Project	ISOSCAFF UNIVERSAL SCAFFOLDING PROTECTION SYSTEM
Document	REPORT 01 BUILDING TECHNICAL CONDITIONS

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1. General

1.1. Assignment

The clients have asked me to investigate the Isocaff: universal scaffold protection system. The assignment includes providing the basic documentation of the roof and wall system. Inspection of the underlying structure and surface is not part of my assignment and should be carried out by third parties.

1.2. Project description

The Isocaff system is used to temporarily protect buildings and objects.

1.3. Uitgangspunten

The calculation of the construction is based on the following standards and guidelines: European directives

NEN-EN 12810 Facade scaffolds, manufactured from prefabricated components.
NEN-EN 12811 Scaffolds, performance and general design.
NEN-EN 12812 Temporary structures for construction sites.
NEN-EN 1991 Loads on structures, part 1-4 wind loads
NEN-EN 1993 Design and calculation of steel structures

Assumption class
The temporary structure formally belongs to CC2.

Documentation

- Supplier documentation
- Properties of polycarbonate
- Hardness and mechanical properties
- Alloy description data sheet
- Relationship and DIN standard data sheet
- Data sheet 05 F25
- Isocaff document
- Isocaff brochure
- Patent report

1.4. Summary

I In this report, a summary is given of the constructional possibilities of the system.

What do we know?

- The system is translucent.
- Good insulation for heat and sound.
- The system has been tested for impact resistance and bullet resistance, showing protective properties.
- The system is strong, with test results showing a load capacity of up to 2.4 kN/m2.
- The system consists of a limited number of components and is easy to apply.
- The system is patented.

INTERNAL

What don't we know?

- How the system performs under extreme conditions, such as water resistance.
- How the polycarbonate plates behave. From a static perspective, they are more likely to sag than break. The consequences of sagging are unknown.
- The load-bearing capacity of the system under normal conditions.
- The substructure on which the system is placed. This is always dependent on third parties and is decisive for the roof structure. The achievable span, therefore, depends on the temporary support structure.
- The dust tightness of the system. This can be achieved with extra measures.

Project-based

This report provides the constructional conditions mathematically, assuming a proper substructure. It is recommended to always analyze the construction project-based.

2. Configuration

2.1. Drawings

This report was prepared, based on drawing: 01

2.2. System discription

The system is always installed on a structural substrate. The substructure is outside the scope of this analysis.

System
This system consists of aluminum profiles with polycarbonate sheeting placed in between. These profiles can be installed horizontally, vertically, or flat. The system is attached to the scaffold pipes of the underlying structure using spacers. Standard 2 per aluminum profile and 3 for extra load. See also the support table.

Aluminum supports: central profiles, distribution beams, and corner profiles.

Sheets
16 mm thick polycarbonate plastic sheets. The size of the plastic sheets has a length of 1000 mm, which increases in steps of 500 mm up to 3000 mm.

Load capacity
This varies and depends on how the sheets are installed: 2-sided, 3-sided, or 4-sided supported.

Roof
If the system is used as a roof, it should be installed in a tile-like pattern. A slope of between 5 and 10 degrees is recommended.

Anchoring
The roof structure is connected to the underlying structure using an M10 bolt and a half-coupling.
Type 1: 2-sided supported sheets (calculated and tested)
Type 2: 3-sided supported sheets (not calculated and tested)
Type 3: 4-sided supported sheets (tested)
Type 4: half sheets (width = 500 mm) (innovative!)et systeem wordt altijd geplaatst op een constructieve ondergrond. De onderconstructie valt buiten deze analyse.

2.3. Stability

Roofingconstruction The roof structure is placed on a completely stable frame.

3. LOADS

3.1. General

The scaffold structure is loaded with permanent load (the weight of the structure itself) and variable load (snow load). The wind load is undefined and needs to be project-specifically verified. These loads are processed in the calculation by means of combinations.

3.2. Permanent load

A permanent load of 0.25 kN/m2 is used in the roof area calculation.

3.3. Variable load

The following representative variable load is taken into account:

Snow	0,56	kN/m_2
Variable load (1)	1,0	kN/m_2
Variable load (2)	1,5	kN/m_2

3.4. Variable load 2 – sided plates

Snow load:
The panels have been checked (calculated and tested) for a variable load of 0.56 kN/m2.
The panels have been tested with a load of 1.0 kN/m2 (1.0 / 1.5 = 0.67 kN/m2).

3.5. Variable load 4 – sided plates

Variable load:
The aluminum structure has been tested up to a variable load of 2.46kN/m2.
This corresponds with a representative load of 2.46 / 1.5 = 1.64 kN/m2.

3.6. Wind loads

De windbelasting wordt berekend aan de hand van EN 1991-1-4 en wordt middels puntlasten en q-lasten op de steiger geplaatst. De windbelasting dient per steiger locatie en bebouwdheidsklasse bepaald te worden. De windbelasting dient projectmatig gecontroleerd te worden.

3.7. Combinations

We calculate using the serviceability state and the out-of-service state. The combinations are (partially) based on NEN-EN 12811.

We calculate using the following combinations:

	Permanent load	Variable load
Combination 1	1,2	1,5

4. Capacity

4.1. General

The failure values of the materials are determined based on the factory properties of Polycarbonate sheet and aluminum.

4.2. Test

In annex A, the results of the tests are presented. The construction was tested uniformly up to a load of 2.64 N/m2.
The results show that the plates deflect but do not fail.
This means that the plates can be used with a maximum representative load of 2.64/1.5 = 1.64 kN/m2.

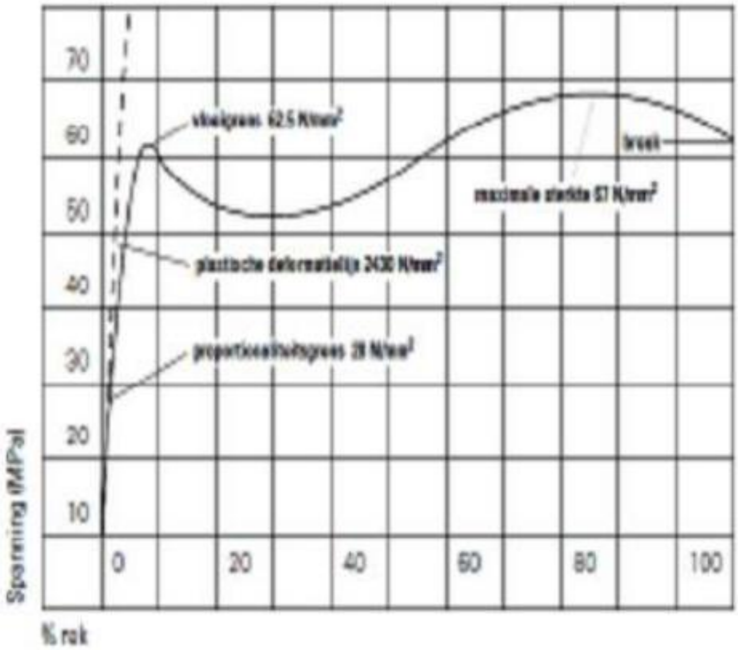
4.3. Plates

The supplier's data and documentation, as well as the following profile properties, are used. The plates have been tested for impact resistance and bullet resistance (see supplier documentation). Attachment A provides a calculation of the Polycarbonate plate based on its properties. It is determined that deflection is the controlling factor, but the consequences are not determined.

Polycarbonate plates:
- The thickness is 16 mm (the plates are not solid); the calculation assumes 2/3 x t.
- The maximum unsupported length is 1000 mm (type 4 differs).

The plate is supported by the aluminum profiles.

The material's yield strength is 62.5 N/mm2.
The elastic modulus of polycarbonate is 2200 N/mm2.



4.4. Aluminium profile

The following profile and manufacturer data are assumed:
Assuming a yield strength of 160 N/mm2 and a material factor of 1.1,
the moment capacity is 0.51 kNm.

Ix−x=	43514 mm ^{4}
Iy−y=	209243 mm ^{4}
Wx−x=	3531 mm ^{3}
Wy−y=	5696 mm ^{3}

In Annex B, the calculation results of the aluminum profile are provided. The profile was tested with a service load of 1.5 kN/m2.

The profile can be loaded according to the table below:

Q [kN/m2]	L (mm)
0,56	1950
1	1500
1,5	1300

Example
When used up to 1.0 kN/m2, the profile should be supported at intervals of 1.5 meters.

4.5. Profile properties

The table below provides an overview of the profile properties. For the polycarbonate plate, a working height of 2/3 of the height (16.0 mm) has been assumed.

buis	Thickness [mm]	f_y [N/mm2]*	y_m = 1,1	$M_{y;d}$ [kNm]	I_y [mm4]	W_y [mm3]	E [N/mm2]
Polycarbonate	16	62,5	56,8		137675,75	28444,44	2200
Alu profile	-	160	145,5	0,51	115856,50	3531,00	160000
*by y_m = 1,1							

5. APPENDICES

BIJLAGE A POLYCARBONAAT PLAAT T = 16 MM (werkende hoogte 2/3 x t)

In deze bijlage is de plaat berekend met sneeuwbelasting.

Profielgegevens:		
type:		
materiaalkwaliteit:	S62,5	
lengte:	1,00	m

Belastingopgave

permanent	overig	0,1	kN/m²
	Totaal	0,10	kN/m²
	belaste breedte:	1,00	m
permanent representatief:		0,10	kN/m
totaal permanent representatief:		0,10	kN/m
nuttig:	werkbelasting:	0,56	kN/m²
	belaste breedte:	1,00	m
totaal nuttig representatief:		0,56	kN/m
factor:	permanent:	1,2	
factor:	nuttig:	1,5	
Totaal representatief (lijnlast):		0,66	kN/m
Totaal rekenwaarde (lijnlast):		0,96	kN/m

Controle volgens Eurocode

Het optredend moment bedraagt:	0,12	kNm
Optredende dwarskracht:	0,48	kN
Opneembaar moment:	1,08	kNm
De opneembare dwarskracht:	2,00	
Doorbuiging:	38,62	mm
Unity-check moment	**0,11**	
Unity-check dwarskracht	**0,24**	

BIJLAGE B ALU PROFIEL

Het aluminium profiel wordt gecontroleerd uitgaande van een verticale nuttige belasting van 1,50 kN/m2.

Profielgegevens:		
type:		
materiaalkwaliteit:	S160	
lengte:	1,30	m

Belastingopgave

permanent	overig	0,2	kN/m²
	Totaal	0,20	kN/m²
	belaste breedte:	1,00	m
permanent representatief:		0,20	kN/m
totaal permanent representatief:		0,20	kN/m
nuttig:	werkbelasting:	1,50	kN/m²
	belaste breedte:	1,00	m
totaal nuttig representatief:		1,50	kN/m
factor:	permanent:	1,2	
factor:	nuttig:	1,5	
Totaal representatief (lijnlast):		1,70	kN/m
Totaal rekenwaarde (lijnlast):		2,49	kN/m

Controle volgens Eurocode

Het optredend moment bedraagt:	0,53	kNm
Optredende dwarskracht:	1,62	kN
Opneembaar moment:	0,51	kNm
De opneembare dwarskracht:	10,00	
Doorbuiging:	9,08	mm
Unity-check moment	**1,02**	
Unity-check dwarskracht	**0,16**	