FALL PROTECTION
and
GREENHOUSE INSTALLATION GUIDELINES

for

Havecon North America Inc.
Greenhouse Projects
Niagara-on-the-lake, ON

Fall Protection Guidelines	**FPG**	**0**	**10-Apr-19**
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This Fall Protection Guidelines has been prepared for the exclusive use of Havecon North America Inc. Greenhouse Projects, Niagara-on-the-lake, Ontario, Canada.

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Fall protection and fall protection devices are a mandatory part of Provincial Occupational Health and Safety Legislation. Legislation does not prescribe methods to be used but does require erectors to provide safe erection procedures and safety devices for worker protection. These safety devices are required to prevent a fall and to minimize the distance the worker falls, in the event the person slips from the steel being erected.

1. SCOPE

These guidelines cover the erection of greenhouse and support building structures, and roof glazing and insulated panel systems, Appendix A and Appendix B respectively. These appendices cover specific details for the erection of the greenhouse and support building structures, and roof glazing and insulated panel systems.

2. PROCEDURES

To ensure the risk of a fall and injury, or death of a person is minimized, proper equipment and procedures must be followed. The proper use and installation of equipment shall be followed as described in the appendices:

1. Before use and installation, all equipment shall be inspected to verify that all components are functional. Any defective components shall be clearly marked and shall not be used until repaired;
2. For the erection of greenhouse and support building structures: refer to Appendix A;
3. For the installation of glass roofing and insulated panel system: refer to Appendix B; and
4. For the Rescue Plan: reference Appendix C.

Though not essential to the safe erection of the steel is the site preparation, off-loading and staging of construction materials, and the installation of the foundation. Instructions for this work is included in Appendix D.

3. SUMMARY

Providing the equipment is properly inspected and maintained, the equipment should function as designed. With proper use of the fall arrest equipment, and procedures and personal safety equipment, the risk of injury or death from a fall is minimized.

Respectfully Submitted

GS Engineering Consultants Inc.

Albert Schepers, P.Eng.

APPENDIX A

Greenhouse Structure Installation

A.1 SCOPE

These guidelines describe the safety procedures and devices to be used for the erection of greenhouse superstructures for Havecon North America Inc. (Havecon) Greenhouse Projects. Each person is responsible for using the appropriate safety equipment and the site supervisor is responsible for the work crew. To this end, these guidelines are written, reviewed, and updated to CSA Z259.16-2015 to assist all personnel in job site safety. These guidelines cover the fall arrest safety procedures for greenhouse structure installation.

Notwithstanding the requirements for fall arrest devices, the steel shall be detailed as best as possible so that each structural component may be installed and secured independent of other members. These guidelines deal with only the site fall protection safety procedures of Havecon Greenhouse Projects.

A.2 EQUIPMENT

General and personal fall arrest equipment are covered by this guideline. A general type of equipment is an elevated work platform (EWP) in the form of a track-based, self-levelling, scissor lift, which shall be used along with personal worker safety equipment. This equipment, when used properly, provides the necessary safety for person using the equipment. The underlying assumption is that the equipment is properly installed, maintained, and used.

The equipment shall be used with the following guidelines:

- Fall protection shall conform to the Ontario Occupational Health;
- All work at heights shall be done with the use of a CSA approved scissor lift;
- Scissor lift operation manual shall be present and readily available for viewing always during use of the equipment; and
- At all times the scissor lift shall be operated within its safe parameters as indicated in the lift equipment operation manual.

A.2.1 General Scissor Lift Operation and Fall Arrest

Workers shall be familiar with, and properly trained on, the safety features and operation of the scissor lift before use. All workers who use a scissor lift shall be equipped with and wear a travel restraint fall arrest system consisting of a CSA approved full body harness and lanyard tied off to a designated anchor location on the lift with a minimum capacity of 16kN (3600lbs). All workers using a scissor lift must always remain within the guard rails of the lift during its operation and shall not stand on the rails of the guards to perform work.

A.2.2 Fall Arrest Accessories

Besides the equipment described in the preceding paragraphs the following equipment shall be used:

- Elevated Work Platform (scissor lift), CSA approved;
- CSA approved full-body harness;
- CSA approved travel restraint lanyard; and
- Any other personal safety gear required for the job such as safety shoes, gloves, safety glasses, hard hat, etc.

A.3 PROCEDURES

To ensure that the risk of a fall and injury or death of a person is minimized, proper equipment and procedures must be followed. Safety equipment shall be properly used as described and the following procedures used by all persons as follows:

1. Before use, the supervisor shall verify that the equipment is in safe working order. Any improperly installed or damaged equipment shall be replaced or repaired as required.

2. All persons shall properly use personnel safety equipment as dictated by the job site including:

- CSA approved safety glasses;
- CSA approved safety shoes;
- CSA approved hard hat;
- CSA approved full-body harness, and;
- CSA approved lanyard.

3. Sequencing of the installation of greenhouse and support building structural steel shall be as per the Havecon Instructions included with this Appendix and generally follows:

- Site shall be graded as to level as per the site plan design drawings;
- All caisson footings for the greenhouse columns shall be drilled and cast as per the approved foundation plan;
- Column stub posts shall be set into the poured concrete caissons, plumb, and to correct line and levels;
- Starting near the centre of the greenhouse along the proposed braced bay, two column frames are built on the ground;
- Using a crane, boom truck, or extended boom fork-lift the two connected frames are lifted into place and connected together by the gutters by workers from the safety of the scissor lift;
- The two erected and connected frames are plumbed and braced and bolts are tightened;
- Moving in each direction from the erected frames, the entire braced bay is completed in the same manner to the end gables side walls;
- The greenhouse bays to either side of the erected braced bay are completed in the same manner; and
- Girts are connected around the side walls of the erected frames.

4. In the event of an injury or falling, all work shall cease until the person is rescued and the cause determined. See Appendix C for Rescue Plan.

5. At the completion of the job, all personnel safety equipment and lanyards shall be removed, inspected, and properly stored. Any equipment that is found to be damaged shall be discarded and replaced as required.

6. At no time shall more than one erector be secured to any single anchor location on the scissor lift or lifeline.

A.4 SUMMARY

The equipment and procedures are for the safety of the worker. Proper installation, maintenance, and use is the responsibility of each person. Havecon Greenhouse Projects, through their site supervisor, must train and verify that each person understands these procedures before they are allowed to erect the structure. This training should be reinforced from time-to-time with Job Site Tool Box Talks. Any questions related to the proper installation, maintenance, and use shall be directed to Havecon Greenhouse Projects through their site superintendent.

Providing the equipment is properly inspected and maintained, the equipment should function as designed. With proper use of the fall arrest equipment, procedures, and personal safety equipment, the risk of injury or death is minimized.

Havecon Steel construction - Instruction

Handbook

Content

1. Work prior to steel construction

- **Design**
- **Field measurements**
- **Construction site facility's**
- **Loading / unloading of materials**
- **Risk analysis**
- **Foundation**

1.1 General description of steel construction

The first part of constructing is the steel construction, existing of columns, trellis and brace bars. Also the gutters are installed in this process, as they are part of the main construction. The gutters are made of aluminium.

There is a lot of movement going on while the construction starts: Manitou's, IHI construction machines and scissor lifts are on the move. Manitou's supply the materials and the other machines, each operated by a Foreman of every crew, work together to build the greenhouse in an efficient but safe way.

This process is a step by step process and workers are well trained for the job. They learned how to work in the most efficient and most safe way. Having a unexperienced crew member on one of the machines can not only jeopardize the schedule, but can also result in serious injuries to the crew.

1.2 Roles

Export manager (office) General
The Export manager is responsible for keeping the whole team up to date about the status. The role of the export manger is to process the information he gets from the project leader and to communicate with all teams working together on site. The Export manager monitors the schedule.

Project leader (field) General
The project leader communicates closely with the Foreman of all crews and contractors. Everyday there is a 5 minute meeting to inform each other where they work and what they will be doing. The Project leader reports back to the Export manager if any problems occur or when something goes better than expected. This way we are on top of all changes and progress on site and can work as a team.

Foreman (field) Steel crew
The Foreman is in charge of the supply of goods to the construction site. He communicates closely with his crew, and reports the necessary information to the Project leader, or Export Manager. The Foreman reports the defects and the potential shortages of materials. The Foreman can be part of an actual construction crew. It is important the Foreman is well known with the job he performs, he has to have several years of experience

Specialized worker (field) Steel crew
The Specialized worker (worker) is well experienced and trained for the job he performs. The crew works step by step and makes sure the compartments are put together as shown on the drawings. The specialized worker is responsible for the level of work and craftsmanship. They report to their Foreman.

Helper (field) Foundation crew
Having helpers in this line of work is very rare. The helper has to be instructed daily about the job he has to perform: Simple jobs like handing over materials and preparing work for the specialized worker.

2. Steel construction

The construction of the greenhouse is divided into 2 parts:

- Field construction
- Gable construction

Both constructions are carried out by the same crew, with a similar setup of machinery.

Starting up field construction

Prior to constructing critical components will be marked to reveal their location. For example the heating tubes are most likely already in the ground and risers are just above ground level. To prevent any damage to the installations, we ask the contractors to make their installation clearly visible for the construction crew.

At the turning points and corners, or other critical areas where machinery can hit foundation post, a protective shield is installed next to it to make the foundation post more visible, and prevent damages.

2.1 Field construction

The Field construction is the first step of the structure. When this (almost) completely finished, one of the crews can start constructing the gable construction. The field construction consists of the following components:

- Infield columns;
- Trellis;
- Gutters;
- Brace bars;
- Cross bracing;
- Fixation materials such as bolts and nuts.

2.1.1 Brace bar

Between the foundation posts a brace bar has to be installed to strengthen the structure. This bar is also used to fix the cross braces to. This work has to be done prior to installing a column.

Steps

The crew makes sure all the materials they need are on the construction IHI. They install the brace bar based on the instructions on the drawing. The crew must be trained to operate the construction machinery.

The Foundation posts, steel or concrete, are pre drilled. A contra plate has to be put on the outside of the foundation post. The crew fixates the push bar to the foundation posts with bolts and nuts. After installing, the crew moves to the next location to continue with the installation of the brace bars.

Machinery
Construction machine IHI.

Tools
Hand drill.

2.1.2 Steel construction base point

The IHI construction machine equipped with crane is loaded with the materials. Together with the platforms (scissor lifts) this group of machines start to "pull" up the first part of the structure.

As soon as the first columns are installed, the crew puts the trellis in place, they fix the trellis to the columns. They repeat this step for the next set of columns.

When both trellis are fixed to the columns the crew installs two gutters directly on top of the columns. The rest of the brace bars are installed as well as the cross braces.

This is the start of constructing, the crew continues pulling up trellis and posts until the first row is set. This is the base point of the structure, and runs from the centre to the head gable. This repeats itself until the side gable is reached.

The Foreman and Project leader both decide what the setup is and how the rest of the job will be performed by the construction crew. It is important to have a continuous flow of materials. Good teamwork is key in this part of the construction. The crews work together as a team, they know exactly where everyone is positioned which minimizes the risk of injuries. It is of great importance that the crew is well trained and experienced for the job they perform.
When the first row is set, the Forman does a final check before continuing with the rest of the construction.

Machinery
Construction scissor lift;
Construction machine IHI.

Tools
Hand drill;
Water level instrument.

2.1.3 Construction steel continued

When the base point is finished the crew starts constructing the rest of the greenhouse. One of the workers attaches the hook of the crane to the materials with a special bracket to lift the column into position.

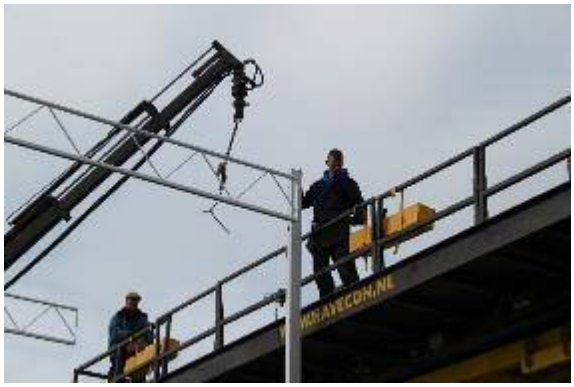
The operator moves the column into position. He communicates with the person standing on the scissor lift and the person on the floor. Based on their directions the column is put in place.

As soon as the column is in place, the worker on the ground fastens the column to the foundation post. The worker on the scissor lift attaches the trellis to the column. The operator gives the order to release the hook from the materials.

The gutter crew installs the gutter on top of the posts. When they are done the next crew installs a new trelli to the recently placed column.

This process repeats itself, the construction crew has a way of doing the job in a special order. The way they work they minimize the chance of injuries.

The trellis come in different designs, the Foreman makes sure the crew installs the right trellis at the right position.



Machinery
Construction scissor lift;
Construction machine IHI.

Tools
Hand drill.

2.1.4 Installing gutters

The gutter is a hollow aluminium profile specially designed for different applications. The gutter is part of the overall construction and is important for the strength of the structure. The gutter has a special shape so the roof system can be mounted in a quick and efficient way. The glazing bars are connected to the sides of the gutter. The hollow design allows the gutter to transport condense water coming from the roof to the main water distribution.

The gutters are loaded onto the scissor lift. They are fixed to the top of the column. Halfway the trellis (or at one-third, depending on the size of the trellis) a gutter column is fixed. On top of this column another gutter will be installed. The gutter is also part of the roof system. This is where the glazing bars are fixed to.

The gutters come in different designs, the Foreman sorts them out and makes sure the crew installs the right gutter at the right position.

Connecting the gutters
In the process, gutters are installed right after the steel columns are up and when a trelli is connected. The gutters are connected to each other with a strip at the inside of the gutter. At a later stage, when the gutters are installed, a different crew installs the gutter scale where the two gutters meet, to create a more rigid connection.

Machinery
Construction scissor lift;
Construction machine IHI.

Tools
Hand drill.

2.2 Gable construction

The Gable construction is built after the field construction is (almost) completely finished. The gable construction consists out of the following components:

- Gable columns, with or without RWD;
- Purlins.

When the crew reaches the head gable, a specially designed column is put in place. This column rests on the foundation wall, or in some cases on the foundation posts. The crew connects the column to the gutter. After that the crew fixes the cross braces and fixes the columns to the foundation wall where the cross braces are installed.

When the cross braces are installed, the crew starts with installing the purlins. The rest of the gable structure is not fixed to the foundation wall or posts.

Machinery
Construction scissor lift;
Construction machine IHI.

Tools
Hand drill.

2.3 Finalizing

When the steel construction is finished, and before the glazing starts, the Foreman does a final check. The Foreman checks randomly if the columns are installed correctly, if any bolts are missing and if there are any damages to the structure.

Together with Project leader they check if the structure is built according to the drawing When they both agree, the next part of constructing the greenhouse can start.

Whenever there is any damage to the structure, the Foreman evaluates the damage with the designer of the greenhouse. They both decide if the damaged part has to be repaired or replaced.

Tools
Hand drill;
Cutting tool.

APPENDIX B

Greenhouse Glass Roof and Insulated Panel Installation

B.1 SCOPE

The roof glazing and insulated panel system installation guidelines describe the safety procedures and the devices to be used for the installation of roof glazing by Havecon North America Inc. (Havecon) Greenhouse Projects. Each person is responsible for using the appropriate safety equipment and the site supervisor is responsible for the work crew. To this end, these guidelines are written, reviewed, and updated to CSA Z259.16-2015 to assist all personnel in job site safety. These guidelines cover the fall arrest safety procedures for roof glazing system installation.

B.2 EQUIPMENT

General and personal fall arrest equipment are covered by this guideline. A general type of equipment is an elevated work platform (EWP) in the form of a truck-based, self-levelling, scissor lift, which shall be used along with personal worker safety equipment. This equipment, when used properly, provides the necessary safety for person using the equipment. The underlying assumption is that the equipment is properly installed, maintained, and used.

The equipment shall be used with the following guidelines:

- Fall protection shall conform to the Ontario Occupational Health;
- All work at heights shall be done with the use of a CSA approved scissor lift;
- Scissor lift operation manual shall be present and readily available for viewing always during use of the equipment;
- At all times the scissor lift shall be operated within its safe parameters of as indicated in the lift equipment operation manual.

B.2.1 General Scissor Lift Operation and Fall Arrest

Workers shall be familiar with, and properly trained on, the safety features and operation of the scissor lift before use. All workers who use a scissor lift shall be equipped with and wearing a travel restraint fall arrest system consisting of a CSA approved full body harness and lanyard tied off to a designated anchor location on the lift with a minimum capacity of 16kN (3600lbs). All workers using a scissor lift must always remain within the guard rails of the lift during its operation and shall not stand on the rails of the guards to perform work.

B.2.2 Fall Arrest Accessories

Besides the equipment described in the preceding paragraphs, the following equipment shall be used:

- Elevated Work Platform (scissor lift), CSA approved;
- CSA approved full-body harness;
- CSA approved travel restraint lanyard; and
- Any other personal safety gear required for the job such as safety shoes, gloves, safety glasses, hard hat, etc.

B.3 PROCEDURES

To ensure that the risk of a fall and injury or death of a person is minimized, proper equipment and procedures must be followed. Safety equipment shall be properly used as described and the following procedures used by all persons as follows:

1. Before use, the supervisor shall verify that the equipment is in safe working order. Any improperly installed or damaged equipment shall be replaced or repaired as required.

2. All persons shall properly use personnel safety equipment as dictated by the job site including:

   - CSA approved safety glasses;
   - CSA approved safety shoes;
   - CSA approved hard hat;
   - CSA approved full-body harness, and;
   - CSA approved lanyard.

3. Sequencing of the installation of roof glazing system shall be as per the included Havecon instructions and generally as follows:

   - Start aluminum assembly for roof;
   - Couple the ridges;
   - Mount the end gable glazing bars, as required;
   - Place ridges, place glazing bars, and place NRN-plates;
   - Start glazing roof or panel installation;
   - When the roof is glazed or paneled, place the gutter covers;
   - Glazing of end gables where the roof is also glazed;
   - Repeat mounting the end gable glazing bars;
   - Repeat placing ridges, placing glazing bars, and placing NRN-plates, as required;
   - Assemble aluminum in side gables;
   - Glazing of side gables; and
   - Mounting of doors.
   - All above actions must follow the descriptions in the construction drawings.

4. In the event of an injury or falling, all work shall cease until the person is rescued and the cause determined. See Appendix C for Rescue Plan.

5. At the completion of the job all personnel safety equipment and lanyards shall be removed, inspected, and properly stored. Any equipment that is found to be damaged shall be discarded and replaced as required.

6. At no time shall more than one erector be secured to any single anchor location on the scissor lift or lifeline.

B.4 SUMMARY

The equipment and procedures are for the safety of the worker. Proper installation, maintenance, and use is the responsibility of each person. Havecon Greenhouse Projects, through their site supervisor, must train and verify that each person understands these procedures before they are allowed to install roof systems. This training should be reinforced from time-to-time, Job Site Tool Box Talks. Any questions related to the proper installation, maintenance, and use, shall be directed to Havecon Greenhouse Projects through their site superintendent.

Providing the equipment is properly inspected and maintained, the equipment should function as designed. With proper use of the fall arrest equipment, procedures, and personal safety equipment, the risk of injury or death is minimized.

7 - Havecon Glazing- Instruction

Handbook

Content

1. Work prior to Glazing

- **Design**
- **Field measurements**
- **Construction site facility's**
- **Loading / unloading of materials**
- **Risk analysis**
- **Foundation**
- **Steel construction**

1.1 General description of glazing works

The glazing installation process uses specialist machinery and equipment which has been designed for the sole purpose of glazing a Venlo glasshouse.

The glazing Mobile Elevated Work Platforms (Glazing machines) are fitted with an integral fork lift to pick up boxes of glass and aluminium glazing bars and lift them onto the platform. Similar to the steel Glazing machineS they all have their own power generators to drive the power tools used to assemble the glazing bars.

They have a hydraulic arm with suction cup attachments to lift the glass without the need for manual handling.

Glazing of the greenhouse is a job that has to be carried out by a specialized crew. Some types of glass may only be installed when the "glazer" wears gloves. This to protect the special coating on the glass. Glazing of the greenhouse must happen in a as short as possible period with the greatest care.

1.2 Roles

Export manager (office) General
The Export manager is responsible for having the whole team up to date about the status. The role of the export manger is to process the information he gets from the project leader and to communicate with all teams working together on site. The Export manager monitors the schedule.

Project leader (field) General
The project leader communicates closely with the Foreman of all crews and contractors, everyday there is a 5 minute meeting to inform each other where they work and what they will be doing. The Project leader reports back to the Export manager if any problems occur or when something goes better than expected. This way we are on top of all changes and progress on site and can work as a team.

Foreman (field) Glazing crew
The Foreman is in charge of the supplier of the glass to the construction site, he communicates closely with his glass driver about the available crates. The Foreman reports the defects and the potentially shortage of the glass. The Foreman can be part of an actual glazing crew. It is important the Foreman is well known with the job he performs, several years of experience is one of the abilities he has to have.

Specialized worker (field) Glazing crew
The Specialized worker is the person who operates the machines, and puts together the roof system. He will make sure all components are installed the right way in in the right order.

Helper (field) Glazing crew
For this job, there is no need for helpers. All crew on the platforms have to be well experienced and trained. Having a unexperienced crewmember can lead to unexpected situations with any form of danger as result.

2. Glazing step by step

2.1 Compartments of the roof system

- Aluminum gutters;
- Glazing bars;
- Peak glazing profile;
- Rubber strip;
- Glass
- Ventilation window frame

Together these components form the roof system of the greenhouse.

2.2 Work order glazing

Starting glazing

Prior to glazing, the construction crew prepares the roof so the glazers can start. Above every trellis a glazing bar, peak profile and peak block are put together. This so the structure gets more strength for the glazing process. When this is done, the glazing crew starts glazing.

The foreman of the glazing crew checks the drawings for the exact location of the glass. This to make sure the different sizes of plates are being installed at the right position.

The glass driver is instructed by the foreman to get the right size of glass from the storage area. A tractor with special designed clamps drives through the rough terrain. Driving of the glass is a job to be carried out by a well experienced worker, this to minimize breakage and to be ensured of a safe work environment.

The delivery of the glazing bars and gutter rubber is also the responsibility of the glass driver. The glazing bars and glass plates are loaded on the Glazing machine. This machine holds stock for the crew to work with.

Tools used

- Cordless hand drill;
- Rubber strip press (roller).

Glazing machine

The Glazing machine is a scissor lift with a number of modifications. This scissor lift has a boom attached to it, to load the glass crates to the right height. It has a bracket installed to hold the ventilation windows with their frames. Along both sides of the Glazing machines, 2 hydraulic glazing arms are installed. These arms are specialize designed for lifting and putting plates of glass in the right position.

Because this machine cannot be equipped with railings, it is essential that the crew operating it, is well trained and experienced. Having a unexperienced crewmember can lead in to serious injuries.

Crew tasks

A glazing crew usually has 3 members. One member is operating the machine and helps with installing the glass plates and fixes the glazing bars together with a peak block. The other 2 members are installing the glass, glazing bars and the rubber profile in the gutter.

How it's done

The glazer picks up the glass plate from the machine with the help of the hydraulic arm. When the plate is in position he places a glazing bar in place holding the glass plate in position. The middle crew member installs the peak block, glazing bars and the peak profile together. This process repeats itself until a ventilation window has to be installed.

When a ventilation window has to be installed, another component is used. Instead of placing a whole piece of glass, the crew places the under vent window. A extra glazing bar is used about 1/3 of the plate of glass. A third glazing bar is put in place to keep the smaller window in position. The ventilation windows has a profile attached to it, this profile is designed to fit and to allow the windows from opening and closing.

The glass, glazing bars and ventilator components are carried on the Glazing machines. The glazing bars and ventilator sections are assembled as they are fitted and then glazed. When a section of roof glazing as been completed the glazing machine is moved forward to the next section where it picks up new supplies of glass and aluminium and the process is repeated.

This procedure is carried out along each row in turn until the roof glazing work in all of the glasshouse sections is completed.

The wall glazing is carried out from the glazing machines working around the perimeter of the glasshouse and along internal partitions. The wall glazing bars will have been fitted by the steel erection team so only the glass and the retaining bar caps will be fitted.

NOTE

The machine has adjusted rail, this because the machine needs to reach to the top of the structure
The structure will protect the worker, Gutters and trellis will function as railings, preventing the worker from falling off, of the scissor lift. When the machine is driving the crew must be tethered to the machine.

When the platform is moving, the worker has to be tethered to the machine. When the platform is stationary with the rails in position, the workers are allowed to be untethered. Whenever a worker needs to perform tasks at a high height then the platform base, they need to be tethered.

APPENDIX C

Rescue Plan

C.1 INTRODUCTION

Havecon North America Inc. (Havecon) Greenhouse Projects takes pride in ensuring its employee's safety. As such, company policies have been prepared to enable prompt and rapid response to medical treatment should a person be injured on a job site. The Rescue Plan, a requirement of the Ontario Occupational Health & Safety Regulations, helps qualified and competent employees act quickly and effectively to rescue a person suspended from a safety harness after a fall.

C.2 THE NEED FOR RAPID RESPONSE

The survival of an injured person depends on the speed of recovery and the level of care subsequently provided. Being suspended for any length of time after a fall is potentially fatal due to the effects of suspension trauma.

Suspension trauma, also known as harness hang syndrome (HHS), is an effect which occurs when the human body is held upright without any movement for a period of time. Should a person fall and hang in their harness, they eventually faint. A person who faints and remains vertical risks death due to lack of oxygen to the brain.

Any user of personal fall protection systems, and others involved with work at height, should be aware of the following in the event a person is found in a suspended position:

1. The longer a person remains suspended (especially if unconscious or not moving), the greater the chances of suspension trauma. Therefore, a suspended person must be immediately removed from an upright position once brought to safety. Rescuers are cautioned to keep the person in a seated position with knees bent and elevated. Only move the person to a fully horizontal position at the advice of qualified medical personnel. Moving a person to the horizontal position may cause other dangerous effects related to improper blood flow to the vital organs.

2. A conscious person should be encouraged to exercise their legs gently, to stimulate circulation of the blood.

C.3 GENERAL CONSIDERATIONS FOR RESCUE

It is essential there be a Rescue Plan and adequate resources in place where work at height is carried out. Rescue Plans should be regularly assessed and updated where necessary.

When planning a rescue, consideration should be given to the specific situation from which a person must be recovered and the type of safety equipment required for a successful rescue.

Before carrying out a rescue operation, the following points should be addressed:

1. The safety of all those aiding in the rescue;
2. The anchor points to be used for the rescue equipment;
3. The suitability of equipment by which the person is suspended;
4. The method in which the person is to be attached to the rescue system (and detached from that which they are suspended);
5. The direction the person will be moved in order to achieve a successful transfer to a point of safety;
6. The first aid needs of the person; and
7. The possible needs of the persons following the rescue.

Anchor points are an important part of a rescue plan; they should be suitably positioned and have sufficient capacity for the intended operation.

Caution: *Always be sure that the anticipated loads of any equipment planned for use in a rescue are within the capacity specified in the manufacturer's user instructions.*

C.4 RESCUE PROCEDURES

C.4.1 General Procedure for Recovery

The Rescue Plan must allow for the person being rescued to be conscious or unconscious. Always communicate with the person throughout the rescue, be in visual contact with the person at all times or communicate through another who is in visual contact. This will help prevent placing the person in a more dangerous situation.

Procedure to follow for a successful rescue attempt:

1. Assess the situation fully before commencing a rescue operation;
2. Identify the proper position from which to carry out the rescue;
3. Identify proper anchorage points;
4. Prepare a point of safety to move the person;
5. Ensure all involved are aware of the procedure to be carried out and their specific role;
6. Ensure all involved are trained and are competent to carry out their role(s);
7. Request medical assistance and arrange for transport to hospital, if necessary;
8. Carry out the rescue steadily and in a controlled manner;
9. Ensure communication is maintained at all times;
10. Monitor the person's condition at all times;
11. If possible and if necessary, provide first aid during rescue operations;
12. If possible, elevate or bend the person's legs during rescue operations;
13. Once rescued the precaution in C.2 should be followed for first aid treatment;
14. Upon completion of the rescue all equipment must be inspected and secured; and
15. Conduct a review of the whole situation identifying areas of improvement to update the Rescue Plan.

Caution: *No two job sites are the same. Be aware of all equipment, including that of other's, on site before you begin work and while on site. Knowing what surrounds you will help save time planning a rescue.*

C4.2 If the Job Site Contains an Elevating Work Platform

An Elevating Work Platform (EWP) is a scissor lift, man lift, or similar devise as defined in regulations. These devices shall be used, where practical, in any rescue operation.

The following procedures should be used when EWP are available:

1. Safely bring the EWP to the location of the fall;
2. Ensure that all people involved in the rescue are tied-off and protected against falling;
3. Ensure that the platform has a load capacity sufficient to withstand both rescuer(s) and suspended person;
4. If the person is unconscious, two rescuers will likely be required to safely handle the person;
5. Arrange for medical assistance and transport to the nearest hospital, if necessary;
6. Position the EWP below the person, raise to the elevation of the person, and disconnect the person's lanyard when it is safe to do so;
7. Safely position the person in the seated position with knees bent and elevated considering the safety of the person while on the EWP;
8. Transport the person to the nearest safe zone;
9. Ensure communication is maintained at all times;
10. Monitor the person's condition at all times;
11. If possible and if necessary, provide first aid during rescue operations;
12. If possible, elevate or bend the person's legs during rescue operations;
13. Once rescued the precaution noticed in C.2 should be followed for first aid treatment;
14. Upon completion of the rescue all equipment must be inspected and secured; and
15. Conduct a review of the whole situation identifying areas of improvement to update the Rescue Plan.

Note: *If a person is suspended from an EWP and the EWP is operational, the EWP may be lowered by rescue personnel. When a person is lowered by means of lowering the EWP, care must be taken to ensure it is done in a safe manner to avoid the risk of further injuring the suspended person.*

C4.3 If an EWP is Not Available

Where an EWP is not available or site conditions prevent the safe use of an EWP, the following four options are available. In order of preference, they are as follows:

1. Lowering a person to safety – plan out proper anchor points and equipment necessary for the specific task at hand. If person is suspended by a lanyard or lifeline, attach a separate lowering line to the person's lifeline. Guide the person down as others below, slowly lowering the person to safety. Treat the person to any first aid requirements and arrange for transport to nearest hospital.
2. Raising a remote person to safety – If possible, securely attach a second line to the person's harness to assist in raising. At least two strong persons or a winch will be needed to pull someone up. Keep constant communication with all involved ensuring the person is elevated safely. Treat the person to any first aid requirements and arrange for transport to nearest hospital.
3. Self evacuation – If person is conscious, communicate to assist the person to lower them self down the lifeline or simply climbing up to a safe location. Examine the person to assess injuries and apply first aid treatment, if necessary.
4. Rescuing another in descent – It is preferable that the rescuer is not involved in any descent or suspension as this places the rescuer at risk. In situations where the person is suspended in an inaccessible area, only those with specialized training and experience in emergency rescue should be involved. All other procedures in C.4.1 shall be followed as they apply.

Caution: *The potential for a person to be located over an edge should also be considered. All four types of rescue will be further complicated where edges and obstructions are involved. This situation increases the risks of abrasions due to anchor lines, increases the effective loads in raising operations, and interferes with the necessary equipment. Equipment must be properly selected to ensure effective operation in the conditions that apply. Always arrange the anchor point so that the equipment does not contact the edge.*

C.5 CONCLUSION

Havecon North America Inc. Greenhouse Projects requires all its field employees read, understand, adhere, and respect the Rescue Plan. Following these procedures will help achieve the company's goal of ensuring that work is completed correctly and on time and ensures its employees return home safely.

APPENDIX D

Site Safety Instruction

Loading and Unloading Instruction

Foundation Instruction

Havecon Site facility - Instruction

Handbook

Content

1. Work prior to Construction site facilities

- **Design**
- **Field measurements**

1.1 General description of construction site facility

With facilities for the construction site we refer to:
Mobile offices, where the crew can seek shelter during rain storms or rough weather, have their lunch. Also for having site meetings and storage of small valuable tools / materials.
Toilets, for all sanitaria needs.
Storage containers, for storing materials that have to be protected from rain or other weather conditions.
Power generator, for charging the electrical tools and the airco / heating in the mobile office.
Drinking water, for drinking, and cleaning.
Storage material, wooden beams to store materials on, so the components don't touch the floor.

1.2 Roles

Export manager (office) General
The Export manager makes sure the requirements of the construction site are met before unloading the materials and the arrival of the working crew. Toilets, mobile offices, materials for unloading and storage of materials, availability of storage containers, etc.

Project leader (field) General
The Project leader communicates with the export manager to make sure everything is in place. Also, he has to make sure the Construction site is safe and clean. His crew will report directly to him whenever there are shortcomings or other needs.

Foreman (field) loading & unloading crew
The Foreman has to report damages, shortcomings and other needs to the Project leader.

2. Construction site facilitys

Mobile offices
Usually provided by the main contractor, this mobile office is used for the construction crew to have their lunch, meetings and to take shelter during rough weather conditions. The office is equipped with a heating / cooling installation. Also a power connection for charging tools etc.

Toilets
On the project site, the number of toilets is determined by the amount of workers on site. The toilets have to be cleaned 2 times a week and must be stored at a safe location somewhere at the construction site / unloading area. The toilets are usually provided by the main contractor

Storage containers
Small materials have to be stored at a safe location, to protect them from theft and weather conditions. A number of storage containers, mostly two 20 ft. containers supplied by the main contractor, are placed on site.
The Foreman or project leader holds the key and determines what materials are allowed to store in the container or not.

Usually each contractor has its own storage container from the start until the end of the project. The Project leader determines a good location for storing materials.

Power generator
Often the main contractor is responsible for the supply of a power generator. This generator has to be "big" enough to supply power to the mobile office, for heating and cooling and the equipment used in the storage container. Sometimes the customer provides a panel for construction power. When this is done, the main contractor or customer has to make sure the power can be used at any time.

Drinking water
A water connection has to be on site so the workers can have drinking water. Also for cleaning materials and washing them self's. This can be a simple hose with a valve on it.

Storage material
Storage material is needed to store the components safely. The Wooden beams are put on the ground so, for example, greenhouse posts can lay on them, not touching the ground. Doing this, we prevent the posts from getting dirty so any damages can be seen at any time.

Fencing
When the project is freely accessible, fencing has to be put up to prevent theft and unwanted visitors on site.

Storage lighting
During the winter period, lights must be installed / supplied to prevent dangerous situations on construction site.

Havecon loading & unloading - Instruction

Handbook

Content

1. Work prior to loading & unloading

- **Design**
- **Field measurements**
- **Construction site facility's**

1.1 General description of loading & unloading

Unloading of materials shipped from The Netherlands is a task for people specially trained for it. Materials can only be unloaded with the right equipment. Our Project leader contacts the head office to express his needs for unloading the containers. The team decides which machines will be brought to the site, or rented.

1.2 Roles

Export manager (office) General
The Export manager makes sure the construction site facilities are in place prior to Loading & Unloading. The delivery appointments of the containers are organized by the Export manager, he will inform the Project leader and-/or Foreman about the schedule. He checks with them what is available and which containers must be unloaded first.

Project leader (field) General
The Project leader is responsible for the coordination of the containers and materials on site. The truckers contact the Project leader to make sure there is room available on site and they will also inform the Project leader when something notable happened on the road.

Foreman (field) loading & unloading crew
The Foreman is the person in lead of the loading & unloading process. He makes sure he and his crew load & unload in a safe and efficient way. This process requires special workers, trained to unload the greenhouse materials.

Specialized worker (field) loading & unloading crew
The Specialized worker assists the Foreman with unloading the containers, it is important that the Foreman and Worker understand each other. The Worker must be trained on our equipment provided on the project site.

Helper (field) loading & unloading crew
For this task, the helpers are not needed.

Load crew Netherlands
The load crew in the Netherlands ask the Export Manager if any special instructions are required, such as hoist loops or extra packing material.

2. Loading & unloading step by step

2.1 Loading & unloading

Unlading a truck

Materials are being transport to the site by truck or container. When materials arrive on a truck the Manitou unloads the materials by using the forks directly. The materials will be stored at the unloading area, the Foreman makes sure there is enough wood on site to store the materials safely.

Protective sleeves

For unloading and transport of the coated materials, protective sleeves are used. These sleeves are attached to the forks of the Manitou or forklift. This way the materials are protected against any damage that may occur.

Unloading a container

For unloading a container it is of great importance that a well-trained crew will carry out the work. This to prevent damages and to protect the people involved.

The Fore-man and his worker must communicate well and go through every step for unloading. In a container there is little space and the materials can be damaged quickly by hitting the walls of the container.

It is of great importance that the machinery and tools used for this kind of work are up to the task. Certified hoist loops are used to hoist the materials out of the container. Also the telehandler used for unloading must meet all requirements. Usually the telehandlers are rented locally.

The foreman communicates with the trucker about the delivery of the goods.

2.2 Transport in the field

Transport from unloading area to construction crew

When the containers and trucks are unloaded, and there is sufficient material on site, the supply of materials to the construction crew can start. For a smooth and safe way to transport the materials a gravel or steel plate road is required.

To protect the materials from getting dirty, the materials will be placed on stands nearby the construction crew. The construction is put together as clean as possible, to make sure any damage to the materials can be seen.

The Foreman of the construction crew makes sure he has enough materials nearby to keep the crew going. The Foreman knows by experience what materials are needed and when they are needed. The crew transporting the materials must be trained to do this, this to prevent any damages to the materials and to get the materials safely to the required location.

Communication
Whenever a construction crew member is in need of materials, the Manitou driver will supply them with the requested materials. This way the right machine is used for the job that has to be done. The construction machine doesn't drive long distances.

Having an experienced crew for this part is essential for the safety and quality of the end product.

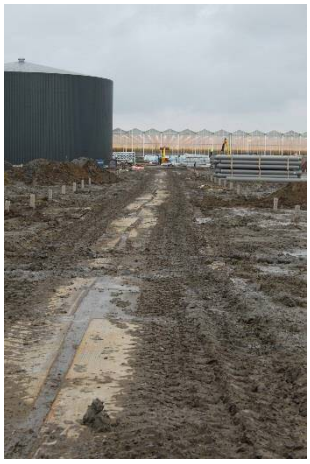


Gravel road
Road made of compacted gravel, has to be maintained during the total project.

Steel plates
Road made of steel plates, laid down so they overlap. Machinery can move easily over these plates. During the total project, the road must be adjusted and maintained.

← Gravel road

Steel plates →



Gravel covered unloading area
The Unloading area is often made of compacted gravel. The area must be big enough to be able to store the materials during construction. As machines move constantly, the unloading area must be maintained properly.


Havecon Foundation - Instruction

Handbook

Content

1. Work prior to foundation

- **Design**
- **Field measurements**
- **Construction site facility's**
- **Loading / unloading of materials**
- **Risk analysis**

1.1 General description of foundation works

The foundation of the greenhouse is designed by the engineers of Havecon. The design is based on Casta calculations. These calculations are based on information from soil reports and the loads of the structure. The complete foundation file will be examined by a local engineer, who decides whether the foundation is sufficient for the area where the foundation will be installed. When adjustments are needed, the engineers of Havecon make the adjustments. After this, a new set of drawings will be supplied for confirmation by the engineer.

1.2 Roles

Export manager (office) General
The Export manager is responsible for sourcing a local concrete supplier who can deliver the required quality of concrete. The export manager knows roughly how the job will be carried out. The export manger makes sure everyone involved with the project knows the foundation works are starting (schedule).

Project leader (field) General
The Project leader is responsible for the coordination on site of all different crews. He instructs the foreman of the do's and don'ts,the schedule, and health and safety. The Project leader instructs the Foreman what needs to be done. The Project leader reports any problems to the Export manager , and he also provides progress reports. The project leader makes sure he has all the latest drawings / details in his possession.

Foreman (field) Foundation crew
The Foreman orders the concrete directly from the supplier, sourced by the Export manager. The Foreman decides the amount of truckloads and will install the foundation according to the given instructions by the Project leader and based on the drawings. The Foreman helps the Specialized worker with his tasks. Whenever there is no Project leader, the Foreman takes over the tasks normally performed by the Project leader.

Specialized worker (field) Foundation crew
The Specialized worker is the person who operates the machines and works with the tools on site. He follows the instructions of the Foreman. The worker carries no other responsibilities, other than the Health and Safety and carrying out the work in a professional way. This worker is specifically trained for the job he performs.

Helper (field) Foundation crew
Some jobs can be performed by a local, untrained person. For jobs like this, local workers are hired. These workers are not trained by Havecon, but do have to have their Health and Safety certificate. Helpers do not hold any responsibility other than Health and Safety and work according to the instructions given by their Foreman / Project leader.

2. Foundation step by step

2.1 Compartments of the foundation

- Piers beneath foundation wall, marked red.
- The foundation wall itself is marked blue.
- The piers in the field, green.
- The steel foundation post, yellow

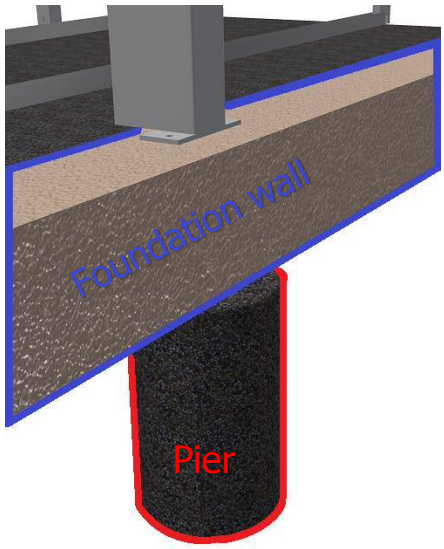
Together these 4 components form a foundation of the greenhouse.

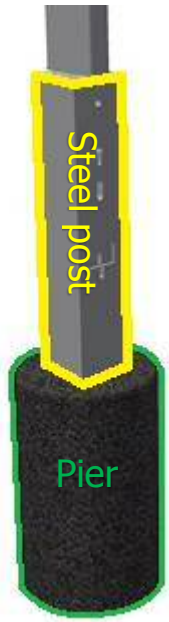
When the land is on a slope, the height of a traditional foundation is 300mm at any given location, (based on the drawing).

When the land is levelled, the height of the foundation wall is determined by the slope of the greenhouse. The wall in the side gables rises towards the middle of the greenhouse based on the supplied drawings, the foundation walls in the head gable have no slope.

Having a foundation wall on slope requires taller forming, and can only be performed by a specialized crew.

The type of slope is also important for pouring the piers beneath the foundation wall and in the field.





2.2 Work order foundation wall

Setting the marks

The Foreman of the foundation crew checks if the landmarks are set according to the drawing. Based on the drawing, experience and training the Foreman starts marking the location where the holes have to be drilled for the piers beneath the foundation wall. Along the line of the land measurements, the Foreman lays down a measuring tape and marks every position where the holes have to be drilled.

Tools used

- Measuring tape;
- Spray paint;
- Wooden poles and stakes;
- Total station;
- Rope;
- Line rods;
- Steel pins.

Drilling the holes

The worker operates the drilling machine, this can be one of the following setups:

- A bobcat with a drill attached;
- A tractor with a drill attached;
- A crane with a drill attached.

The crane is usually used for drilling deeper holes at "soft spots".

Machine preparation

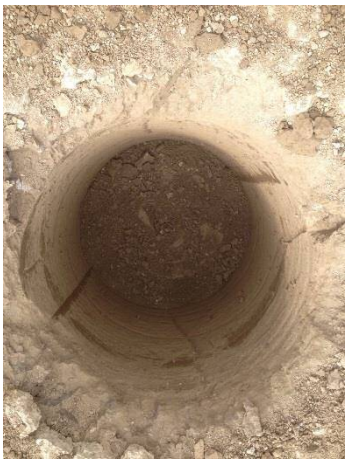
The worker prepares the machine for drilling, the drill device has to be attached and the right diameter has to be picked.

The drawing specifies the exact size of the drill to be used. Also the depth of the hole is pointed out on the drawing. Based on this, the worker places the limit on the drill, as shown on the picture on the right.

Tools used

- Bobcat / Crane / Tractor;
- Drill based on drawing;
- Drill limit (set to height);
- Measuring stick.

The worker brings the machine into the right position, using the positions marked by the Foreman. After checking his surrounds the worker starts drilling. This process repeats itself until the last hole of the piers is drilled.



Pouring concrete

After a number of holes have been drilled, the Foreman starts ordering concrete. The type of concrete is mentioned on the drawings. Most likely a 20MPA mixture is used for filling the holes drilled in the ground. When the cement trucks arrive on site, the foreman sends a member to go pick up the concrete using the concrete transporter.

The concrete is poured into the concrete transporter designed for rough terrain. The machine transports the concrete to the drilled holes and fills them up A 3rd crewmember makes sure the concrete is poured exactly to the same height using a stick with the right depth marked on it. The height of the piers may be different for each row depending on the type of slope used. A laser will be used to determine the correct height of the piers.
A piece of rebar is placed in the concrete. These "hairpins" will be used to fix the rebar of the foundation wall to the piers.

Fixing rebar

The rebar in the piers and the foundation wall are calculated by the engineer. The right size of the rebar is listed on the foundation drawing. When the concrete has enough strength the installation of the rebar starts.

Using a steel fixer, the worker fixes the rebar of the foundation wall to the rebar of the piers. For this a hand tool is being used. This tool can be operated after being instructed by an experienced foundation worker. It is very important all rebars are properly fixed. This work has to be done by someone specially trained for this job.

The rebar has to be cut at the dilatation spots. Also the rebar has to be removed at the locations of doors or other openings in the foundation wall. These spots are indicated on the foundation drawings.

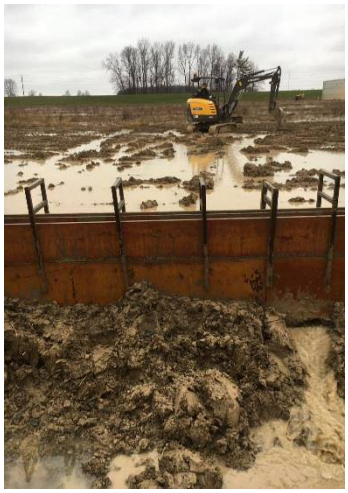
Tools used

- Rebar fixer
- Rebar cutter

Preparing pouring of foundation wall

Before pouring the foundation wall, the forming has to be placed.
The thickness (distance between the forming) and the height of the wall is written on the drawing. The crew has to check what type of slope the greenhouse uses, as explained at the start of this chapter.

Before placing the forming, the forming has to be threatened with forming spray. This prevents concrete from sticking to the forming.



After the forming is placed, U brackets are installed to keep the forming in position. These brackets have to be placed carefully by an experienced worker trained for this job. Whenever a bracket is misplaced, the shape of the foundation may be different.

Every 40-55 meters, a dilatation has to be placed in the foundation wall. A sheet of tempex will be placed as shown on the drawing. The locations are marked with the letter D on the provided drawings.

In some designs, the condensation water discharge goes right through the foundation wall. An oversized tube is placed in the ground to prevent the concrete from flowing there. Later, a smaller size tube is placed inside the oversized tube.

Other designs may have a small gap in the wall. An oversized tube is placed at the side of the wall, preventing the concrete from flowing there. After the forming is removed, the wall has a gap, where a rainwater discharge tube fits perfectly.

Pouring of foundation wall

After placing the forming, laying out the dilatation, and all other extras, the pouring can start. The foundation wall can only be poured when there is no ice the in ground and the temperatures are right. The Export manger will determine whether this job can be performed, based on the schedule and the engineers advice.

Whenever the crew is ready, the Foreman orders the concrete. This concrete is of the type 25MPA air trained.

The concrete transporter brings the concrete from the truck into the field at the location. The concrete is poured based on the instructions of the 3rd person walking next to the transporter.

After the concrete is poured, a compactor is used to compact the concrete by vibrating quickly. After the concrete is settled, the workers flatten out the top of the wall with plasterwork tools, for a smooth finish. It is very important this is done by a specialized worker. In a later stage a profile has to be drilled onto the wall for the gable system If there is too much height variation, the profile doesn't close properly and unnecessary gaps occur in the gable system.

The Foreman determines when the forming can be removed. This process repeats itself until all foundation walls are placed.

Tools used

- Forming spray;
- Compacting tool;
- Plasterwork tools.
- U-Brackets
- Forming

2.3 Work order field foundation

Setting the marks and drilling

The Foreman of the foundation crew checks if the landmarks are set according to the drawing. Using the foundation wall, the Foreman determines the height of the infield foundation based on the provided drawings.

Behind the foundation wall, a steel pin is placed with a wire attached to it. Along the line of the land measurements, the Foreman lays down a measuring tape and marks every position where the holes have to be drilled.

Tools used

- Measuring tape;
- Steel pins;
- Wire;
- Spray paint.

Drilling the holes

The worker operates the drilling machine, this can be one of the following setups:

- A bobcat with a drill attached;
- A tractor with a drill attached;
- A crane with a drill attached.

The crane is usually used for drilling deeper holes at "soft spots".

Machine preparation

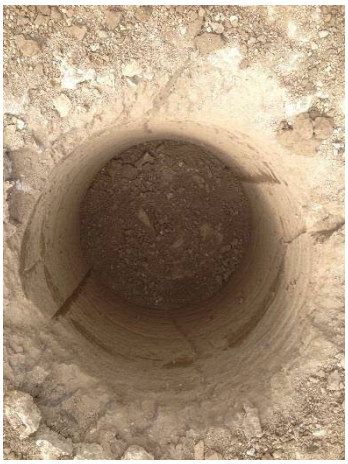
The worker prepares the machine for drilling. The drill device has to be attached and the right diameter has to be picked.

The drawing specifies the exact size of the drill to be used. Also the depth of the hole is pointed out on the drawing. Based on this, the worker places the limit on the drill, as shown on the picture on the right.

Tools used

- Bobcat / Crane / Tractor;
- Drill based on drawing;
- Drill limit (set to height);
- Measuring stick.

The worker brings the machine into the right position, using the spots marked by the Foreman. After checking his surroundings the worker starts drilling. This process repeats itself until the last hole of the piers is drilled. The amount of holes drilled is based on the amount of concrete one truck carries. With bad weather, the holes will fill-up with water. If this happens the holes have to be drained and restored.



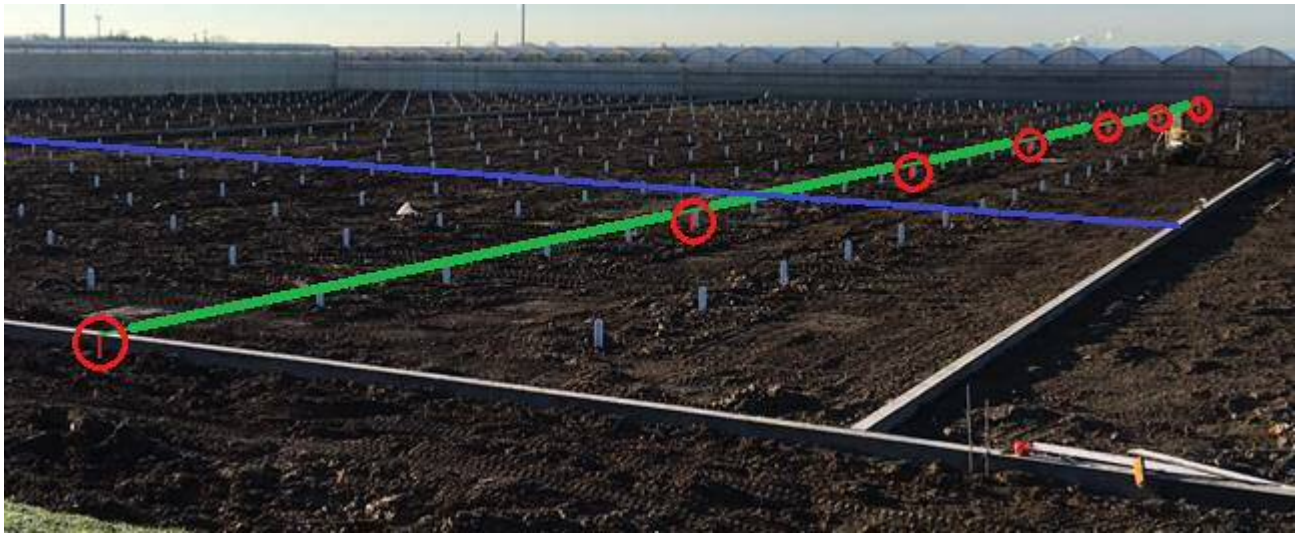
Pouring concrete

After a number of holes have been drilled, the Foreman starts ordering concrete. The type of concrete is mentioned on the drawings. Most likely a 20MPA mixture is used for filling the piers in the ground. When the cement trucks arrive on site, the foreman sends a member to go pick up the concrete using the concrete transporter.

The concrete is poured into the concrete transporter designed for rough terrain. The machine transports the concrete to the drilled holes and fills them up. A 3rd crewmember makes sure the concrete is poured exactly to the same height using a stick with the right depth marked on it. The height of the piers vary each row because of the type of slope used. A laser will be used to determine the correct height of the piers.

Setting steel posts

Behind the foundation wall, a steel pin is placed with a wire attached to it. In the field, every 25 meters a steel pin is put in the ground with the help of a laser. This pin is there to keep the wire in place at the exact same height.
Using the foundation wall as basepoint, the infield foundation will get a uniform slope.



The red marks on the sketch above are the steel pins. The green line is the wire tightened to the pins. A second line (blue) is placed to determine the exact location of the foundation posts.

The Foreman decides if the concrete is strong enough to "hold" the foundation post. The foundation post will be put in place using the two wires. Based on experience the Foreman sees if the concrete hardened enough to keep the post in place.

When the post is in place and the row is set, they remove the wires for the next rows. This repeats itself until the whole infield foundation is set.

Tools used

- Laser;
- Rope;
- Steel pins;
- Measuring tape;
- Water level instrument.

The foreman checks a number of posts randomly to see if everything is in place.