Precision Demolition Company

WORLD DEMOLITION AWARDS 2012 WINNER
EXPLOSIVE DEMOLITION AWARD

Method Statement for the Controlled Explosive Demolition of Dorman Long Tower associated with the South Bank Coke Ovens Demolition Works Redcar

Demolition Contractor: **Thompsons of Prudhoe Ltd.**

Explosives Engineers: **Precision Demolition Company Ltd**

Document Issue Control

Issue Number	Date of Issue	Reason for Issue	Issued by
Rev A	6 August 2021	For comment/discussion	J Beatty

INDEX

1.0 Introduction

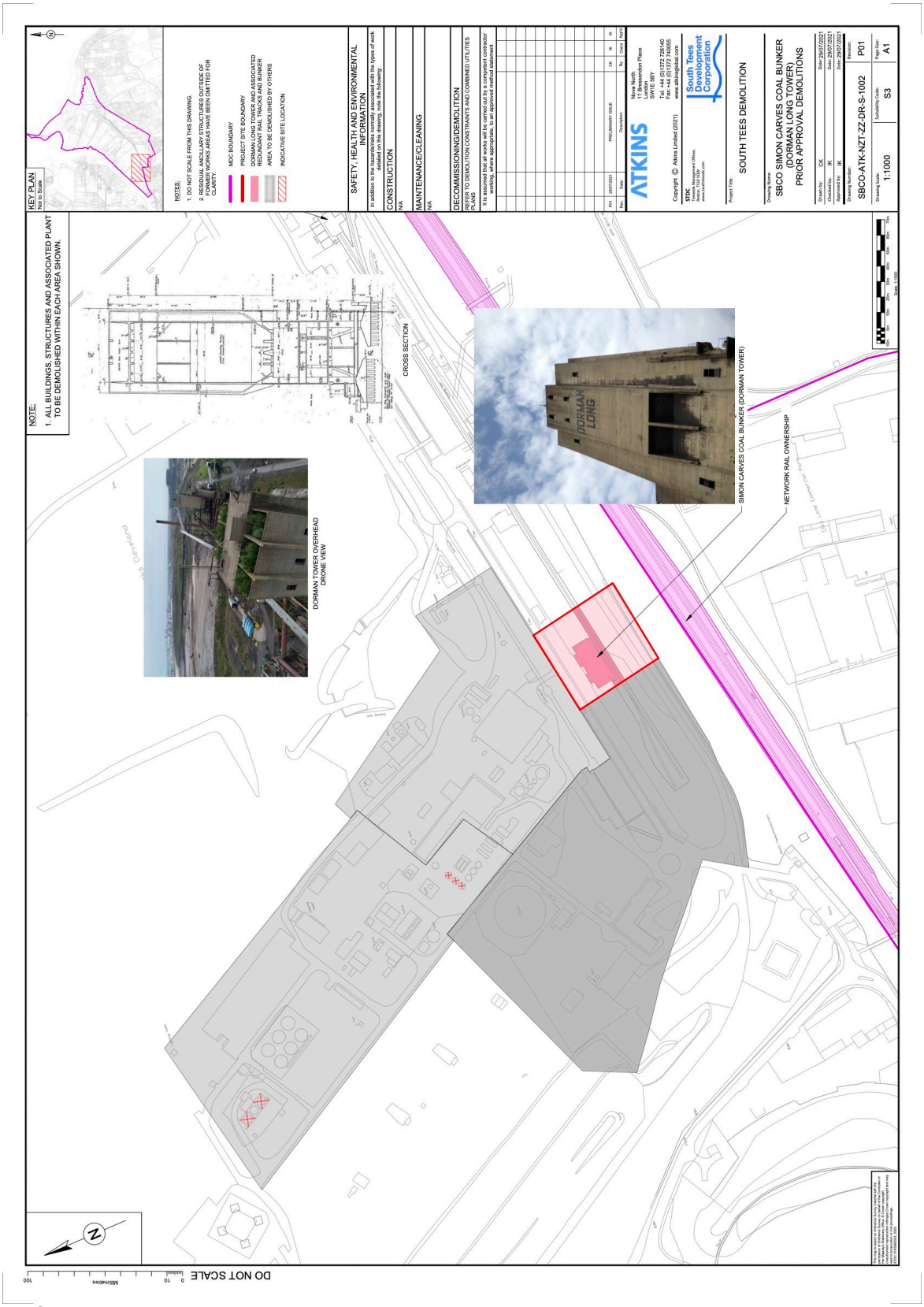
1.1 This document and its contents has been prepared and are intended solely for the use of the controlled explosive demolition of the Dorman Long Tower in relation to the South Bank Coke Ovens Demolition Works, South Tees Development Corporation (STDC) Site, Redcar.

1.2 The structure was part of the Simons Carves development which comprised a number of structures that have previously been or are in the process of being demolished by mechanical means.

1.3 The South Bank Coke Ovens site is located within the STDC site as shown in Sketch 1.1 and is accessible via the South Bank gate off Smiths Dock Road TS6 6UJ, or alternatively via the Lackenby Gate and driving through the site.

Sketch 1.1

1.4 Sketch 1.2 shows the location of Dorman Long Tower within the site.



Sketch 1.2

2.0 Exclusion Zone and Protection of Assets Within the Exclusion Zone

2.1 Exclusion Zone and Protection of Assets

2.2 The exclusion zone is based on two considerations.

- The explosion displacing material in pre-determined directions.
- The spread of ricochet debris as the structure hits the ground. The height and nature of collapse of the structure is clearly a factor.

2.3 The main consideration in the collapse of the Dorman Long Tower is debris fly due to the controlled explosion. Ricochet debris is less of a concern.

2.4 The exclusion zone for material displaced by the explosion is a factor of the likely direction and distance debris will fly. In this instance 150m is considered to be sufficient based on previous experience of the controlled demolition of similar structures.

2.5 Shielding by adjacent structures or topography and/or the introduction of additional protection measures can reduce the exclusion zone further.

2.6 The assets identified within the exclusion zone that will need protecting are live services and Network Rail property. Live services will be confirmed in due course and will be addressed when the information is available.

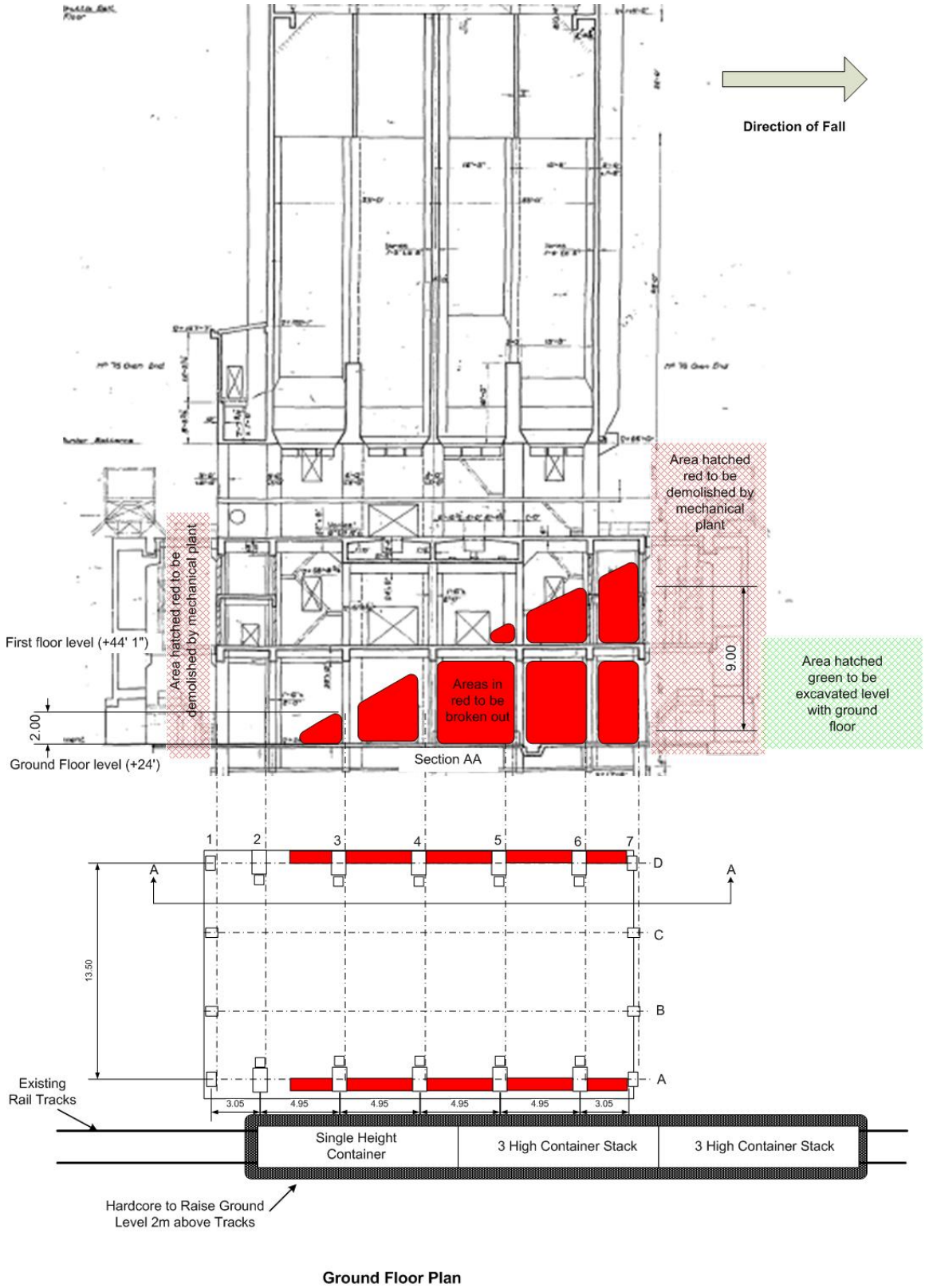
2.7 Network Rail assets lie to the south of the structure and are within the 150m boundary. The protection measures that will be adopted in this instance is the stacking of steel containers to form a wall that will stop debris fly in the direction of Network Rail property.

2.8 Thompsons of Prudhoe will install the protection measure as detailed in Sketch 2.1 below.

2.9 Ground vibration predictions will be provided by PDC Ltd. After a review, and if considered necessary, then monitoring of the ground vibrations during the blast can be undertaken.

2.10 The exclusion zone for the structure is shown in Sketch 2.2 below.

2.11 The plan of the sentry positions will be produced two weeks before the planned date of the blow down.



Ground Floor Plan

Sketch 2.1 Steel containers stacked to contain debris fly.

Sketch 2.2 Dorman Long exclusion zone shown in yellow.

3.0 Dorman Long Tower

Photo 3.1


Dorman Long
Tower
Direction of fall
Bearing 80 degrees
Essentially East

Photo 3.2

3.1 Scope

3.2 Dorman Long Tower is a concrete box structure approximately 17m wide x 22m lg x 56m high. It is estimated to be 5200 tonnes.

3.3 It will be collapsed by removing support on the east elevation together with intermediate support along the north and south elevations proportionally to remove a wedge as shown red on Sketch 6.1, thus causing the structure to rotate east towards Wilputte Bunker.

3.4 It is supported on eighteen concrete columns, as shown also on sketch 6.1

3.5 Material will be displaced over two floors at the east elevation to a height of approximately 9m, decreasing proportionally towards the west elevation.

3.5 It is considered that displacing this amount of material is necessary to ensure continued instability and rotation as shown in Sketch 6.2.

3.6 The concrete panels on the ground floor together with concrete panels on the first floor will be removed by mechanical means during pre-weakening break out as directed.

3.7 There are two elements to the structure that will also be removed by mechanical means during pre-weakening breakout as shown on Sketch 6.1. One element is on each of the east and west elevations.

3.8 **Demolition Preparation**

3.9 Demolish and clear any obstructions in the line of fall of the bunker.

3.10 Mark out the required pre-weakening break out as per Sketches 3.1 and 3.3.

3.11 Carry out the pre-weakening breakout and remove any internal walls as directed by the explosive engineer.

3.12 Notify persons and authorities that may be affected, of the intention to fell the bunker by explosives (already considered under section A). This is to include all stakeholders.

3.13 Prepare and make ready ‘at source’ blast protection. Steel containers can be used to form a wall between railtrack property and the blast area together with suitable lengths of conveyor belt with two oversized holes cut in the top to hang off two lengths of rebar inserted in two predrilled holes above the blast area of each column.

3.14 Mark out the required pre-weakening break out as per Sketches 6.1.

3.15 Set out the drilling pattern as per Sketches 6.3 and commence drilling.

3.16 Note that the drilling is to be carried out off each floor level. Additional height maybe gained using an 600x600 “hop-up” providing it is a suitable distance from any edge, podium or a MEWP.

3.17 A mobile diesel compressor (150 cfm) will be used to power our BBD 15E Pneumatic rock drills and drill rods.

3.18 Place the required explosives, stem and connect them together using detonating cord.

3.19 All explosive materials will be placed on the day that they are delivered to the site. No unplaced explosives will be stored on the site overnight.

3.20 The quantity of explosives required for each shot hole is based on the ratio of the volume of concrete to be displaced with respect to explosive charge weight. This having been based on numerous similar sized concrete structures will ensure that total displacement and total fragmentation of the concrete section is achieved. The explosives engineer will also consider a number of other factors such as the condition of the concrete, the proximity of the hole to a free edge and the presence of debris in the hole at the time of charging.

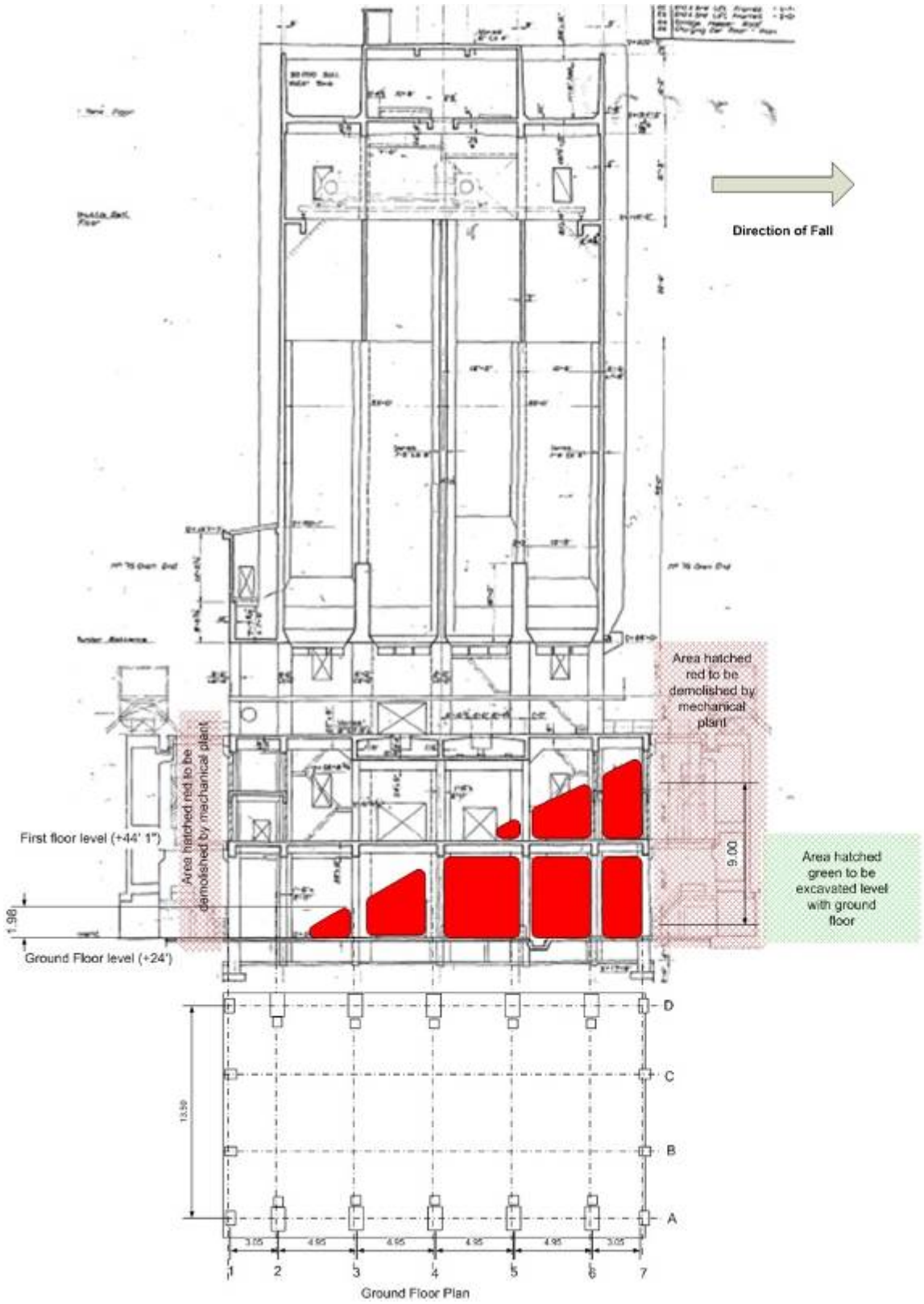
3.21 The charged holes will then be stemmed with Ceramicist fast setting grout and Plystem clay tamped in place with a stemming rod.

3.22 Lay out the starter line / shot firing cable to the control / firing point and make final detonator connections etc.

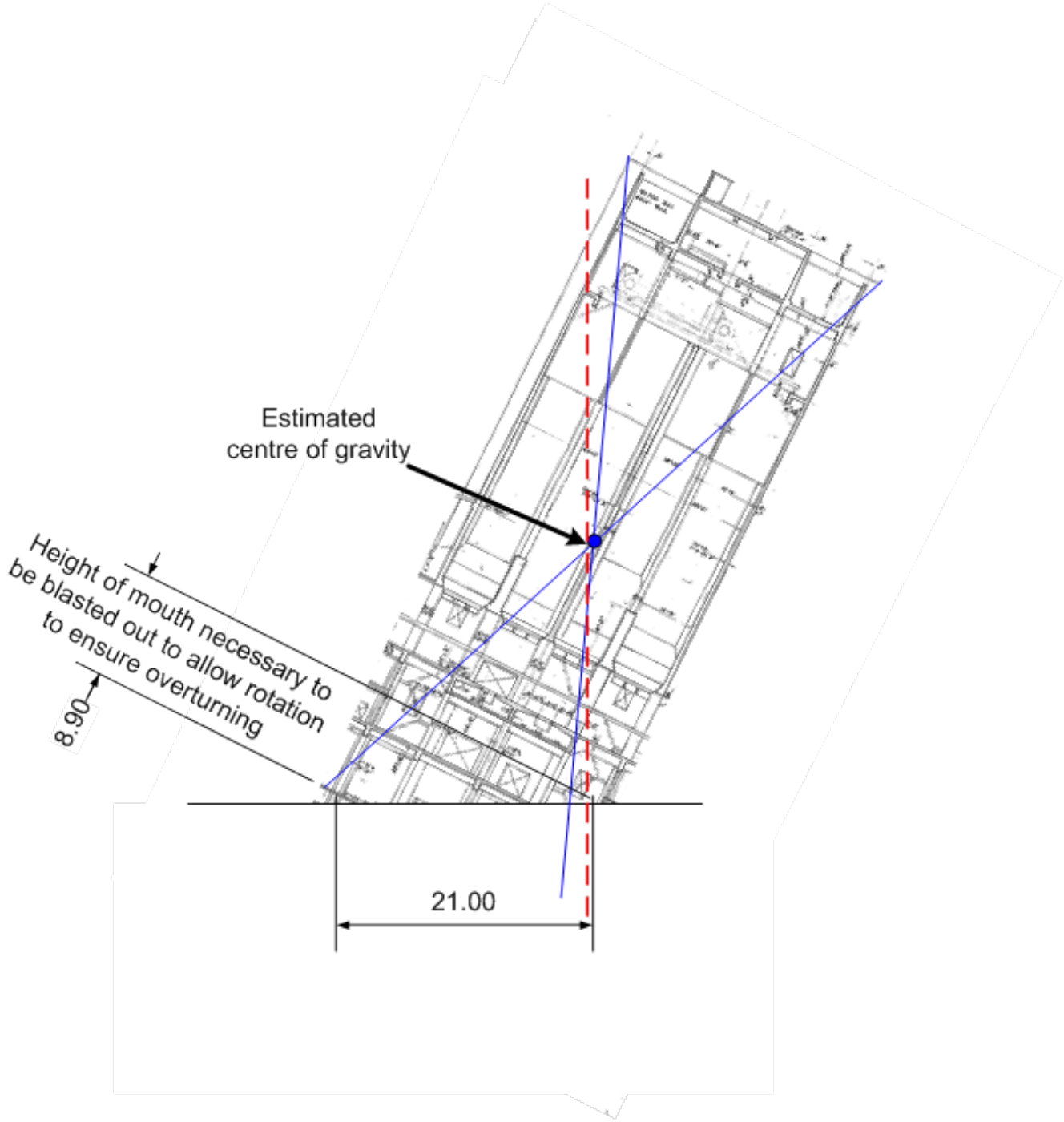
3.23 At the pre-arranged time brief and locate the sentries in their designated positions around the perimeter of the exclusion zone.

3.24 Follow the standard countdown procedure leading to the blowdown.

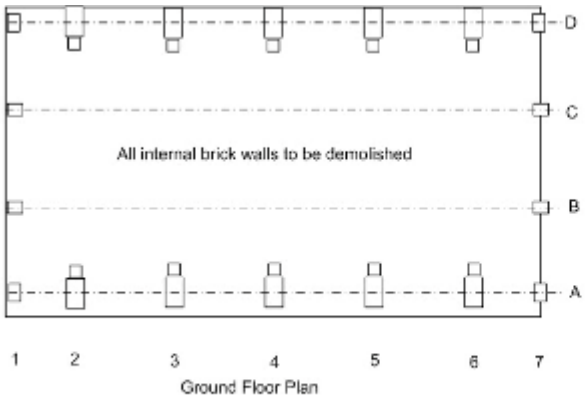
3.25 The detonation will take place subject to confirmation that the exclusion zone is maintained clear of all persons by the Thompsons appointed manager who shall liaise with those authorities and persons who may be affected by the demolition.


Direction of Fall
Area hatched red to be demolished by mechanical plant
Area hatched red to be demolished by mechanical plant
Area hatched green to be excavated level with ground floor
First floor level (+44' 1")
Ground Floor level (+24')
1.98
9.00
13.59
D
C
B
A
1
2
3
4
5
6
7
Ground Floor Plan

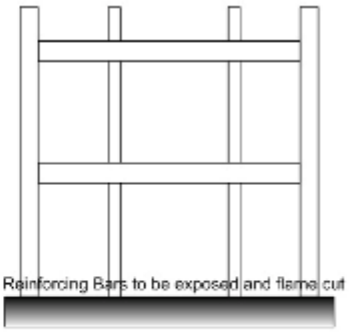
Sketch 3.1


Estimated
centre of gravity
Height of mouth necessary to
be blasted out to allow rotation
to ensure overturning
8.90
21.00

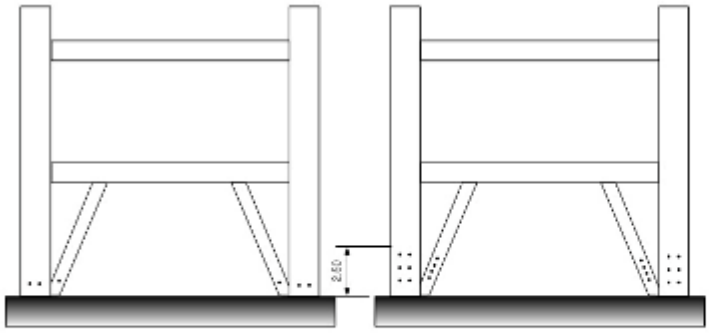
Sketch 3.2



Ground Floor Plan

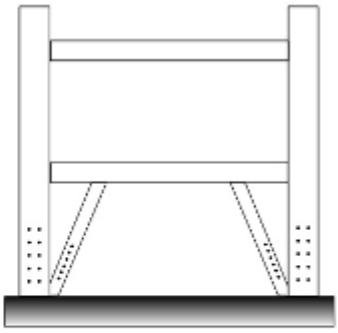


Row 1

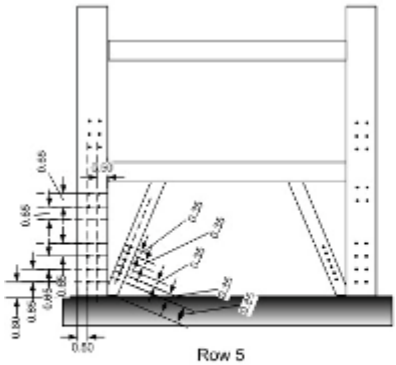


Row 2

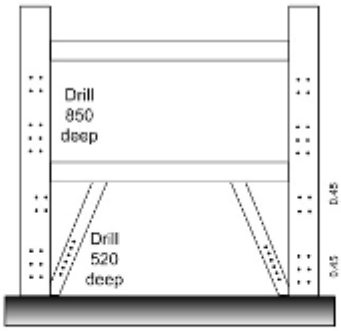
Row 3



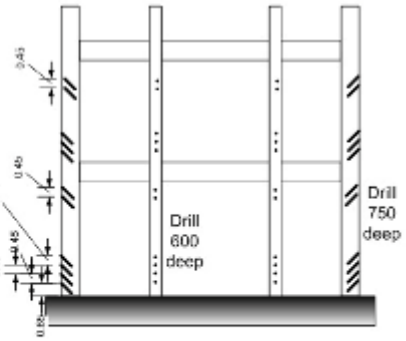
Row 4



Row 5



Row 6



Row 7

All holes 35mm dia

Sketch 3.3

3.26 **Summary of Calculations**

3.27 Consider stability of structure after pre-weakening breakout when the outside walls are removed. The stress in the columns is approximately 2.9 N/mm2 producing an acceptable factor of safety against collapse of 8.5. See table 3.1 below. Therefore OK.

3.28 Rotation east will occur about the base of columns A2 and D2.

3.29 Immediately after blast the weight of the structure rests on these two columns.

3.30 Total area = 2700000mm2

3.31 Weight of structure = 5215 x 1000 x 9.81 = 51159000 N

3.32 Stress immediately after blast = 51159000/2700000 = 18.9 N/mm2

3.33 Assume compressive strength on concrete > 25 N/mm2

3.34 Therefore, rotation will advance prior to any direct compression failure of the columns.

Dorman Long Bunker Leg Stress with Outside Walls Removed.

Estimated Weight			5215	te
		or	51159150	N
Area of Legs at Ground flooer level (Ignoring braces)				
	Depth (mm)	Breadth (mm)	Area (mm²)	
A1	600	900	540000	
A2	900	1500	1350000	
A3	900	1500	1350000	
A4	900	1500	1350000	
A5	900	1500	1350000	
A6	900	1500	1350000	
A7	600	900	540000	
B1	760	600	456000	
B7	760	600	456000	
C1	760	600	456000	
C7	760	600	456000	
D1	600	900	540000	
D2	900	1500	1350000	
D3	900	1500	1350000	
D4	900	1500	1350000	
D5	900	1500	1350000	
D6	900	1500	1350000	
D7	600	900	540000	
		Total Area	17484000	
		Deadload stress	2.9	N/mm²
Take typical compressive stress of structural concrete as			25	N/mm²
Factor of safety		25 / 2.9	=	**8.5**

Wind loading and ecentricity will not significantly effect this sso no further calculations are considered as necessary.

4.0 Misfire and Stand Up Procedures

4.1 Misfire Procedure

4.2 In accordance with the recommendations of BS5607, Safe Use of Explosives in the Construction Industry, a period of at least 5 minutes will be allowed to elapse before the structure is approached following a misfire. The sentries will be instructed to maintain their positions and ensure that the exclusion zone is maintained clear of personnel.

4.3 Prior to the explosive engineer approaching the structure the non-electric main firing tube shall be physically disconnected from the firing device. The explosives engineer will carry out a check on main line connectors from the firing point to the charge positions. This will enable the explosives engineer to identify the failed element(s) of the explosives system. Failed connectors will be replaced and failed detonators will be replaced as appropriate to rectify the problem.

4.4 When the defect has been rectified the forgoing warning and countdown procedure will be repeated and the blast carried out as previously described.

Stand-up procedure.

4.5 A stand-up can be caused by a partial misfire; therefore, this must be checked to establish if any explosive charges have failed to have detonated.

4.6 The appropriate action will be to approach the structure form a safe direction and re-connect remaining circuits as a means to conclude the detonation of explosives.

Two major concerns:

- Allow a reasonable time before approaching the structure in the event that temporary stability has not been achieved. This time is to be at the sole discretion of the structural engineer. (Check the weather forecast for a change of strength or wind direction).
- Any attempt to detonate the remaining explosive charges may necessitate an increased exclusion zone due to loss of protection / explosive charge confinement.

4.7 Should the structure remain standing following all controlled detonations it will be due to support afforded by structural members which have not been effectively displaced by the explosive charges. The location of such supports must be determined and the means of concluding a collapse established, explosively or mechanically in consideration of the safest means available.

4.8 Should the structure only have suffered partial collapse following all controlled detonations, the exclusion zone should be reduced to an appropriate safe distance should there be concerns that it could collapse in an onerous direction.

4.9 Following assessment of the structure a method of concluding the collapse will be discussed and agreed with Thompsons. When agreed this method will be documented prior to implementation. During the course of 7.6 to 7.9 the emergency services and other relevant stake folders are to be kept informed.

4.10 As a minimum the mechanical plant that it is anticipated may be required is a 30 tonne 360º demolition excavator with attachments. This machine and an operator will be available on site for immediate use as required.

4.11 In the event of a partial misfire the structure may or may not still be standing. If the structure is still standing then the possibility of firing the charges must be considered as detailed in 5.5 above.

4.12 If the structure has collapsed as planned but there is reason to believe that a misfire has occurred then the explosives engineer is to carefully inspect the rubble in the area of the suspected misfire. Any charges that can be identified are to be recovered.

4.13 An excavator fitted with a bucket will be used under the direct supervision of the explosives engineer to carefully spread out the debris from the area of the miss fire so that this can be further inspected by the explosives engineer.

4.14 Only once the explosives engineer is satisfied that all explosives have been accounted for will he permit debris clearance to commence.

5.0 Risk Assessments

PROJECT SPECIFIC RISK ASSESSMENT								
Task No	**Task**	**Effects of Hazard**	**Hazard Rating**	**Who /What will be affected.**	**Likelihood Rating**	**Initial Risk**	**Control Measures**	**Residual Risk**
1.	Control of personnel on site.	Difficulty in enforcing exclusion zones. Inability to evacuate site.	Med (2)	People in the locality unofficially entering the site. Operatives in the vicinity of work activities	Med (2)	Med (4)	Work activities to be enclosed with suitable fencing. A pedestrian access gateway should be used. All site personnel (including visitors) are to sign in and off site.	Low (2)
2.	General site activity.	Slips, trips and falls, falling objects, moving vehicles.	Med (2)	Operatives moving around and across site	Med (2)	Med (4)	Good housekeeping to be practiced at all times. Constant vigilance to be used to spot hazards on an ongoing basis. Hi viz vests to be worn.	Low (2)
3.	Work near to chimney base	Falling debris or objects striking personnel	High (3)	Any persons	Med (2)	High (6)	Use of overhead shelter to protect all persons.	Low (2)
4.	Work adjacent to other site operations.	Falling debris striking people, passing vehicles or damaging retained installations.	Med (2)	Operatives and members of the public in vicinity	Med (2)	Med (4)	Work methods to be selected to prevent falling debris. Temporary barriers to be erected. All work to be carried out to the Approved Method Statement	Low (2)
5.	Vehicle Movements.	Damage to vehicles and structures. Injury to site personnel. Crush and physical injury to all parts of body, possible death.	High (3)	Plant, retained structures and personnel.	Med (2)	High (6)	Vehicles to wait until the site manager can arrange for them to be supervised to enter the work area. Banksman to be used when reversing. Vehicles to be only driven by licensed and authorised personnel. Pedestrians to use footpaths where possible, wear high visibility clothing. Always be aware of moving plant and vehicles and know their route.	Med (4)
6.	Placement of explosives	Injury and damage from premature detonation due to inappropriate handling of explosives Adsorption of NG compounds	High (3)	All property and personnel around work area	Med (2)	High (6)	Correct and careful handling of explosives in accordance with BS 5607 by experienced personnel. Machine movements to be supervised by explosives engineers when in close proximity to explosive charges. Use non ferrous tool and wooden tamping rods only. Retain wrapping around NG charges as far as practical. Hold charges around wrapper.	Med (3)

							Provide localised protection to fingers by us of micropore and pvc tape.	
7.	Third party/others	Contact with hazardous demolition activities	High (3)	Occasional visitors to site	Low (1)	Med (3)	Erect barriers and warning signs, operatives restrict entry to all but authorised persons. Sign others on and of site.	Med (3)
8.	Manual handling	Muscular and skeletal injury to back, arm and body.	Med (2)	Operatives handling debris and small items of equipment.	Med (2)	Med (4)	Always employ mechanical lifting equipment where possible, if not possible seek assistance or work in teams as required. Always use the correct lifting technique as trained.	Low (2)
9.	Work in low light levels.	Various injures from unseen hazards.	Med (2)	Small teams of operatives carrying out work activities in dark areas	Med (2)	Med (4)	Either suspend work when daylight fails or install adequate temporary lighting. Site manager to consider during winter months, short day light hours	Low (2
10.	Use of rotary percussive compressed air drilling equipment	Hearing damage and dust inhalation/in eyes**.** Damage from flying hose in event of coupling failure.	Med (2)	Operatives carrying out work and other site personnel within approx 10m	Med (2)	Med (4)	Hours of work / location of work to be sympathetic to nearby residents equipment. 10m exclusion zone to be maintained around work area and warning signs to be displayed. Rotation of duties amongst operatives to reduce individual exposure to vibration. Low vibration tools to be used Operatives to wear goggles or safety glasses Operatives to wear P2 dust masks and ear defenders. Hoses and couplings to be checked before use. All couplings to be fitted with whip checks.	Low (2)
11.	Detonation of Explosives	Noise, Dust, Flying debris / air over pressure, Visual Distraction, Escape of ejecta	High (3)	All personnel within exclusion zone or within view	Med (2)	High (6)	Personnel out side of the exclusion zone, who may be affected by the noise to be given notification warning. Warning siren to be sounded prior to detonation. Exclusion zone to be maintained during blast. Police to be consulted and traffic on adjacent roads to be 'calmed' by police if they deem	Med (3)

							this necessary. Contain / prevent fragments at source by using appropriate explosive charge weight.	
12.	Connections of detonation circuits.	Damage to circuits causing miss fire Electrical storm causing premature detonation	Med	All site personnel	Med (2)	High (6)	No plant to operate near firing lines. All circuits to be inspected prior to firing. Non electric firing system to be used	Low (2)
13.	Plugging explosively charged shot holes with clay etc.	Cut, trapped and grazed fingers/limbs Dislocated thumb / fingers	Med	Explosives engineers	Med (2)	High (6)	When stemming shot holes with clay use non - ferrous metal or timber stemming rod, do not rely on digits. Exercise care when long stemming rods are to be used. Work at a safe distance to ones neighbours.	Med (3)
Residual Risk Rating = Likelihood of Occurrence x Severity of Hazard					**High = 9, 6**	**Medium = 4, 3**	**Low =2, 1**	

Likelihood of Occurrence	***Severity of Hazard***
Low (1) May occur in time. However, hazard exists infrequently or hazardous event occurs very infrequently. Low expectation of occurrence **Medium (2)** Likely to occur in time. Hazard exists intermittently or hazardous event occurs occasionally. It may be useful to define by exclusion, {i.e. clearly not' High' or 'Low' may be the most practical approach **High (3)** Likely to occur imminently or in the very short term. Hazard exists permanently or hazardous event occurs frequently, or much evidence of previous harm.	Low (1) **Hazard resulting in minor injury requiring first aid treatment only. Minor consequential loss potential to both individual and organisation.** **Medium (2)** Hazard capable of resulting in personal injury/illness requiring brief absence from work. Medical attention required. But ... Again, defining by exclusion, i.e. it simply isn't obviously 'High' or 'Low'. **High (3)** Hazard capable of resulting in death, severe injury or illness. Major consequential loss potential to the individual and organisation.

GENERAL	**HAZARDS ARE NUMEROUS AND CAN BE EVERYWHERE THE KEY IS TO REMEMBER YOUR TRAINING.** **TAKE NOTE DURING SITE INDUCTIONS BE EVER VIGILANT AND WATCHFUL, DON'T TAKE CHANCES, IF YOU ARE NOT SURE ASK.** **REPORT ALL NEAR MISSES.** **NEXT TIME IT COULD BE AN ACCIDENT.**

6.0 PPE and Roles / Responsibilities.

6.1 PPE and Roles / Responsibilities.

6.2 The following Personal Protective Equipment (PPE) will be worn as a minimum at all times whilst on site:

- Hard hat (BS EN397 – Thompsons supplied only)
- Light Eye Protection – EN166F
- Overalls or jacket and trousers (with hi-viz panels or hi-viz vest)
- High visibility jacket/vest- EN471 /
- Safety boots (EN20345 Anti-Static - incl. reinforced toe cap and mid-sole)
- Gloves- EN388 – Specific to task

6.3 In addition to the general PPE listed above additional items will be used as required on a task specific basis as specified in the risk assessments contained in Section 6 of this document.

6.4 The work on site will be carried out by an assistant explosive engineer who will have the following responsibilities:

a) Ensure you are aware of and follow the requirements of the Method Statements and related assessments covering the work you are doing – do not work without a Method Statement.
b) Work Safely - this includes using the correct tools and equipment for the job and handling explosives in a suitable manner.
c) Wear designated personal protective clothing and equipment (PPE) provided.
d) Keep the workplace tidy.
e) Know the legal requirements affecting the use of your equipment and ensure that it is used in accordance with those requirements.
f) Ensure that any defect in equipment is reported immediately. Do not continue to operate the equipment if the defect affects its use.
g) Suggest ways to eliminate hazards or improve working methods.
h) Know the location of fire fighting equipment and know how to use it. Keep fire exits clear at all times.
i) Understand the emergency procedures.
j) Know the named First Aider on site and the location of first aid equipment.
k) Over see the pre-weakening work where this is being undertaken by others ensuring that it is carried out accurately.
l) Ensure the progression of the pre-weakening is reported to the site supervisor on a timely basis so that any quality assurance checks they or others may wish to carry out can be undertaken.
m) Cary out drilling of shot holes and other preparations of the structure in accordance with the approved RAMS.
n) Assist the Explosives Engineer with the transport of explosives, placement of charges and connection of the detonating system.

6.5 The Assistant Explosives Engineer will be a person who has been trained in the handling of explosives. They will also be trained to operate Mobile Elevating Work Platforms (MEWPS) and competent to use drilling equipment. They will hold a minimum of either a CCNSG passport to safety or CSCS card for their work category and will also have a minimum of 2 years' experience of working within the explosives demolition industry.

Signature Sheet

Method Statement for the Controlled Explosive Demolition of Dorman Long Tower associated with the South Bank Coke Ovens Demolition Works, Redcar

PDC/SBCO/DL/RevA

Date:

	Name	Signature	Date
Site Supervisor			

Reviews

I confirm I have read and understood this Method Statement and that I must not use alternative working methods or carry out additional work without written authorisation. I will cease work and report immediately to the Site Supervisor if in any doubt.

Name	Date	Signature