

## Design for Explosive Demolition

**Site:** Gelderland Central Power Station

**Document No:** C2002/MM/D002

**Title:** Design for the Demolition of the Electro Filters  
Support Structures using Controlled Explosives.

**Date:** 30<sup>th</sup> September 2021



Document authorisation:

Designer	<div>5.1.2e</div> <div>5.1.2e</div>	<div>5.1.2e</div> <div>Signature</div>	<div>30/09/21</div> <div>Date</div>
Checker	<div>5.1.2e</div> <div>5.1.2e</div>	<div>5.1.2e</div> <div>Signature</div>	<div>30/09/21</div> <div>Date</div>

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### 1.0 CHANGE LOG

Rev	Date	By	Comment
-	30/09/2021	5.1.2e	Initial Issue

## **2.0 OBJECTIVE / PURPOSE OF CALCULATIONS**

The purpose of the following calculations is to determine stability of the reinforced concrete Electro Filters support structures following the proposed alterations to facilitate their demolition with the aid of Controlled Explosives.


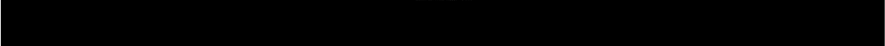
## **3.0 EXECUTIVE SUMMARY**

The calculations confirm that the proposed alterations to the Electro Filters support structures do not adversely affect its stability and the attendant design drawings must be used to prepare the structure for demolition.


## **4.0 BASE DATA USED**

1. Kv.412510: OpStelling E-Filters Groep 13.
2. 0/01/100/5820/5: Elektrofilteranlage.
3. 0/01/111/1230/2: Staubbunker.
4. Site measurements.

## **5.0 DESIGN CODES / STANDARDS USED**

1. NEN3851: 1973 – Technical Principles for the Design and Calculation of Building Structures. TGB 1972 – STEEL.
2.  5.1.2f
3. 

## **6.0 REFERENCES**

1.  5.1.2f

## 7.0 ASSUMPTION LOG

ASSUMPTION LOG			
Ref	Date	By	Assumption
A1	30/09/21	5.1.2e	The concrete density = 24kN/m <sup>3</sup> .
A2	30/09/21	5.1.2e	The concrete strength is 25N/mm <sup>2</sup> .

## 8.0 DESIGN INFORMATION

Building Age	The Electro Filters were built circa late 1970s.
General Loading Conditions	
	Services – N/A.
	Wind loading conditions – basic wind speed 24.5m/s.
Material data	
Static coefficient of friction	N/A

## **9.0        CONDITION**

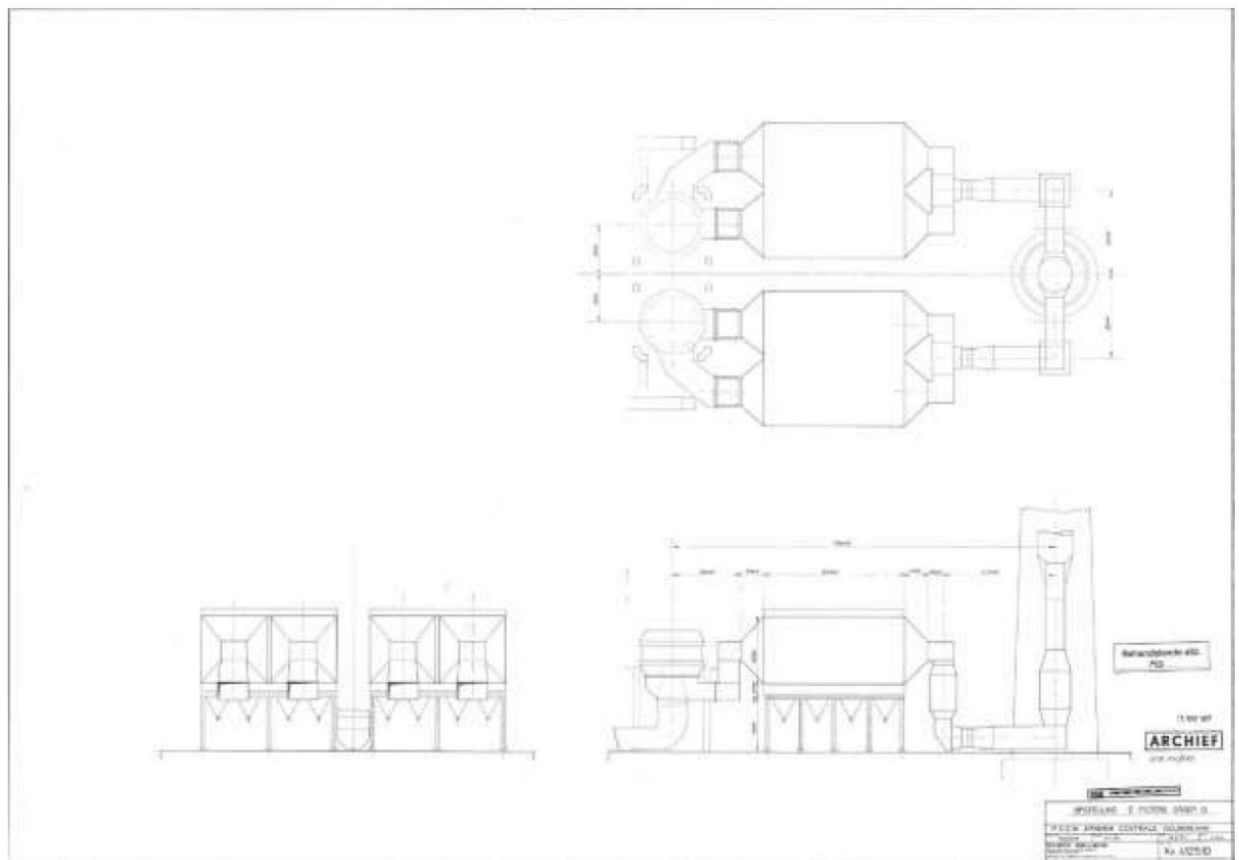
### **The Electro Filters Support Structures.**

B&M have satisfied themselves of the condition of the Electro Filters support structures under consideration and the assessment is going to be undertaken on the basis that the concrete and reinforcement have not suffered any deterioration.

A visual assessment of the structures was conducted on 09/09/2021.

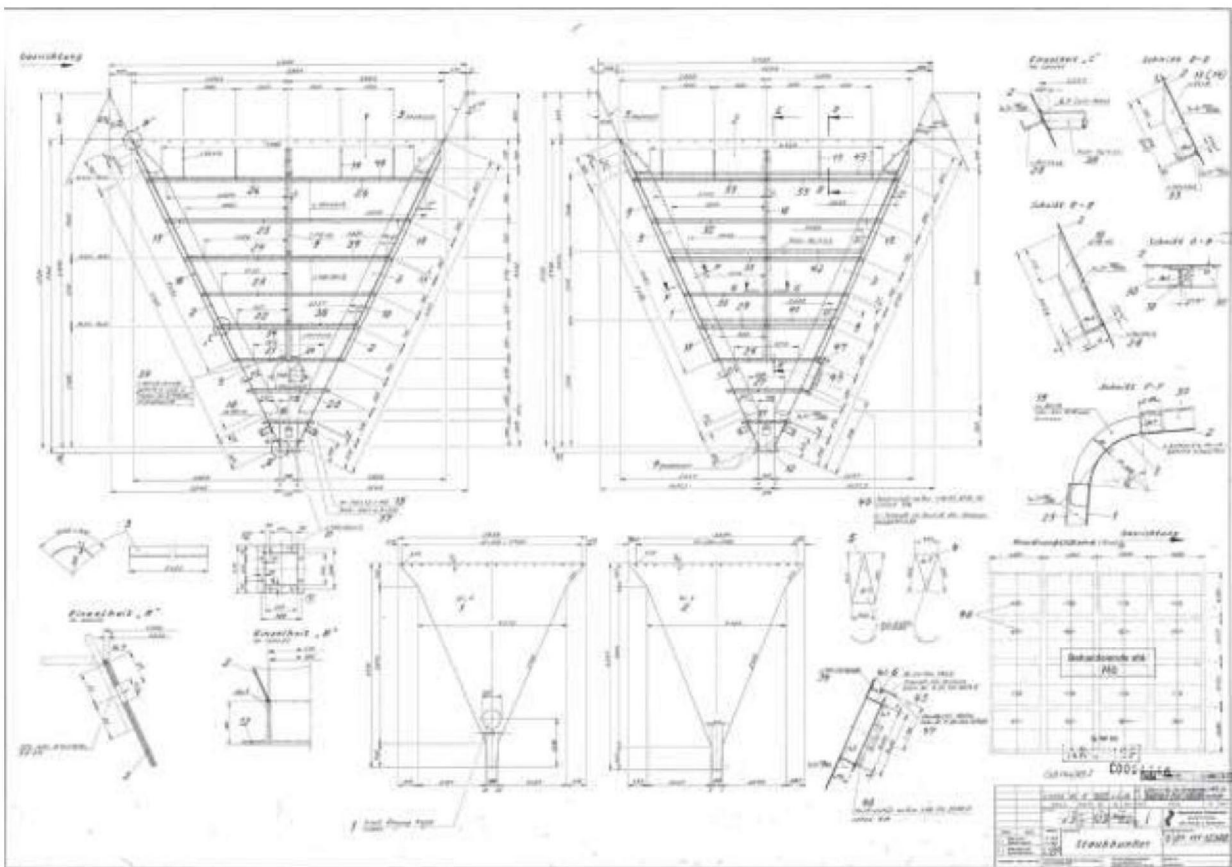
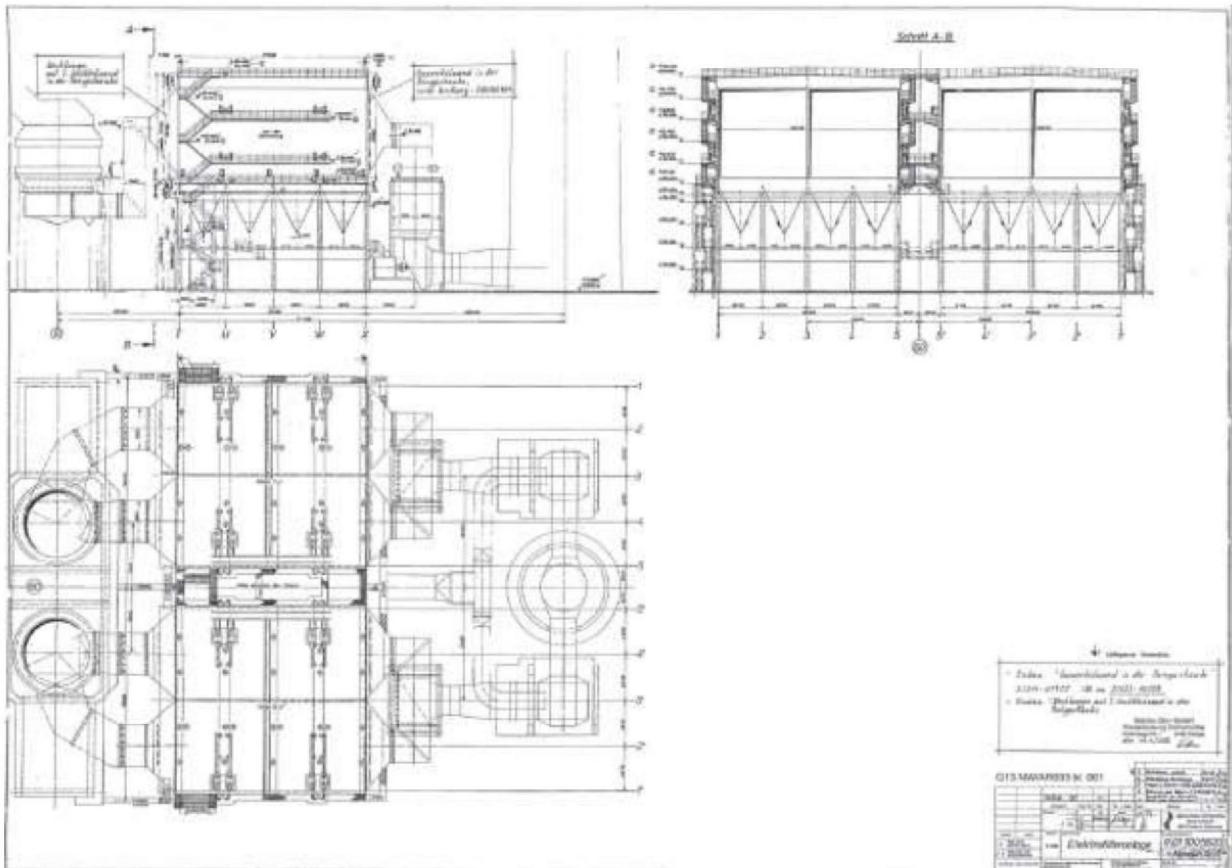
Columns – 600sq and 800sq.  
First Floor Beam size – 1500mm deep.  
Casings' underside Beam size – 1000mm dep.  
Height – approx. 14m.

Footprint plan size – 26m x 27.5m  
Approx. depth of casing = 16m  
Approx. height to top of casings = 31m





## Design for the Demolition of the Electro Filters Support Structures



## 11.0 DESIGN PHILOSOPHY

### 1. Demolition phasing.

Both Electro Filters 1 & 2 supporting structures will be blown down downwards

5.1.2f

### 2. Demolition Strategy.

5.1.2f

### 3. Structural Checks.

The global stability and stresses of the respective structures will be checked in their respective pre-weakened states.


There is going to be minor modifications to the existing structure as all the concrete columns will be drilled with a 5.1.2f mm blind hole to receive the explosive charges.

5.1.2f

5.1.2f


By inspection, the effect of drilling the staggered blind holes on the concrete support structure leading columns will not materially reduce the concrete compressive capacity. No reinforcement bars will be cut during the drilling process and as a result the full tensile capacity is retained. No further checks will be made with respect to this.



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		<b>Part of Structure: Electro Filters Support Structures..</b>				<b>Sheet No./rev.:</b>
		<b>Calc. by:</b> 5.1.2e	<b>Date:</b> 30/09/21	<b>App'd by:</b> 5.1.2e	<b>Date:</b> 30/09/21	
<b>Ref.</b>	<b>Calculations</b>				<b>Output</b>	

## 12.0 CALCULATIONS

BS6399:2	<p><b>WIND LOAD ASSESSMENT.</b></p> <p>The wind load assessment has not been performed because the proposed preparations for the demolition of the Electro Filters Support Structures are minor and do not compromise the existing structural stability of the building.</p>	
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## SELF-WEIGHT ASSESSMENTS.

### Electro Filters Dead Load.

**Note:** At the time of preparing these calculations, the Client did not have any information indicating the weight of the Electro Filters casings.

5.1.2f

*BASE LOADINGS FOR PRECIPITATOR STANS.*

STAN. MK.	A1-3	B1-3	C1-3	D1-3	A1, A3	B1, B3	C1, C3	D1, D3	A2	B2	C2	D2
MAX. DL. ↓	218	308	313	222	109	136	129	100	56	67	66	54
MIN. DL. ↓	16	30.5	30	15	8	15.5	15	7.5	7	14	13.5	7


**DL** refers to **Down Load** and not **Dead Load**.

For the Precipitator support footprint of 14.2 x 14.5m, 205.9m<sup>2</sup>, the minimum vertical load is 179tonnes which is 1790kN.


The Gelderland support footprint is approx. 27.2m x 51.7, 1406.24m<sup>2</sup>,  
 Therefore, the presumed vertical loading for the Gelderland Electro Filters = 1790 x 1406/205.9 = 12225.2, say 12250kN

**Electro Filters weight** onto column 3x = 12250/(17 x 2 X 2) = 180.15kN


Design Load = 1.5 x 180.15 = 270.225, say 275kN

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<b>Ref.</b>	<b>Calculations</b>				<b>Output</b>	

	<p><b>SECTION PROPERTIES' CALCULATIONS.</b></p> <p>Note: Standard sections will be calculated automatically by the analysis software.</p>	
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<b>Ref.</b>	<b>Calculations</b>				<b>Output</b>	

	<p><b>GLOBAL STABILITY</b></p> <p>The structural modifications to the existing structure are very minor and inconsequential with respect to the global structural stability of the Electro Filters Structures.</p> <p><b>Check Sliding.</b></p> <p>By inspection, the structures will not slide after the drilling of the holes and the local cut-outs of the walls.</p> <p><b>Check Overturning.</b></p> <p>By inspection, the structures will not overturn after the drilling of the holes and the local cut-outs of the walls.</p>	
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		<b>Calc. by:</b> MM	<b>Date:</b> 30/09/21	<b>App'd by:</b> SM	<b>Date:</b> 30/09/21	
<b>Ref.</b>	<b>Calculations</b>					<b>Output</b>

	<p><b>CHECK WALL SHEAR STRESS.</b></p> <p>The wall thickness is 300mm. The wall depth is 9500mm. <b>Note</b> – the thicker beam sections have been ignored which is conservative.</p> <p>Self-weight = <math>0.3 \times 9.5 \times 25 = 71.25\text{kN/m}</math></p> <div>5.1.2f</div>	
	<p><b>CHECK WALL FLEXURAL STRESS.</b></p> <div>5.1.2f</div>	
	<p><b>CHECK COLUMN COMPRESSIVE CAPACITY.</b></p> <p>Consider the 800sq columns.</p> <p>The existing cross sectional area = <math>800 \times 800 = 640000\text{mm}^2</math></p> <div>5.1.2f</div>	

### **13.0 DESIGN CONCLUSION SUMMARY**

Having concluded our design calculations we can confirm that the Electro Filters Support Structures remain stable in their temporary state following the proposed alterations to aid their felling with the aid of controlled explosives.

The attendant drawings to be strictly adhered to during the alterations process.

### **14.0 Appendix**

1. Designers Risk Assessment
2. Design Drawings – C2002/D002/DWG001 - 004.



# Appendix 1

## Designers Risk Assessment

**Hazard/Risk Assessment**

Hazard	Hazard Sub Category	Persons at Risk	Initial Risk Rating			Control Measures	Residual Risk Rating		
			S	L	RR		S	L	RR
Disproportionate Collapse caused by accidental loading.	a. Plant	B&M	3	3	9	All plant movement to be controlled and not come closer than 2m from the works (columns and beams) once the structural pre-weakening begins. MEWPs may be exceptions. However, MEWPs should be operated by experienced and authorised personnel only.	3	1	3
	b. Personnel	Contractors	3	3	9		3	1	3
		Others	3	3	9		3	1	3
'Drill' locations which are not readily accessible.	a. Some columns proposed drill locations are not reachable from ground level.	B&M	3	3	9	A safe system of access and egress to be established before any work begins. Suitable fall arrest system to be provided.	3	1	3
		Contractors	3	1	3		3	1	3
		Others	3	1	3		3	1	3
Gust wind speed exceeding 40m/s.		B&M	3	3	9	The structural stability of the building will not be compromised beyond the 40m/s wind speed and up to the designed wind speed. This measure is purely precautionary to protect personnel from windborne debris.  All operations to be stopped and the premises vacated immediately should the limit be exceeded.	3	1	3
		Contractors	3	3	9		3	1	3
		Others	3	3	9		3	1	3
Snow Loading during pre-weakening.	The Electro Filters support structures have not been assessed for snow loading	B&M	3	3	9	The proposed alterations do not diminish the structural stability in any meaningful way and therefore should continue to perform satisfactorily. However, as a precautionary measure, work should be stopped should snow fall exceeding 800mm occur after pre-weakening commences. Any exceedance of the snow fall limit should be communicated to the Designer to facilitate further assessments before work proceeds.	3	1	3
		Contractors	3	3	9		3	1	3
		Others	3	3	9		3	1	3
Destabilising the CG13 Denox Structure.	Two legs of the Denox are within 3m of the Electro Filters. The risk of the collapsing Electro Filters causing damage to the Denox is assessed.	B&M	3	1	3	The risk of the Electro Filters damaging the Denox on collapse is very small because the Electro Filters are expected to collapse vertically. The casing is not expected to disintegrate. The concrete structure is expected to disintegrate but should not cause damage to the Denox. 5.1.2f	3	1	3
		Contractors	3	1	3		3	1	3
		Others	3	1	3		3	1	3

**Severity**

**Likelihood**

1 – Minor accident (First Aid)	2 – Major accident (RIDDOR)	3 – Fatality	1 - Low	2 – Medium	3 – High
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**Risk Rating & Control & Monitoring Protocols**

1-2: Work may proceed in accordance with Brown and Masons policy and procedures	3-4: Work may proceed providing stringent control measures have been implemented (e.g. permit to work, monitoring, etc.)	6-9: The work cannot commence until alternative method of work or additional control measures implemented
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## Appendix 2

Design Drawings – C2002/D002/DWG001 - 004.

18 - 21

5.1.2f