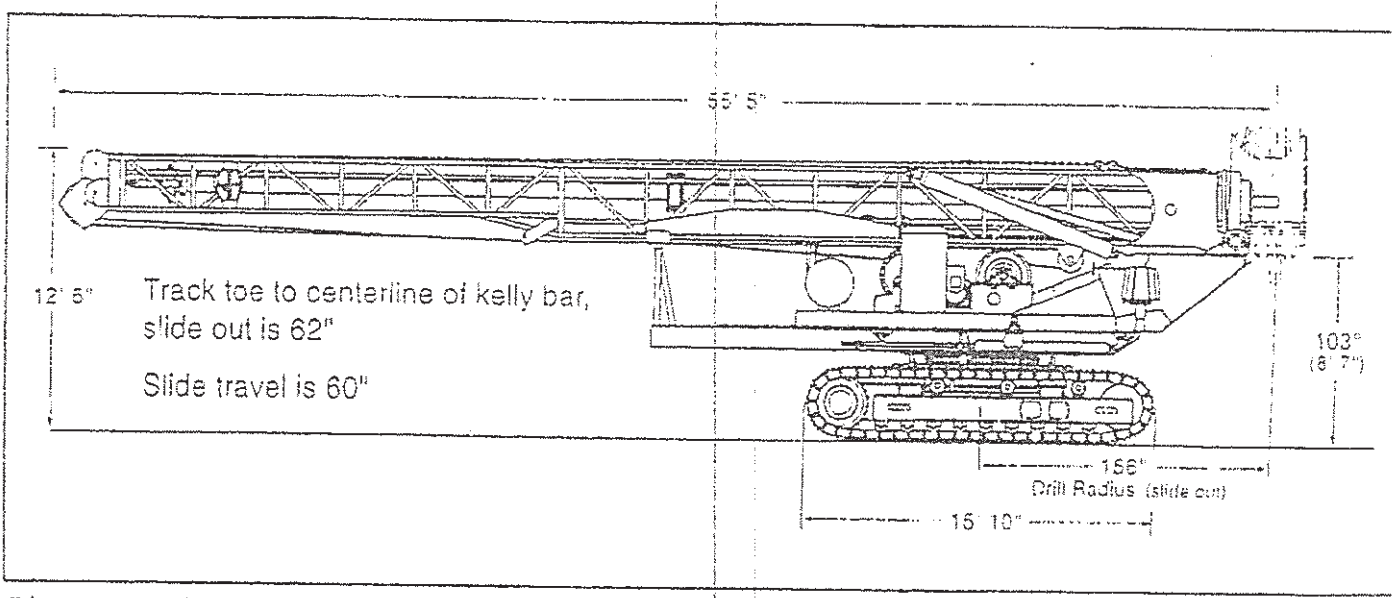
CHARACTERISTICS:
- Power unit: Cummins diesel, Model 6CT8.3 liter, 201 hp
- Transmission: Clark powershift
- Rotary: Double reduction style
- Kellys: 8" outer/6" solid inner
- Hoist: Watson *crane type* hoist with controlled freefall on both inner kelly hoist and freeline. Hoist installation includes a hydraulic power up/power down feature
- Crowd system: crowd force is initiated in the outer kelly operating cylinder located in the derrick structure. Through a system of cable reeving, crowd force pulls down on the outer kelly applying positive crowd to the tool. A special reaction jack installation is incorporated into the rotating frame structure. When activated, the crowd force is balanced to provide maximum production while insuring a straight hole.

Model 3100CM

Dimensions for standard 80' drill depth crawler based drill unit.

Approximate assembled unit weight: 87,000 lbs

Unit width is 11' 11"



Dimensions in feet and inches

WATSON 3100
S/N – 08
S/N – 43
S/N – 56

WEIGHTS:

2'x 14'x 2 = 56

- **TRANSPORT WEIGHT**
  LOWER UNIT – 65,000 LBS.
  DERRICK – 26,000 LBS.

91000/56 = 1.6 KSF

DIMENSIONS:

- **TRANSPORT HEIGHT**
  12' 4" FROM GROUND TO TOP OF PICKIN(
  EYE ON CAB
- **TRANSPORT WIDTH**
  11' 11"
- **TRANSPORT LENGTH**
  24' (LOWER UNIT ONLY)
- **OVERALL LENGTH OF DERRICK**
  55' 5"
- **TOTAL OVERALL HEIGHT BOOMED UP**
  63'
- **MAX DRILLING DEPTH**
  83' (2 BAR KELLY)
  120' (3 BAR KELLY)

WATSON 2500
S/N – 110

WEIGHTS:

- TRANSPORT WEIGHT
  69,660 Lbs.

DIMENSIONS:

- TRANSPORT HEIGHT
  12' 0" (BOOMED DOWN)
- TRANSPORT WIDTH
  10' 0"
- TOTAL WIDTH
  TRACKS EXTENDED: 11' 11"
- TOTAL OVERALL LENGTH
  45" (BOOMED DOWN)
- TOTAL HEIGHT
  51' 3" (GROUND TO TOP OF MAST)
- MAX. DRILLING DEPTH
  63' (DEPENDING ON TOOL USED)

TEXOMA 700
S/N 1007197

WEIGHTS:

- TRANSPORT WEIGHT
  33,880 LBS.
  55,000 LBS-Cat
  Scaled 6/20/08

DIMENSIONS:

- TRANSPORT HEIGHT
  12' 6"
- TRANSOPORT WIDTH
  8'
- TRANSPORT LENGTH
  42' 6"

WORKING DIMENSIONS:

- MAST UP
  33' LONG
  51' HIGH

MAX DRILLING DEPTH:

- 60' + TOOL

SPECIFICATIONS

ENGINE

Model ..... Komatsu SAA6D114E-5*
Type ..... Water-cooled, 4-cycle, direct injection
Aspiration ..... Turbocharged, aftercooled, cooled EGR
Number of cylinders 6
Bore ..... 114 mm **4.49"**
Stroke ..... 144.5 mm **5.69"**
Piston displacement ..... 8.85 ltr **540 in³**
Horsepower:
SAE J1995 ..... Gross 202 kW **271 HP**
ISO 9249 / SAE J1349 ..... Net 192 kW **257 HP**
Rated rpm 1950
Fan drive method for radiator cooling ..... Mechanical
Governor ..... All-speed control, electronic

*EPA Tier 4 Interim and EU stage 3B emissions certified

HYDRAULICS

Type ..... HydrauMind (Hydraulic Mechanical Intelligence New Design) system, closed-center system with load sensing valves and pressure compensated valves
Number of selectable working modes 6
Main pump:
Type ..... Variable displacement piston type
Pumps for ..... Boom, arm, bucket, swing, and travel circuits
Maximum flow ..... 535 ltr/min **141.3 gal/min**
Supply for control circuit ..... Self-reducing valve
Hydraulic motors:
Travel ..... 2 x axial piston motors with parking brake
Swing ..... 1 x axial piston motor with swing holding brake
Relief valve setting:
Implement circuits ..... 37.3 MPa 380 kg/cm² **5,400 psi**
Travel circuit ..... 37.3 MPa 380 kg/cm² **5,400 psi**
Swing circuit ..... 27.9 MPa 285 kg/cm² **4,050 psi**
Pilot circuit ..... 3.2 MPa 33 kg/cm² **470 psi**
Hydraulic cylinders:
(Number of cylinders – bore x stroke x rod diameter)
Boom 2–140 mm x 1480 mm x 100 mm **5.5" x 58.3" x 3.9"**
Arm .... 1–160 mm x 1825 mm x 110 mm **6.3" x 71.9" x 4.3"**
Bucket ..... for 3.2 m **10'5"** and 4.0 m **13'2"** Arms
1–140 mm x 1285 mm x 100 mm **5.5" x 50.6" x 3.9"**
for 2.54 m **8'4"** Arm
1–150 mm x 1285 mm x 110 mm **5.9" x 50.6" x 4.3"**

DRIVES AND BRAKES

Steering control ..... Two levers with pedals
Drive method ..... Hydrostatic
Maximum drawbar pull ..... 290 kN 29570 kg **65,191 lb**
Gradeability ..... 70%, 35°
Maximum travel speed: High ..... 5.5 km/h **3.4 mph**
(Auto-Shift) Mid ..... 4.5 km/h **2.8 mph**
(Auto-Shift) Low ..... 3.2 km/h **2.0 mph**
Service brake ..... Hydraulic lock
Parking brake ..... Mechanical disc brake

SWING SYSTEM

Drive method ..... Hydrostatic
Swing reduction ..... Planetary gear
Swing circle lubrication ..... Grease-bathed
Service brake ..... Hydraulic lock
Holding brake/Swing lock ..... Mechanical disc brake
Swing speed ..... 9.5 rpm
Swing torque ..... 11386 kg•m **82,313 ft lbs**

UNDERCARRIAGE

Center frame ..... X-frame
Track frame ..... Box-section
Seal of track ..... Sealed track
Track adjuster ..... Hydraulic
Number of shoes (each side) 48
Number of carrier rollers (each side) 2
Number of track rollers (each side) 8

COOLANT & LUBRICANT CAPACITY (REFILLING)

Fuel tank ..... 605 ltr **159.8 U.S. gal**
Coolant ..... 37 ltr **9.7 U.S. gal**
Engine ..... 35 ltr **9.2 U.S. gal**
Final drive, each side ..... 9.0 ltr **2.4 U.S. gal**
Swing drive ..... 13.7 ltr **3.6 U.S. gal**
Hydraulic tank ..... 188 ltr **49.7 U.S. gal**
Hydraulic system ..... 365 ltr **96.4 U.S. gal**

OPERATING WEIGHT (APPROXIMATE)

Operating weight includes 6500 mm **21'3"** one-piece HD boom, 3185 mm **10'5"** arm, SAE heaped 1.96 m³ **2.56 yd³** bucket, rated capacity of lubricants, coolant, full fuel tank, operator, and standard equipment.

Triple-Grouser Shoes	Operating Weight	Ground Pressure
700 mm	35,496 kg	0.59 kg/cm²
28"	**78,255 lb**	**8.31 psi**
800 mm	35876 kg	0.52 kg/cm²
31.5"	**79,093 lb**	**7.40 psi**
850 mm	36255 kg	0.50 kg/cm²
33.5"	**79,930 lb**	**7.00 psi**

Component Weights

Arm including bucket cylinder and linkage
3185 mm **10'5"** arm assembly ..... 1761 kg **3,882 lb**
4020 mm **13'2"** arm assembly ..... 1988 kg **4,383 lb**
One piece HD boom including arm cylinder
6500 mm **21'3"** boom assembly ..... 3135 kg **6,912 lb**
Boom cylinders x 2 ..... 259 kg **571 lb**
Counterweight ..... 7090 kg **15,631 lb**
1.96 m³ **2.56 yd³** bucket - 54" width ..... 1554 kg **3,425 lb**

GRADALL®

XL 4100

HYDRAULIC EXCAVATOR

XL 4100

SPECIFICATIONS

Upperstructure Engine

Cummins 6BT5.9 diesel, turbocharged, liquid cooled, 4 cycle, 6 cylinder, 359 cid (5.9L), 4.02" bore x 4.72" stroke (102mm x 120mm), 17.4:1 compression ratio.

150 hp (112kW) max gross at 2000 rpm, 148 hp (110kW) gross at engine gov. speed of 2200 rpm, 138 hp (103kW) net at 2000 rpm, 440 ft.-lb. (597 Nm) gross torque at 1600 rpm.

Altitude capability 10,000' (3050m). Derate 4% per 1000' (305m) above 10,000' (3050m).

Maximum slope: 45°.

12 volt starter, 105 amp alternator, two SAE #C31-S 810 CCA batteries, two-stage dry type air cleaner with centrifugal precleaner, ejector valve and service indicator, spin-on oil filter, spin-on fuel filter/water separator.

Fuel tank capacity: 65 gallons (246L).

Hydraulic System

PUMPS

Main	Two load sensing axial piston pumps; 0-60 GPM (0-227 L/min) each.
Swing	Axial piston pump; 0-16 GPM (0-61 L/min).
Auxiliary	Tandem gear pump for pilot control and cooling circuits; 20.6 GPM (78 L/min).

SYSTEM MONITOR

Electronic monitor in cab indicates low hydraulic fluid level, high hydraulic fluid temperature, and condition of return and suction filters.

SYSTEM SPECIFICATIONS

Four double acting cylinders
- 2 boom hoist: 5.0" ID, 3.0" rod (127mm x 76mm), 26.25" (667mm) stroke.
- 1 tool: 5" ID, 3.0" rod (127mm x 76mm), 18.875" (479mm) stroke.
- 1 telescope: 4" ID, 2.75" rod (102mm x 70mm), 12'6" (3.81m) stroke.

Four hydraulic motors
Swing, 53 hp (39kW); tilt, 26 hp (19kW); Remote Drive 115 hp (86kW), 127 hp. Opt. Engine (95kW).

Operating pressures

Hoist	3900 psi (26,871kPa)
Tilt	2800 psi (19,292kPa)
Swing	5700 psi (39,273kPa)
Tool	4300 psi (29,627kPa)
Telescope	3250 psi (22,393kPa)
Remote Propel	3800 psi (26,183kPa)
Opt. Engine	4200 psi (28,939kPa)
Pilot system	480 psi (3,307kPa)

Oil capacity
Reservoir 75 gallons (284L), system 95 gallons (360 L). Pressurized reservoir with visual oil level gauges.

Filtration system
Combination of 8 micron and 10 micron in-line suction and return filters, plus 10 micron return filter, magnet and 100 mesh strainer in reservoir.

Fin and tube-type oil cooler, with thermal by-pass and relief valves.

Pressure compensated load-sensing valves with circuit reliefs in all valves.

Upperstructure Cab

All-weather cab with tinted safety glass windows, skylight, acoustical lining, four-way adjustable operator's seat, filtered fresh air heater and defroster. Front window slides to overhead storage. Mirrors on both sides of machine.

Controls

Two hydraulic joysticks (hoist & bucket, telescope & swing), one rocker switch (tilt) control upperstructure. Hydraulic joysticks mounted on arm rests, independently adjustable for individual operator comfort and convenience.

Two foot pedals for hydraulic remote control of undercarriage steering, travel and digging brakes.

Joysticks and pedals are self-centering; when controls are released, power for movement disengages and swing and travel brakes set automatically.

Engine controls
Key operated ignition/starter switch, throttle, hour meter and air cleaner condition indicator. Electronic monitor indicates fuel level, low battery charge, coolant level and lube oil pressure, high coolant temperature, and engine rpm.

Swing

Independent closed loop swing circuit with axial piston pump and motor. Planetary transmission.

Swing speed: 8.0 rpm.

Swing brake
Automatic swing parking brake, spring-set hydraulic release. Dynamic braking provided by hydraulic system.

Undercarriage

6x4 or 6x6
Wheelbase: 171" (4.3m)
Frame width: 42" (1070mm)
Gross vehicle axle weight rating:
6 x 4 - 59,200 lb. (26,853 kg)
6 x 6 - 62,000 lb. (28,132 kg)

Engine

Cummins 6BTA5.9 diesel, turbocharged and aftercooled, 4 cycle, 6 cylinder, 359 cid (5.9L), 4.02" bore x 4.72" stroke (102mm x 120mm) 200 hp (149kW) gross at 2500 rpm, 185 hp (138kW) net at 2500 rpm. Throttle stop limited to 2500 rpm hi-idle no load. (200 hp at 2200 rpm loaded.) 600 ft-lb (814Nm) gross torque at 1500 rpm. Altitude capability 9850' (3000m). Derate 4% per 1000' (300m) above 9850' (3000m).

Option Engine
Cummins 6CTA8.3 diesel, turbocharged and aftercooled, 245 hp (183kW) max gross at 2000 rpm, 230 hp (172kW) gross at engine gov. speed of 2200 rpm, 720 ft lb (976Nm) torque at 1500 rpm.

Electrical System
12 volt, 62 amp alternator with integral voltage regulator. Batteries: 2 SAE #C31S 810 CCA

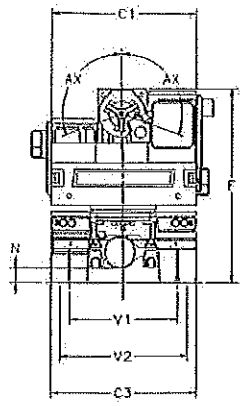
Cooling System
Fin and tube-type radiator. 6-blade 24" (610 mm) fan with shroud.
8-blade fan with optional engine.

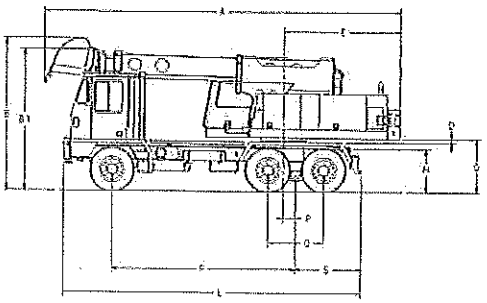
Fuel System
50 Gallon (189L) fuel tank, spin-on fuel filter/water separator.

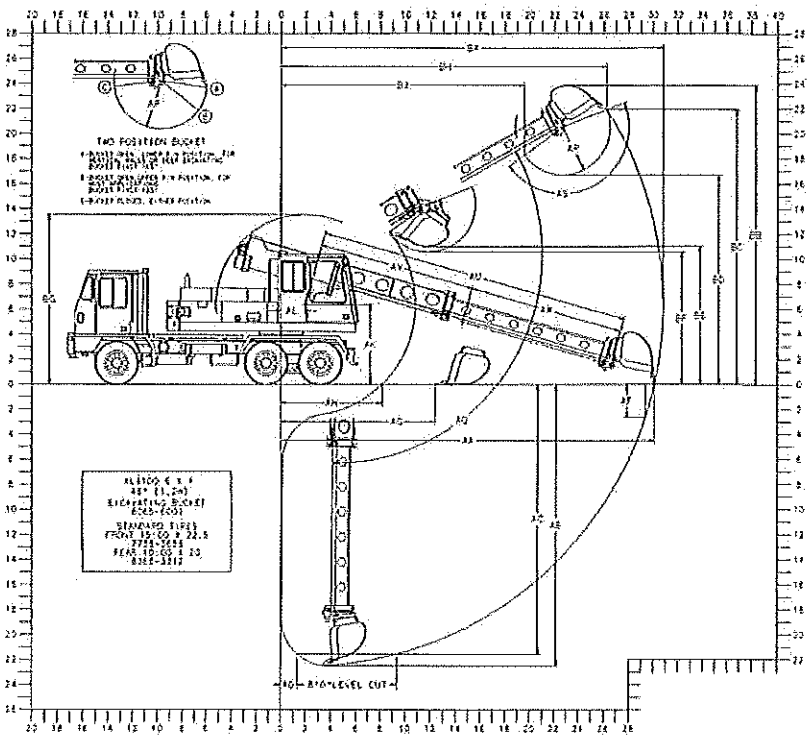
Air Filter
Dry type with service indicator.

Oil Filter
Full flow spin-on element.

Governor
Mechanical.







Shown with 8065-6001 48" (1.22m) excavating bucket

	6 x 4	6 x 6	
A	27' 11" (8.5m)	27' 11" (8.5m)	Overall length (boom in rack) with bucket
B	11' 10" (3.6m)	12' 3" (3.7m)	Overall height (boom in rack) with bucket
B1	10' 11" (3.3m)	11' 4" (3.4m)	Overall height (boom in rack) without bucket
C1	8' 0" (2.4m)	8' 0" (2.4m)	Width of upperstructure
C3	8' 0" (2.4m)	8' 0" (2.4m)	Width of undercarriage
D	4" (100mm)	4" (100mm)	Minimum clearance, upperstructure to undercarriage
E	9' 3" (2.8m)	9' 3" (2.8m)	Swing clearance, rear of upperstructure
F	10' 7" (3.2m)	10' 10" (3.3m)	Top of cradle to ground line
G	50" (1.3m)	53" (1.3m)	Clearance, upperstructure to groundline
H	41" (1m)	44" (1.1m)	Top of wheel mounted under carriage frame to groundline
L	23' 4" (7.1m)	23' 4" (7.1m)	Overall length of undercarriage
N	10" (250mm)	10" (250mm)	Ground clearance (per SAE J1234)
P	11" (280mm)	11" (280m)	Center of rear tandem to axis of rotation
Q	52" (1.3m)	52" (1.3m)	Distance between centers of tandem axles
R	14' 3" (4.3m)	14' 3" (4.3m)	Wheelbase
S	5' 3" (1.6m)	5' 3" (1.6m)	Center of tandem axles to rear of frame (step)
V1	5' 11" (1.8m)	5' 11" (1.8m)	Tread, rear axles
V2	6' 8" (2.0m)	6' 8" (2.0m)	Tread, front axle
AA	30' 1" (9.2m)	30' (9.1m)	Maximum radius at groundline (165° pivot)
AB	22' 6" (6.8m)	22' 2" (6.7m)	Maximum digging depth (165° pivot)
AC	21' 6" (6.6m)	21' 3" (6.5m)	Maximum depth for 8' level cut
AD	16" (400mm)	14" (355mm)	Minimum radius of 8' level cut at depth "AC"
AF	32" (800mm)	30" (762mm)	Maximum depth of vertical wall which can be excavated
AG	12' 4" (3.7m)	12' 0" (3.6m)	Minimum level cut radius with bucket flat on groundline
AH	8' 2" (2.4m)	7' 10" (2.4m)	Minimum radius at groundline
AK	6' 4" (1.9m)	6' 8" (2.0m)	Boom pivot to groundline
AL	22.5" (570mm)	22.5" (570mm)	Boom pivot to axis of rotation
AP	46" (1.2m)	46" (1.2m)	Bucket tooth radius
AQ	30° Up & 90° Down	30° Up & 90° Down	Boom pivot angle
AS	135° & 165°	135° & 165°	Bucket pivot angle
AU	25' 0" (7.6m)	25' 0" (7.6m)	Maximum telescoping boom length (boom pivot to bucket pivot)
AV	12' 6" (3.8m)	12' 6" (3.8m)	Minimum telescoping boom length (boom pivot to bucket pivot)
AW	12' 6" (3.8m)	12' 6" (3.8m)	Telescoping boom travel
AX	110°	110°	Boom tilt angle (both sides to center)
BA	30' 10" (9.4m)	30' 10" (9.4m)	Maximum radius of working equipment (165° pivot)
BB	23' 10" (7.3m)	24' 0" (7.3m)	Maximum height of working equipment
BC	21' 11" (6.7m)	22' 1" (6.7m)	Maximum bucket tooth height
BD	16' 8" (5.0m)	16' 10" (5.1m)	Minimum clearance of bucket teeth, with bucket pivot at maximum height
BE	11' 0" (3.3m)	11' 3" (3.4m)	Minimum clearance of fully curled bucket at maximum boom height (165° pivot)
BF	10' 6" (3.2m)	10' 9" (3.3m)	Minimum clearance of bucket teeth at maximum boom height
BG	13' 6" (4.1m)	13' 10" (4.2m)	Maximum height of working equipment with bucket below groundline
BH	26' 3" (8.0m)	26' 4" (8.0m)	Radius of bucket teeth at maximum height (165° pivot)
BJ	19' 7" (5.9m)	19' 8" (6.0m)	Minimum radius of bucket teeth at maximum bucket pivot height (165° pivot)

Rated bucket tangential force with 36" (914mm) bucket: 18,900 lb. (84kN)
Rated telescoping boom crowd force: 21,650 lb. (96.4kN)

TRAVEL DIMENSIONS
Boom in rack, without bucket-

Overall length:	Overall height:
26' 5" (8.1 m)	6 x 4–10' 11" (3.3m)
	6 x 6–11' 4" (3.5m)

Overall width:
8' 0" (2.4m)

WEIGHT
Approximate working weight, including 36" (914mm) bucket, fuel tanks half full -
6 x 4: 45,660 lb. (20,711kg)
6 x 6: 47,410 lb. (21,505kg)

Specifications subject to change without notice.