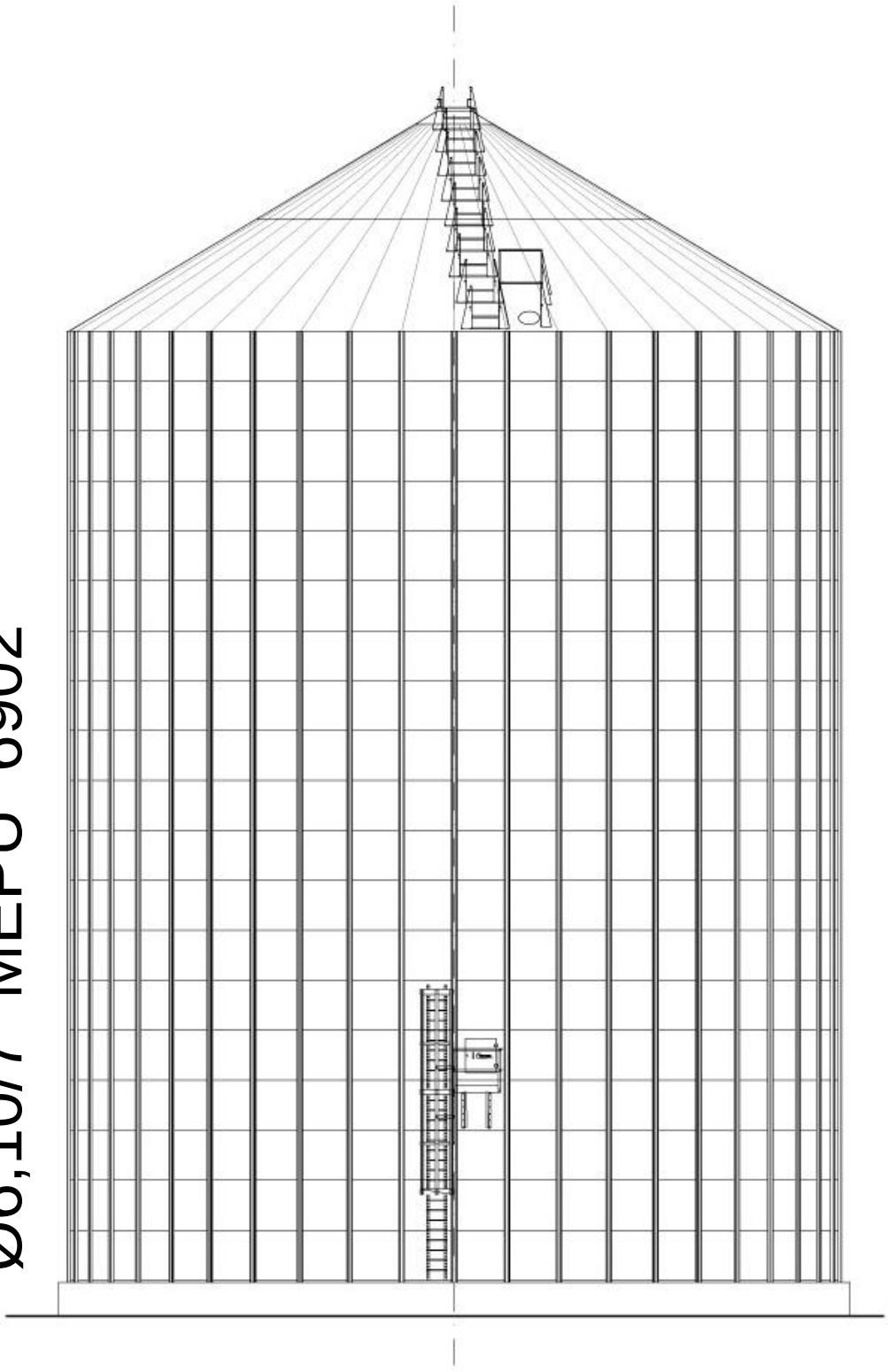
FLAT BOTTOM SILO

Ø6,10/7 MEPU 6902

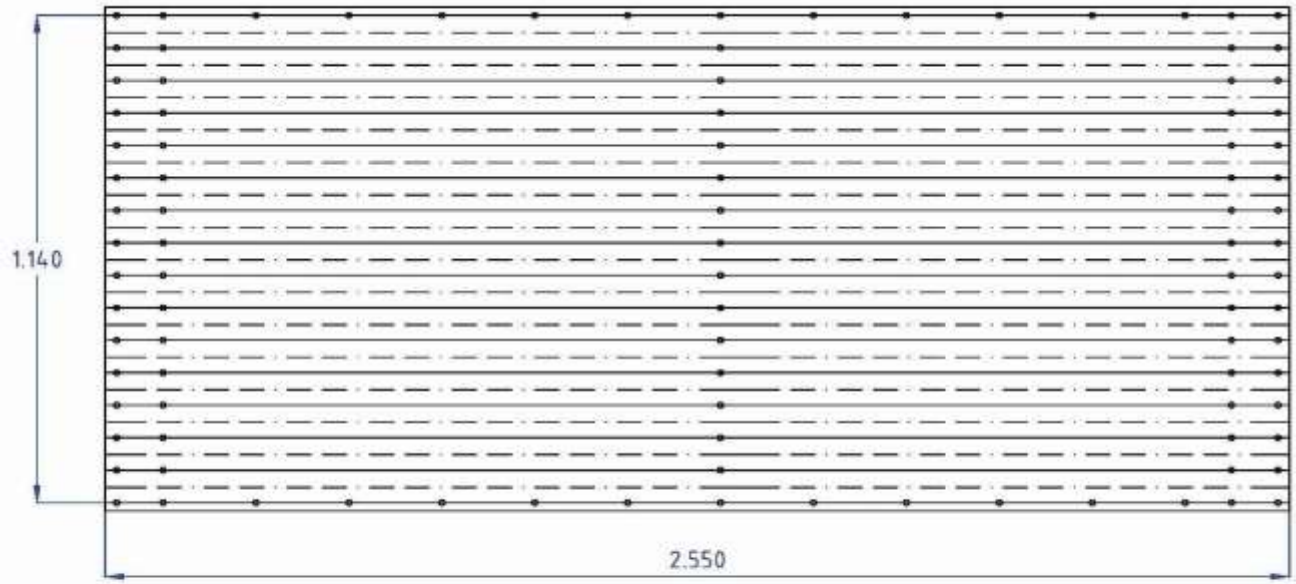


Assembly Instructions

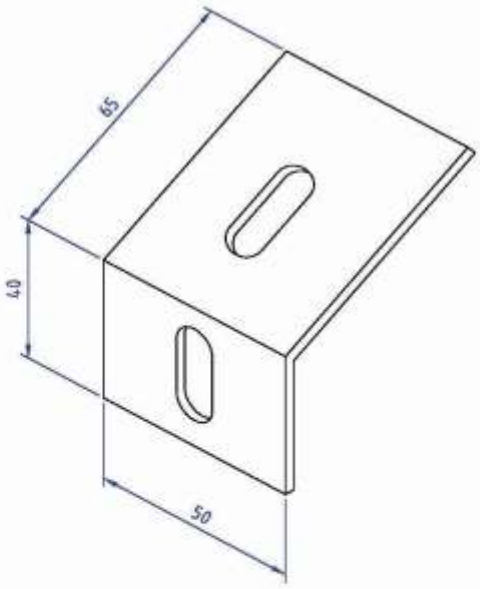
MARK	DESCRIPTION	THICKNESS	QUANTITY
	ROOF		
120498	ROOF SHEET	0,8	23
120535	ROOF SHEET WITH CIRCULAR HOLE	0,8	1
110037	ROOF COLLAR	3	1
120244	ROOF CENTER COLLAR D800mm	5	1
120241	TOP FOR ROOF CENTER COLLAR D800mm	3	1
120261	REINFORCEMENT FOR TOP FOR ROOF CENTER COLLAR D800mm	3	4
111418	FLASHING FOR ROOF COLLAR R1080mm FOR 2 REINFORCEMENTS	0,8	4
120383	REINFORCEMENT CENTER COLLAR "U" 75x30x456mm	2	8
110038	FLASHING SHEET	0,8	24
110011	SMALL ROOF'S CLIP	2	24
110012A	LARGE ROOF'S CLIP	2	24
120692	ROOF LADDER RUNG L= 418mm	3	10
120691	ROOF LADDER RUNG L= 1100mm	3	6
120715A	RING FOR MANHOLE	2	1
110295	COVER FOR MANHOLE	2	1
120780	"U" HINGE FOR MANHOLE	3	1
120779	"U" FOR HINGE-MANHOLE	3	1
121811	WEATHER STRIP L=1500 mm		1
	BOLT 8 X 30 ISO 4017 GALVANISED C-8.8		380
	BOLT 10 X 25 ISO 4017 GALVANISED C-8.8		110
	NUT M-8 ISO 4161 WITH FLANGE		380
	NUT M-10 ISO 4032 GALVANISED C-8.8		110
	FLAT WASHER M-8 ISO 7093 GALVANISED		140
	FLAT WASHER M-10 DISO 7091 GALVANISED		110
	WEATHERSEAL WASHER M-8 GALVANISED		380
	WEATHERSEAL WASHER M-10 GALVANISED		110
	METRE OF PLASTILINE D 6mm		12
	BODYSHEET		
110000A	BODYSHEET 2 STIFFENERS DOUBLE JOINT	0,8	56
122973A	ACCESS DOOR SET TYPE 4		1
122983	SPECIAL BODYSHEET FOR MANHOLE	0,8	1
119714	LADDER'S RAIL L= 1326mm	1,5	4
119610	PLASTIC COVER FOR LADDER'S RAIL		4
119611	LADDER SUPPORT	3	8
119616	LADDER RUNG L= 460mm	1,5	10
	STIFFENERS		
113362	UPPER SHORT STIFFENER 75x988mm	1,5	16
111886	STANDARD STIFFENER 2 BODYSHEETS 75x2280mm	1,5	16
111886	STANDARD STIFFENER 2 BODYSHEETS 75x2280mm	2	16
113363	LOWER STIFFENER 75x2432mm	2,5	16
111882	STIFFENER'S SPLICE 67x456mm	1,5	32
111882	STIFFENER'S SPLICE 67x456mm	2	16
119975	ANCHOR PLATE TYPE "BF" 160x180x25mm D25	5 y 25 mm	16
	BOLT 8 X 20 ISO 4017 GALVANISED C-8.8		50
	BOLT 8 X 60 ISO 4017 GALVANISED C-8.8		30
	BOLT 10 X 20 ISO 4017 GALVANISED C-8.8		2250
	BOLT 10 X 25 ISO 4017 GALVANISED C-8.8		1800
	BOLT 10 X 35 ISO 4017 GALVANISED C-8.8		75
	NUT M-8 ISO 4032 GALVANISED C-8.8		80
	NUT M-10 ISO 4032 GALVANISED C-8.8		4050
	WEATHERSEAL WASHER M-10 GALVANISED		3300
	FLAT WASHER M-8 ISO 7091 GALVANISED		80
	FLAT WASHER M-10 DISO 7091 GALVANISED		2900
	METRE OF PLASTILINE D 6mm		121
	Mts. POLYETHILENE JOINT 15x20 mm		4
	SILICONE TUBE		2

MARK	DESCRIPTION	THICKNESS	QUANTITY
	COLD GALVANIZING SPRAY 985 ZINC		2
	ROOF ACCESSORIES		
	INSULATOR FOR EAVE		24
	INSULATOR FOR WAVES OF ROOF SHEETS		24
	HANDRAIL FOR ROOF LADDER		
120691	ROOF LADDER RUNG L= 1100mm	3	3
113915	HANDRAIL BRACKET	3	11
110026	GUSSET FOR HANDRAIL BRACKET	3	14
110129A	BANISTER L= 990mm	1,5	4
110059B	BANISTER L=1028mm	1,5	4
110058A	BANISTER L= 1488mm	1,5	6
	BOLT 10 X 20 ISO 4017 GALVANISED C-8.8		110
	NUT M-10 ISO 4032 GALVANISED C-8.8		110
	LADDER TO ROOF		
119608	LADDER'S RAIL L= 1138mm	1,5	12
119714	LADDER'S RAIL L= 1326mm	1,5	2
119610	PLASTIC COVER FOR LADDER'S RAIL		2
119611	LADDER SUPPORT	3	16
119612	LADDER SUPPORT ON EAVE-RING-HOPPER	3	2
119613	UPPER SAFETY BAND	2	1
119614	SAFETY BAND	2	6
119616	LADDER RUNG L= 460mm	1,5	29
119617	"U" SAFETY L= 1140mm	2	36
119764	HANDRAIL	1,5	2
119620	HANDRAIL BRACKET LEFT TRANSITION	3	1
119622	HANDRAIL BRACKET RIGHT TRANSITION	3	1
	BOLT 8 X 20 ISO 4017 GALVANISED C-8.8		150
	BOLT 8 X 60 ISO 4017 GALVANISED C-8.8		60
	BOLT 10 X 40 ISO 4017GALVANISED C-8.8		20
	NUT M-8 ISO 4032 GALVANISED C-8.8		210
	NUT M-10 ISO 4032 GALVANISED C-8.8		20
	WEATHERSEAL WASHER M-10 GALVANISED		20
	FLAT WASHER M-8 ISO 7091 GALVANISED		210
	FLAT WASHER M-10 DISO 7091 GALVANISED		20
	DOCUMENTATION		
	xxxxx ingles manual 1		1

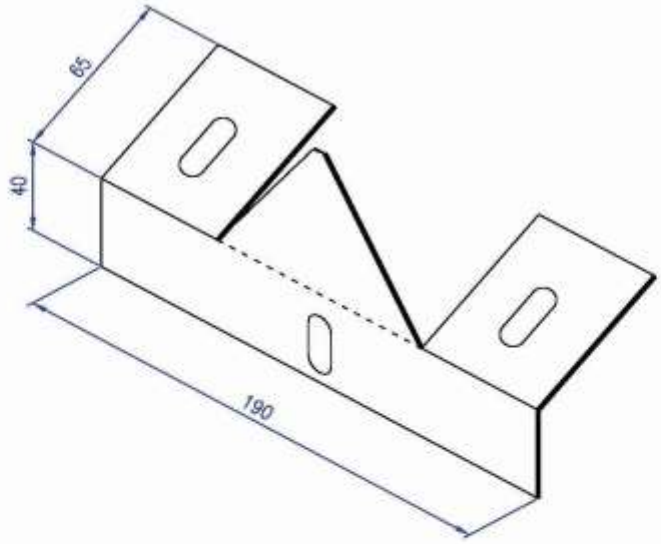
IDENTIFICATION OF MARKS



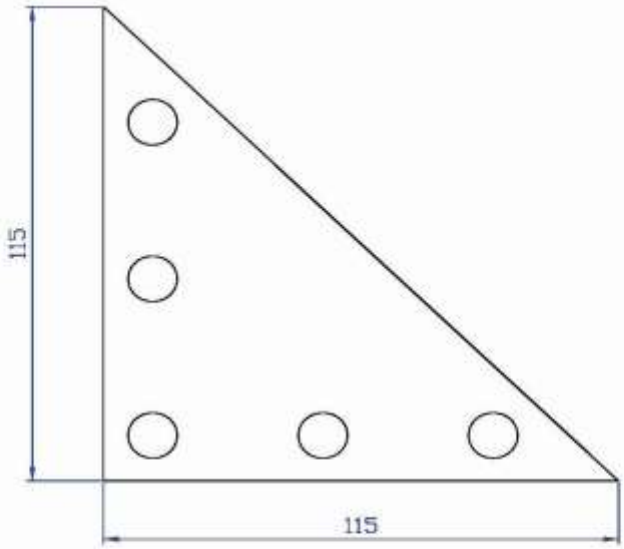
MARCA 110.000A	VIROLA 2 REFUERZOS DOBLE JUNTA
MARK 110.000A	BODYSHEET 2 STIFFENERS DOUBLE JOINT
MARQUE 110.000A	VIROLE 2 MONTANT DOUBLE JOINT



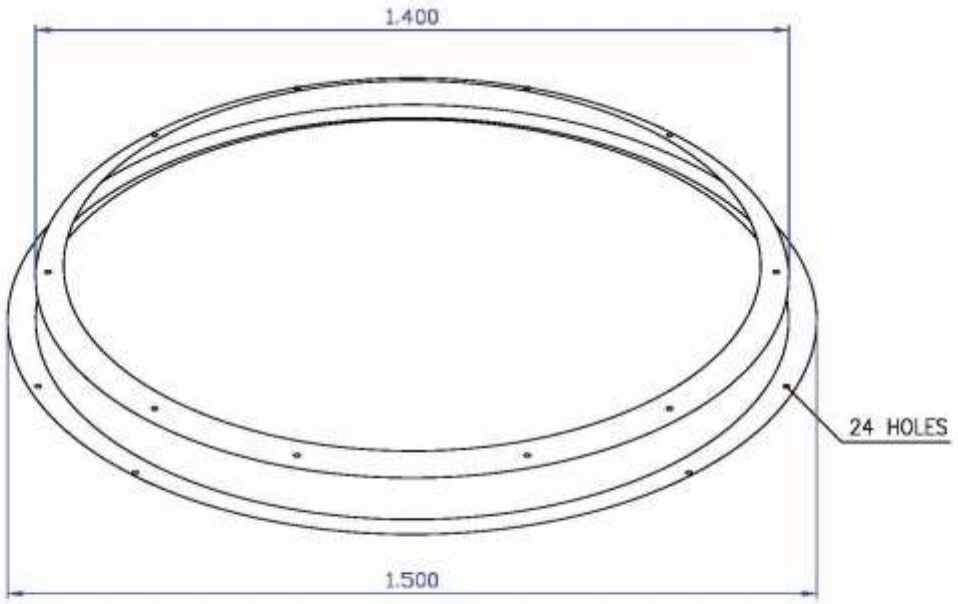
MARCA 110.011	CLIP NORMAL DE TECHO
MARK 110.011	SMALLROOF CLIP
MARQUE 110.011	CLIP PETIT



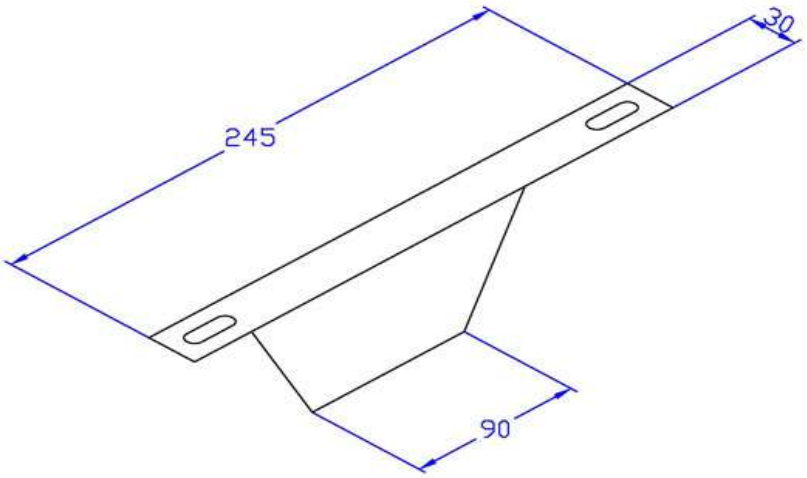
MARCA 110.012A CLIP DOBLE DE TECHO
MARK 110.012A LARGE ROOF CLIP
MARQUE 110.012A CLIP GRAND



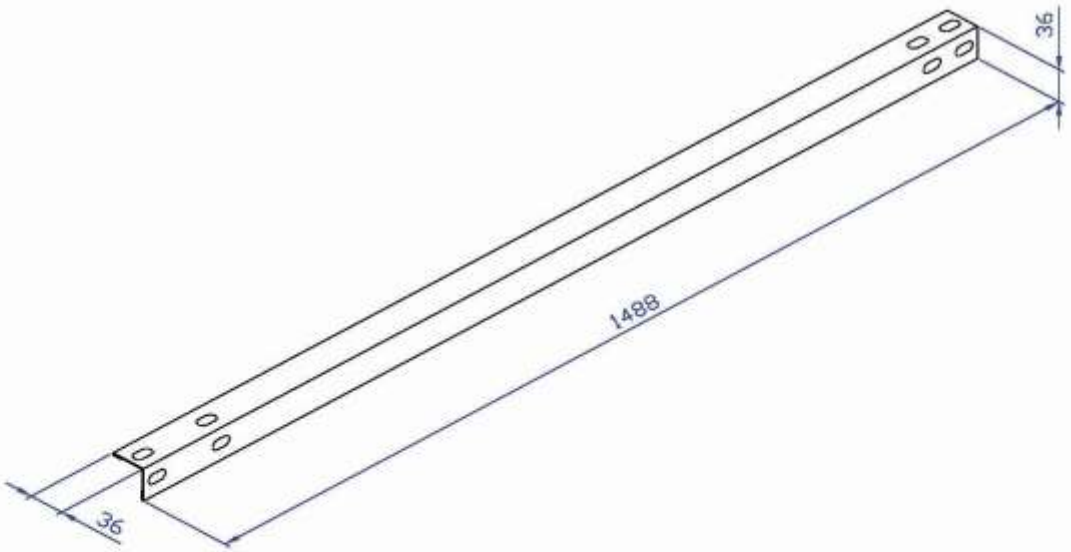
MARCA 110.026 CARTABON EN BARANDILLA TECHO
MARK 110.026 GUSSET
MARQUE 110.026 ECLIPSSE DE RAMBARDE



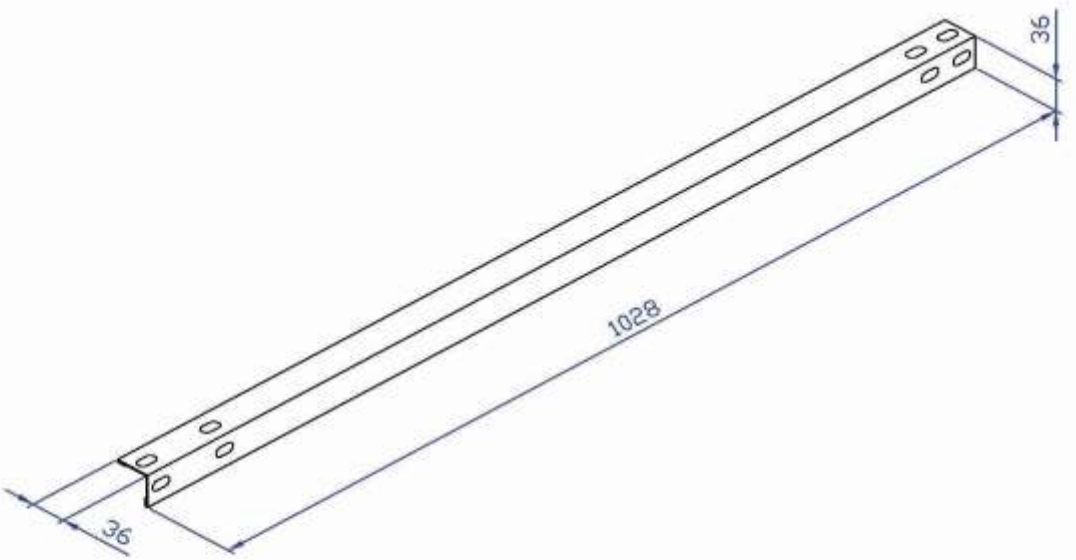
MARCA 110.037 COLLAR TECHO SILO 6,10Ø
MARK 110.037 ROOF COLLAR SILO 6,10Ø
MARQUE 110.037 COLLIER DU TOIT SILO 6,10Ø



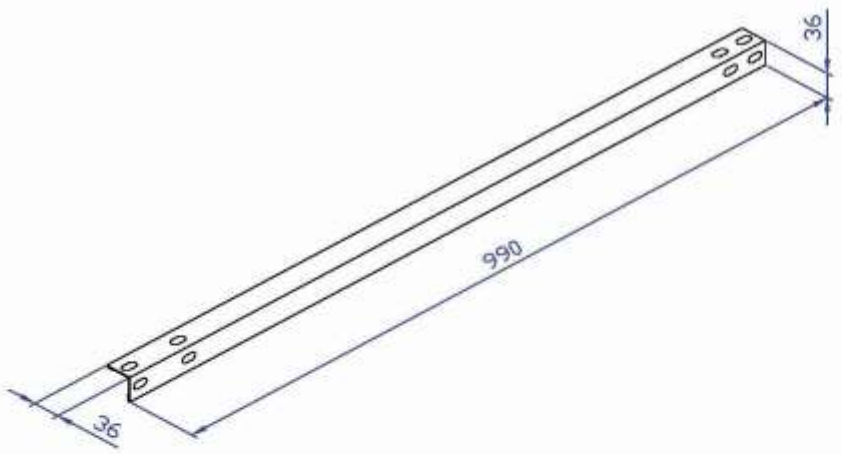
MARCA 110.038 CHAPA CIERRE SILO 6.10
MARK 110.038 CLOSE FLASHING SILO 6,10
MARQUE 110.038 TÔLE DE CLÔTURE SILO 6,10



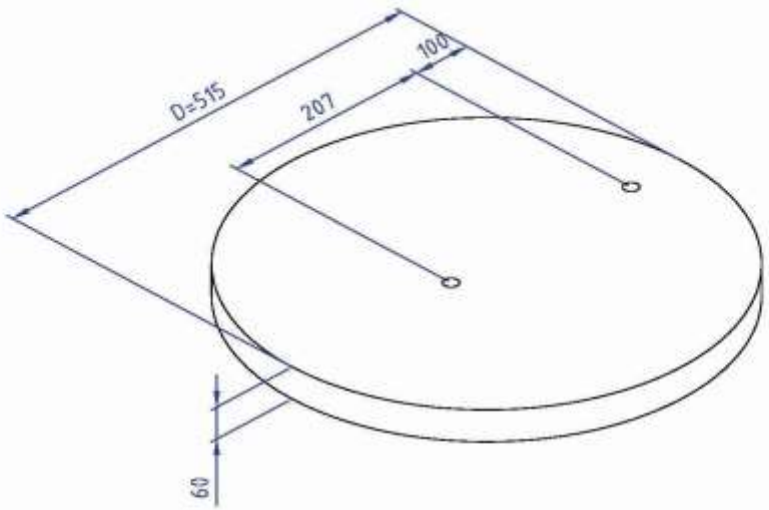
MARCA 110.058A ANGULAR BARANDILLA TECHO
MARK 110.058A HANDRAIL
MARQUE 110.058A ANGLE DE RAMBARDE



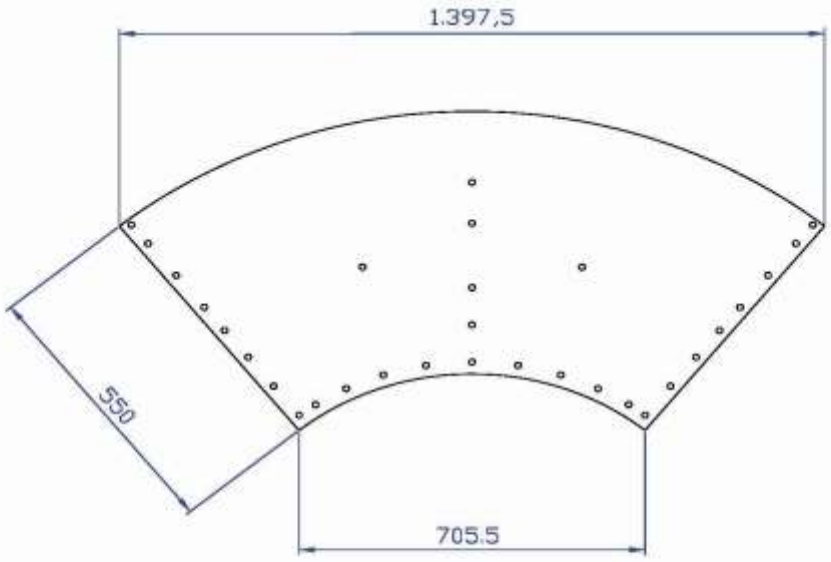
MARCA 110.059B ANGULAR BARANDILLA TECHO
MARK 110.059B HAND RAIL
MARQUE 110.059B ANGLE DE RAMBARDE



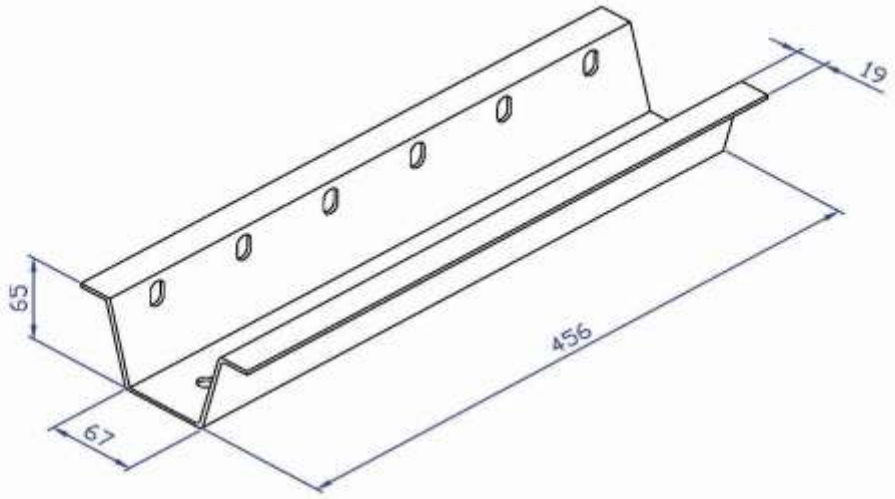
MARCA 110.129A ANGULAR BARANDILLA TECHO
MARK 110.129A HAND RAIL
MARQUE 110.129A ANGLE DE RAMBARDE



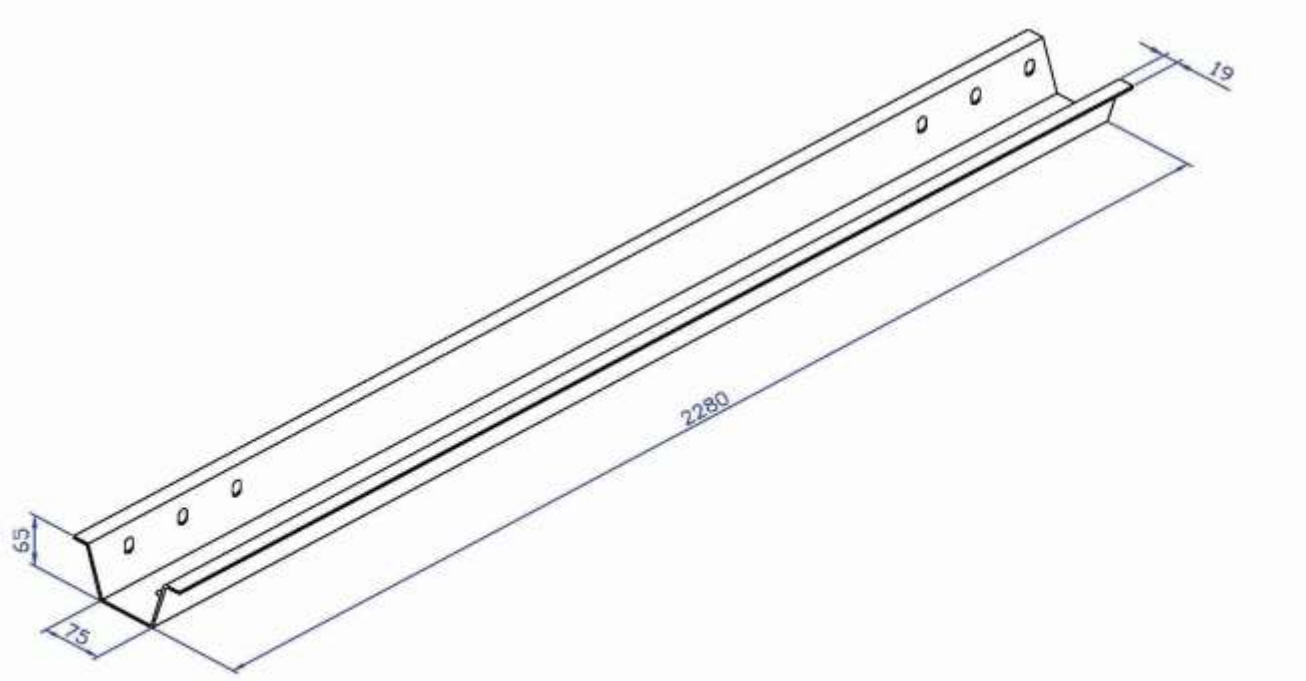
MARCA 110.295 TAPA PUERTA TECHO
MARK 110.295 COVER FOR MANHOLE
MARQUE 110.295 PORTE D'ACCESS



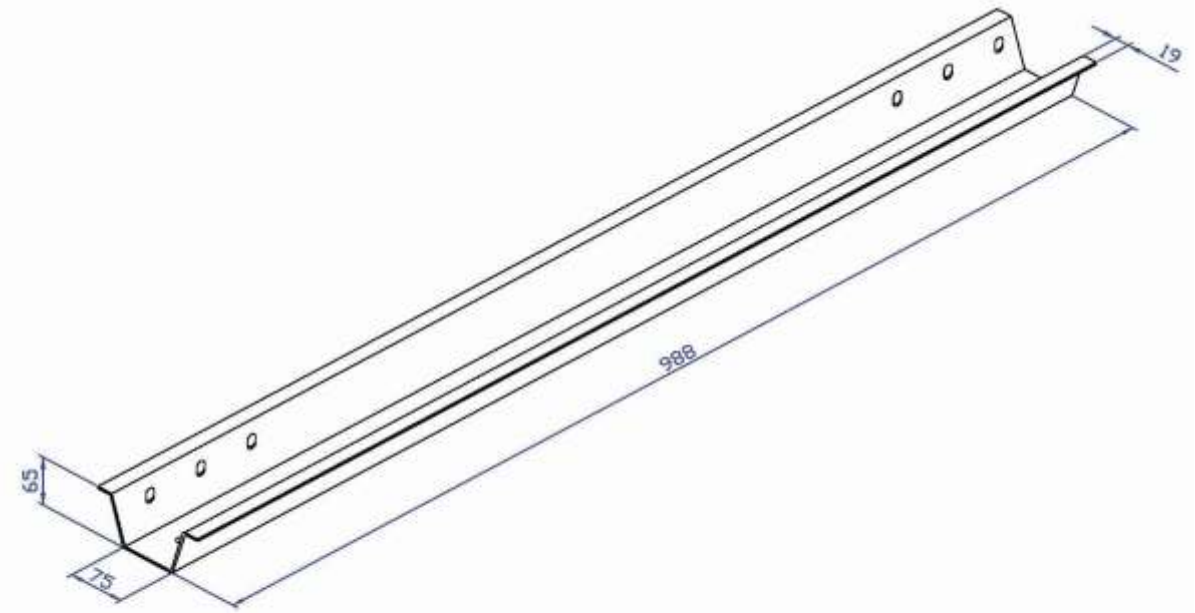
MARCA 111.418 FALDON PARA BOCA DE CARGA
MARK 111.418 FLASHING FOR ROOF CENTER COVER
MARQUE 111.418 BAVECHE POUR BOUCHE CHARGE



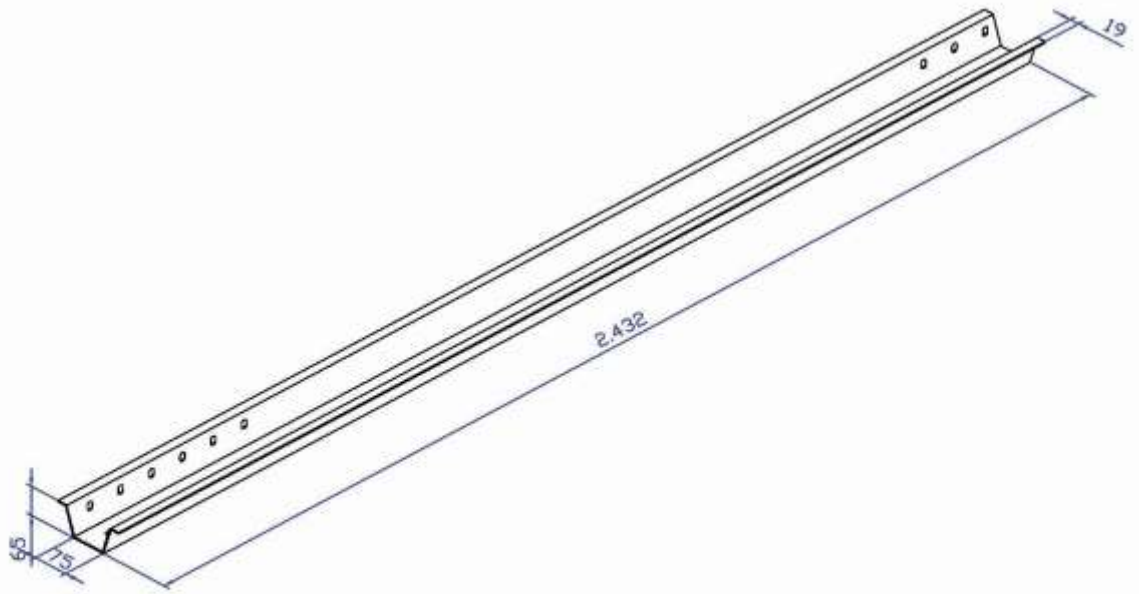
MARCA 111.882 EMPALME REFUERZO
MARK 111.882 SPLICE
MARQUE 111.882 ECLISSE



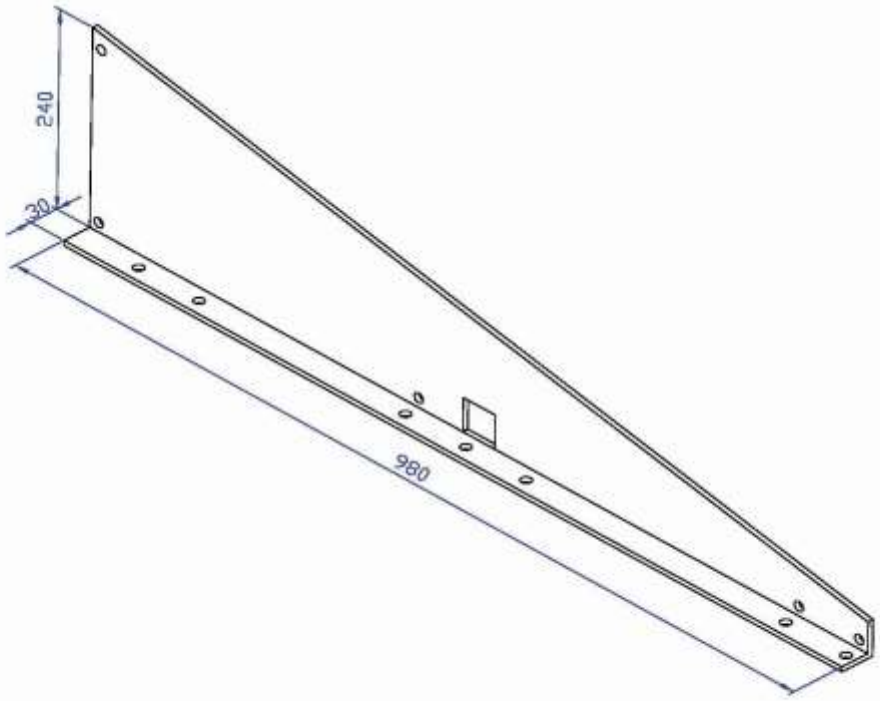
MARCA 111.886 REFUERZO NORMAL
MARK 111.886 STANDARD STIFFENER
MARQUE 111.886 MONTANT STANDARD



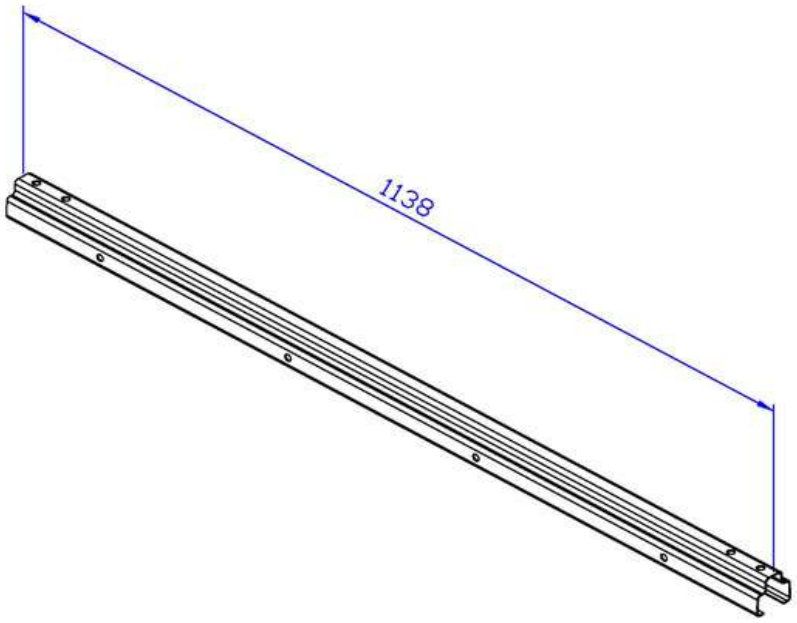
MARCA 113.362 REFUERZO SUPERIOR CORTO
MARK 113.362 SUPERIOR SHORT STIFFENER
MARQUE 113.362 MONTANT PETIT SUPERIEUR



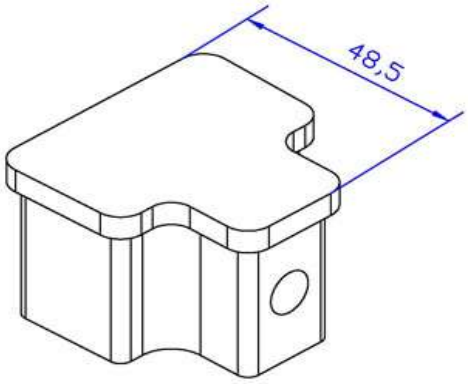
MARCA 113.363 REFUERZO INFERIOR
MARK 113.363 LOWER STIFFENER
MARQUE 113.363 MONTANT INFERIEUR



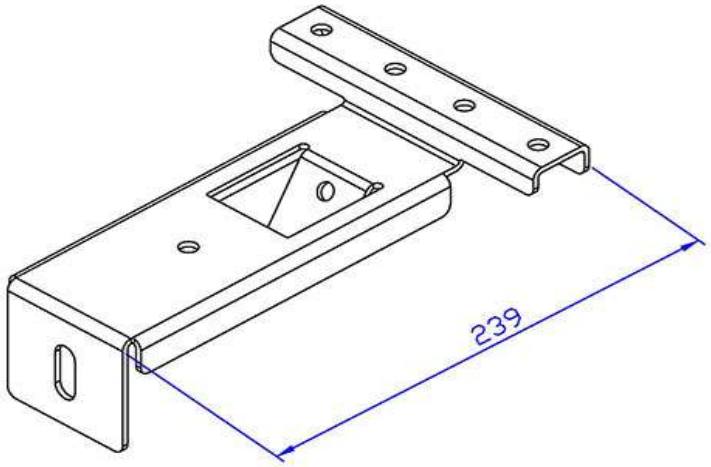
MARCA 113.915 CHAPA BARANDILLA DE TECHO
MARK 113.915 HANDRAIL BRACKET
MARQUE 113.915 POTEAU DE RAMBARDE DU TOIT



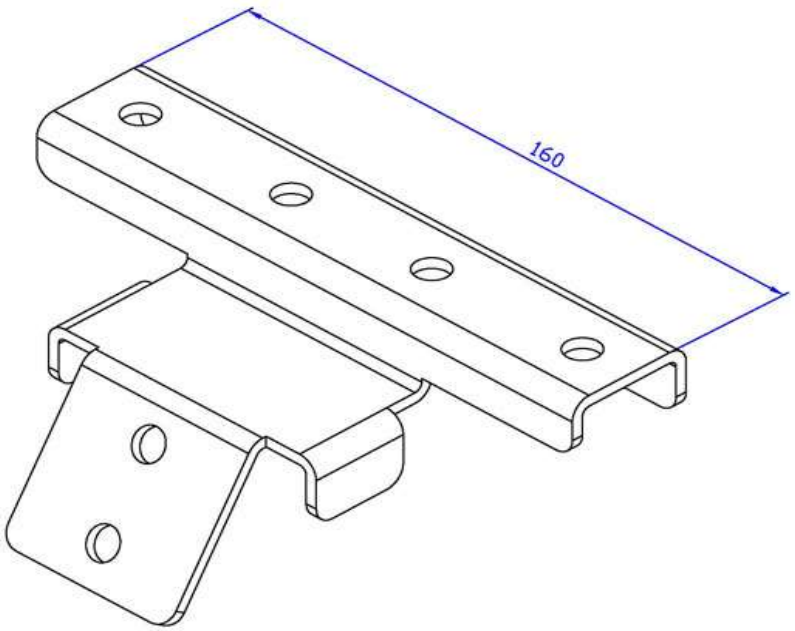
MARCA 119.608	RAIL ESCALERA L=1138 mm
MARK 119.608	LADDER'S RAIL L= 11386mm
MARQUE 119.608	RAIL D'ECHELLE L= 1138mm



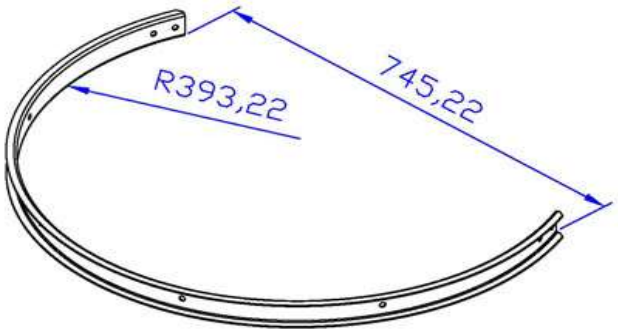
MARCA 119.610	TAPON PLASTICO RAIL ESCALERA
MARK 119.610	PLASTIC COVER FOR LADDER'S RAIL
MARQUE 119.610	COUVERTURE DU PLASTIQUE POUR L'ECHELLE



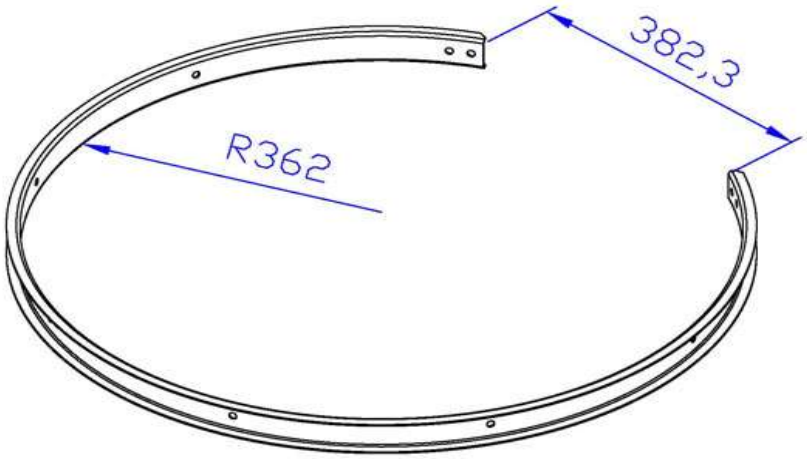
MARCA 119.611 SOPORTE DE RAIL
MARK 119.611 LADDER'S SUPPORT
MARQUE 119.611 SUPPORT D'ECHELLE



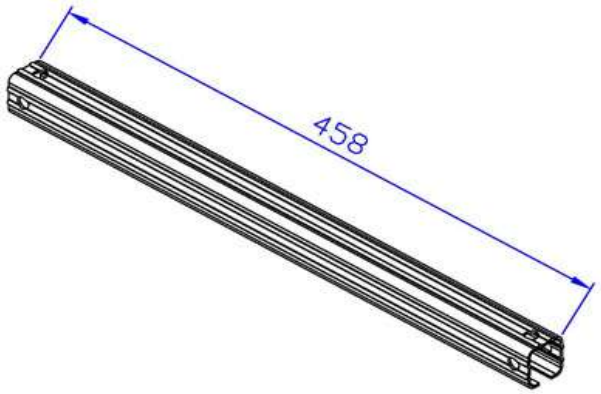
MARCA 119.612 SOPORTE RAIL ESCALERA ZONA ALERO–ANILLO–TOLVA
MARK 119.612 LADDER SUPPORT ON EAVE–RING–HOPPER
MARQUE 119.612 SOUPORT RAIL D'ECHELLE ZONE AUVENT–ANNEOU–TREMIE



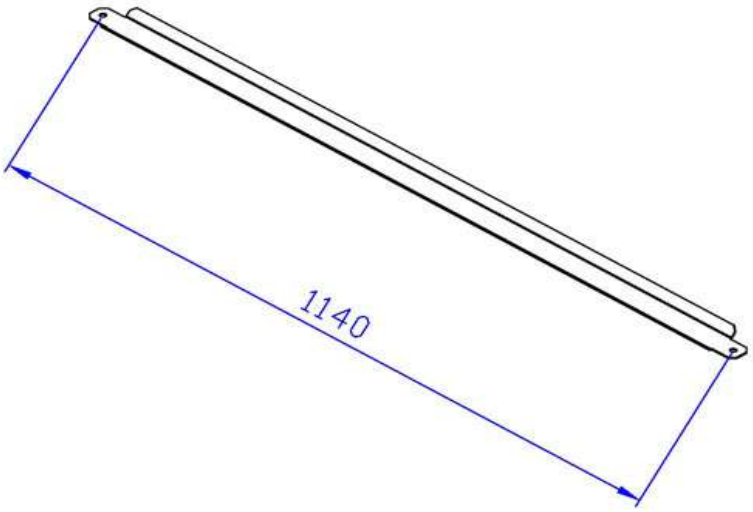
MARCA 119.613	FAJA DEFENSA SUPERIOR
MARK 119.613	UPPER SAFETY BAND
MARQUE 119.613	BANDE DE PROTECTION SUPERIEUR



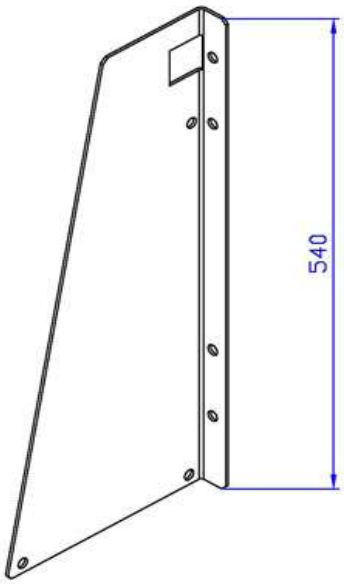
MARCA 119.614	FAJA DE DEFENSA
MARK 119.614	SAFETY BAND
MARQUE 119.614	BANDE DE PROTECTION



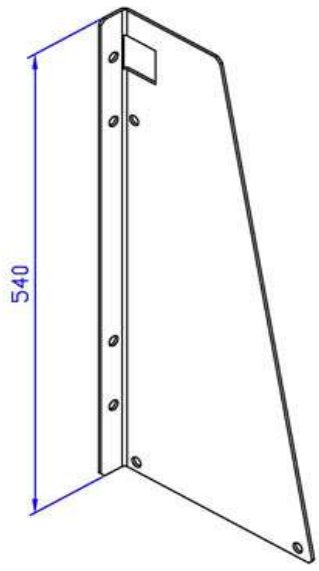
MARCA 119.616	PELDAÑO L= 460mm
MARK 119.616	LADDER RUNG L= 460mm
MARQUE 119.616	MARCHE POUR ECHELLE L= 460mm



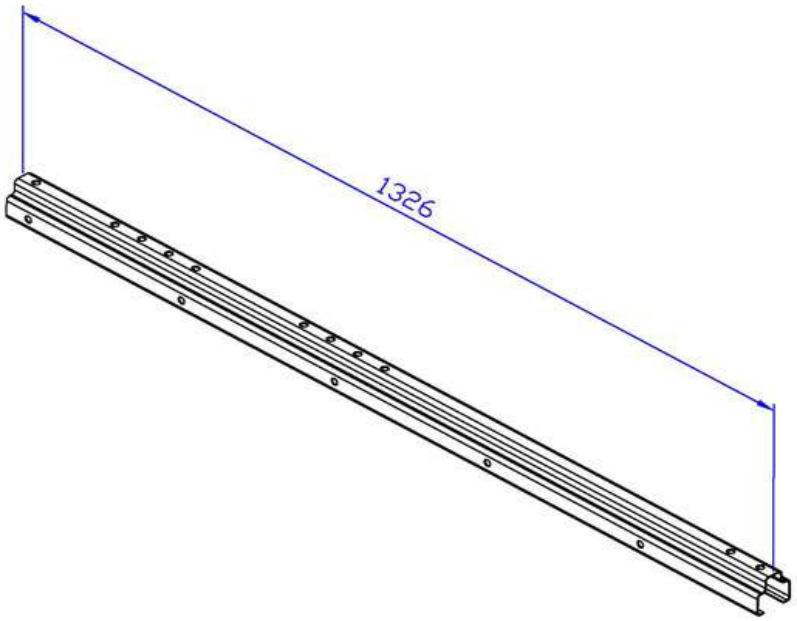
MARCA 119.617	"V" DEFENSA L=1140mm
MARK 119.617	"V" SAFETY L= 1140mm
MARQUE 119.617	"V" PROTECTION L= 1140mm



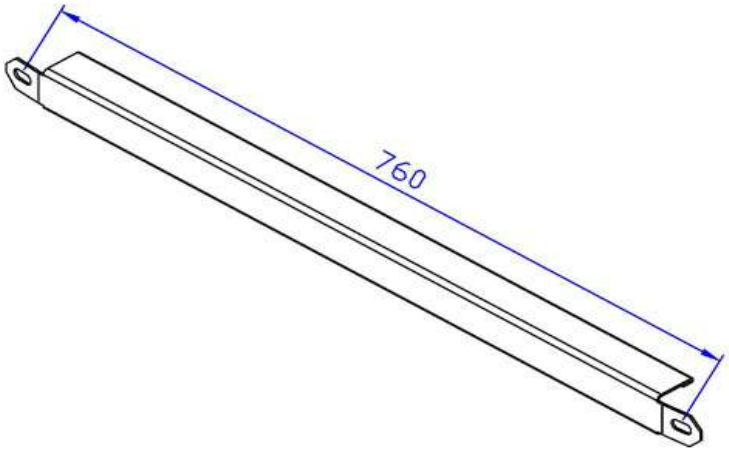
MARCA 119.620 CHAPA BARANDILLA TRANSICION IZQUIERDA
MARK 119.620 HANDRAIL BRACKET LEFT TRANSITION
MARQUE 119.620 POTEAU DE RAMBARDE GAUCHE



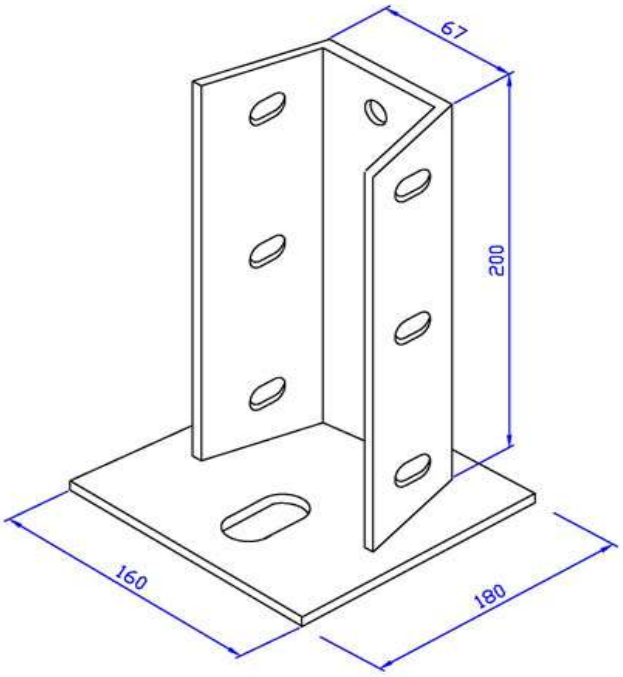
MARCA 119.622 CHAPA BARANDILLA TRANSICION DERECHA
MARK 119.622 HANDRAIL BRACKET RIGHT TRANSITION
MARQUE 119.622 POTEAU DE RAMBARDE DROITE



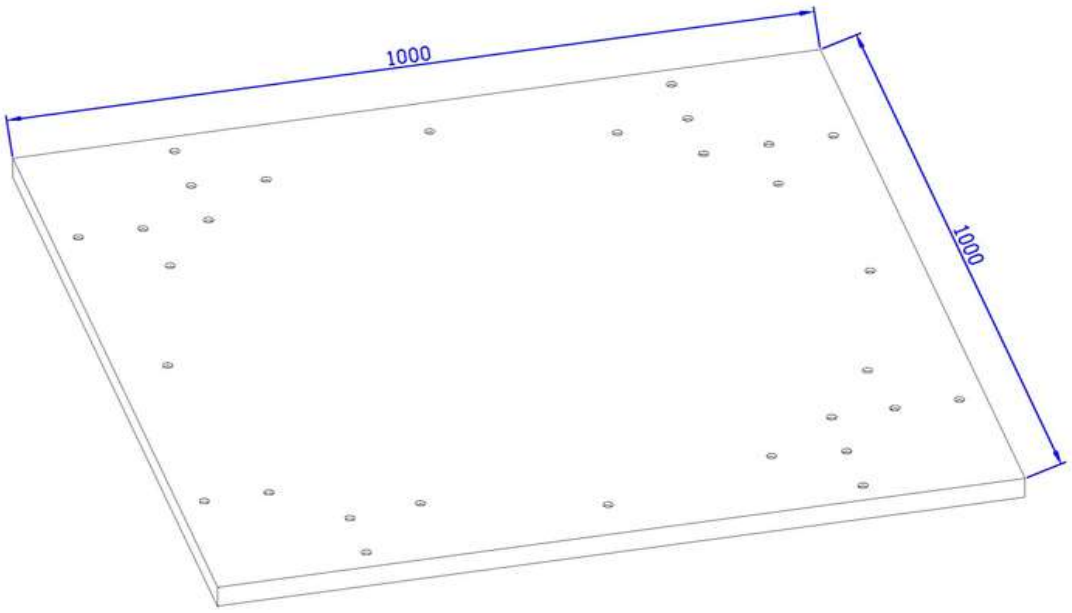
MARCA 119.714	RAIL ESCALERA TERMINAL L=1326 mm
MARK 119.714	LADDER'S TERMINAL RAIL L= 1326mm
MARQUE 119.714	RAIL D'ECHELLE TERMINAL L= 1326mm



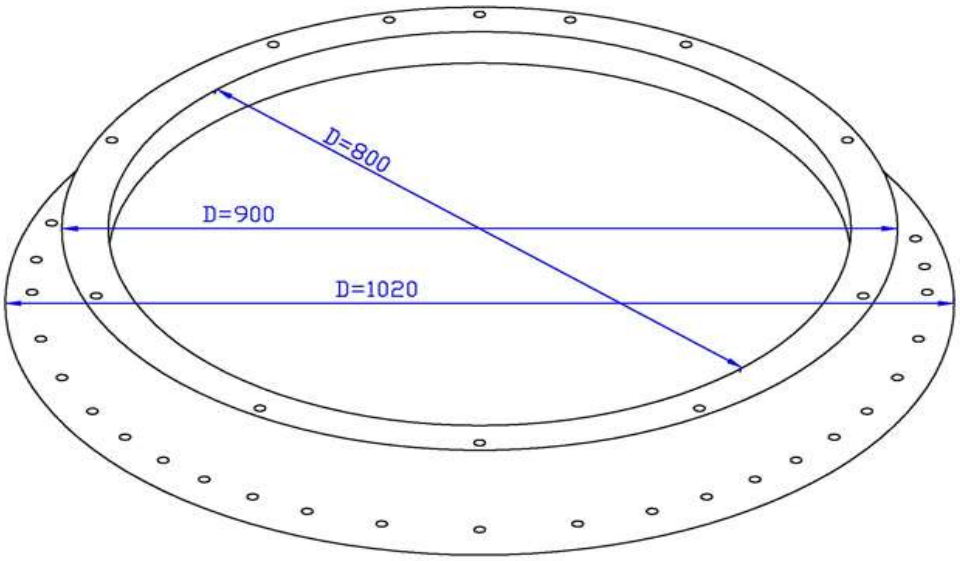
MARCA 119.764	PASAMANOS DE TRANSICIÓN L=760mm
MARK 119.764	HANDRAIL FOR TRANSITION L=760mm
MARQUE 119.764	– L= 760mm



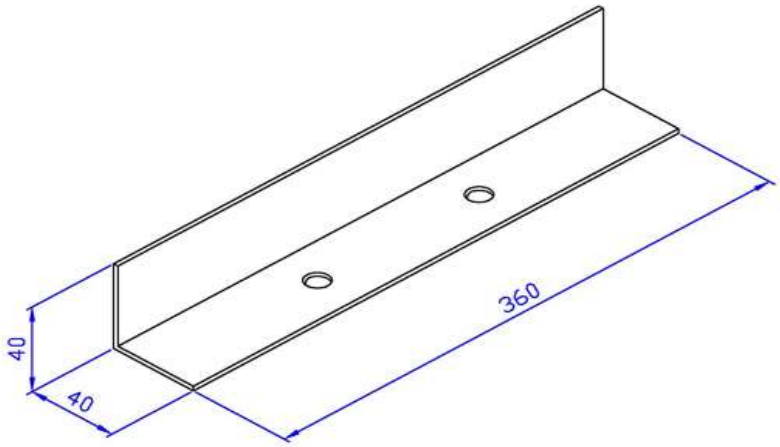
MARCA 119.975 PLACA ANCLAJE TIPO "BF"
MARK 119.975 ANCHOR PLATE TYPE "BF"
MARQUE 119.975 PLAQUE D'ANCRAGE "BF"



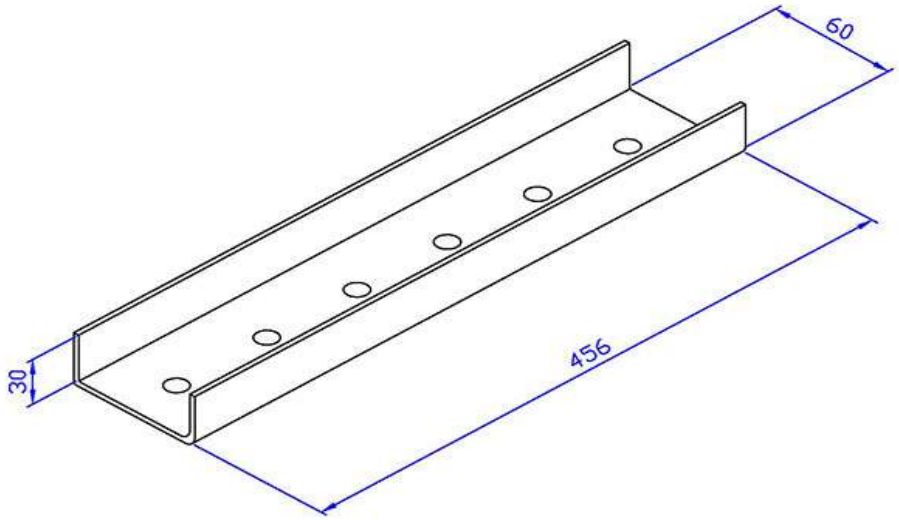
MARCA 120.241 TAPA BOCA DE CARGA
MARK 120.241 TOP FOR ROOF CENTER COLLAR
MARQUE 120.241 COUVERTURE BOUCHE DE CHARGE



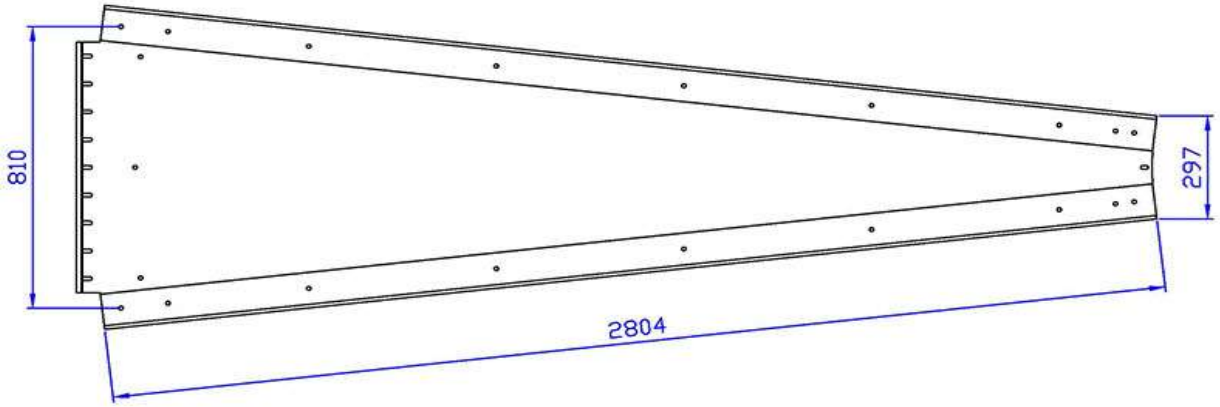
MARCA 120.244 BOCA DE CARGA
MARK 120.244 ROOF CENTER COLLAR
MARQUE 120.244 BOUCHE DE CHARGE



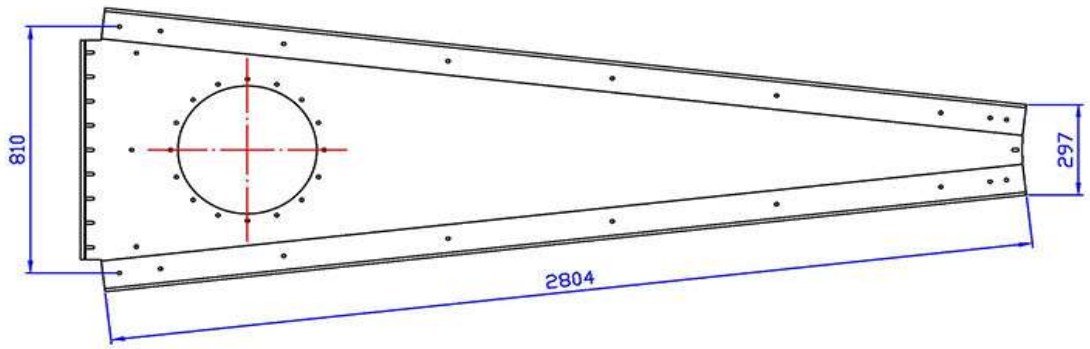
MARCA 120.261 REFUERZO TAPA BOCA DE CARGA
MARK 120.261 REINFORCEMENT FOR TOP FOR ROOF CENTER COLLAR
MARQUE 120.261 RENFORT COUVERTURE BOUCHE DE CHARGE



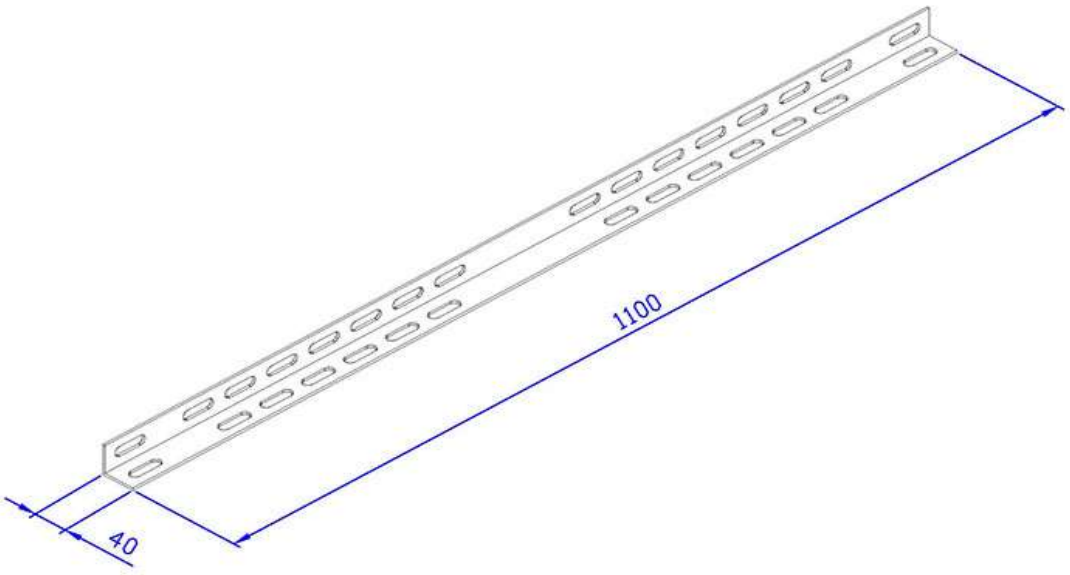
MARCA 120.383 REFUERZO BOCA DE CARGA
MARK 120.383 REINFOR ROOF CENTER COLLAR
MARQUE 120.383 RENFORT BOUCHE CHARGE



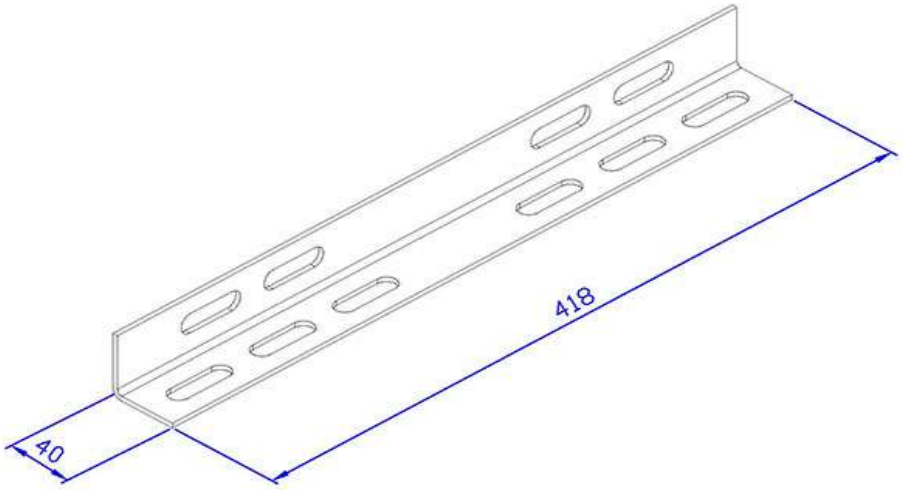
MARCA 120.498 SECTOR TECHO SILO 6,10Ø
MARK 120.498 ROOF SHEET SILO 6,10Ø
MARQUE 120.498 SECTEUR DU TOIT SILO 6,10Ø



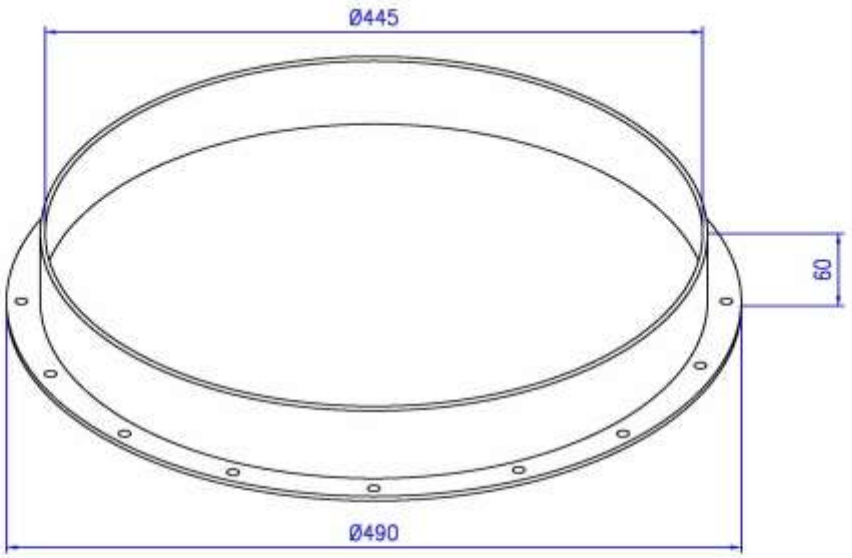
MARCA 120.535	SECTOR TECHO CON ABERTURA CIRCULAR SILO 6,10
MARK 120.535	ROOF SHEET WITH CIRCULAR OPENINING SILO 6,10
MARQUE 120.535	SECTEUR TOIT AVEC OUVERTURE CIRCULAIRE SILO 6,10



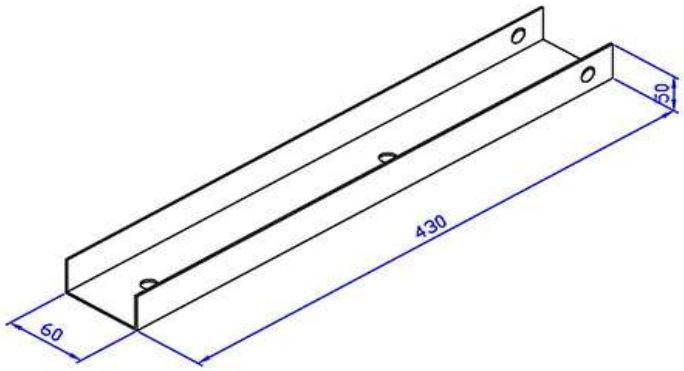
MARCA 120.691	PELDAÑO ESCALERA TECHO L=1100
MARK 120.691	ROOF LADDER RUNG L=1100
MARQUE 120.691	MARCHE DU TOIT L=1100



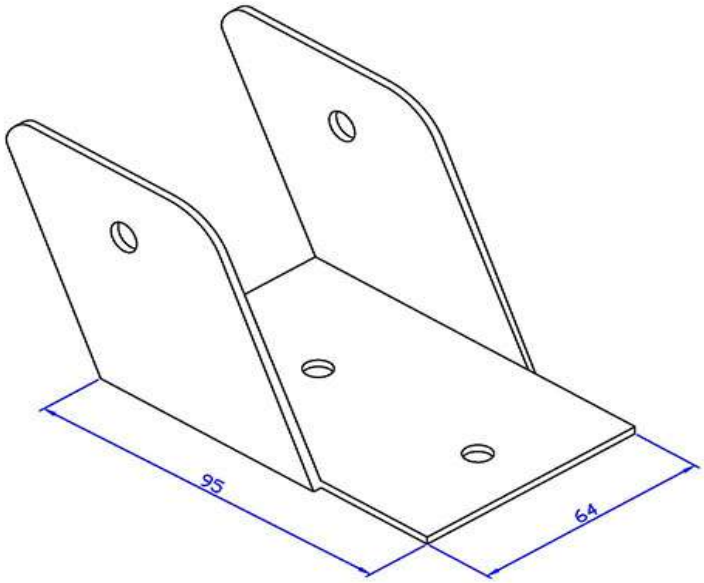
MARCA 120.692 PELDAÑO ESCALERA TECHO L=418
MARK 120.692 ROOF LADDER RUNG L=418
MARQUE 120.692 MARCHE DU TOIT L=418



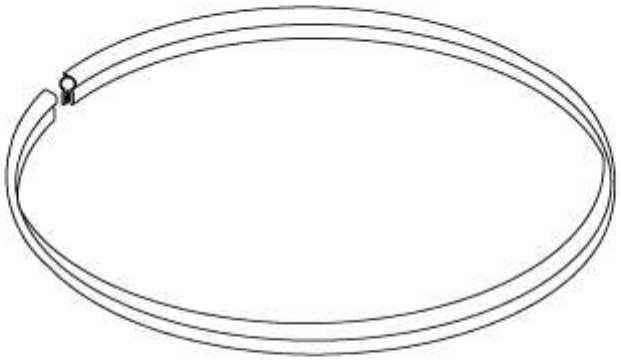
MARCA 120.715 ANILLO PUERTA TECHO
MARK 120.715 RING FOR MANHOLE
MARQUE 120.715 ANNEAU DU PORTE D'ACCESS



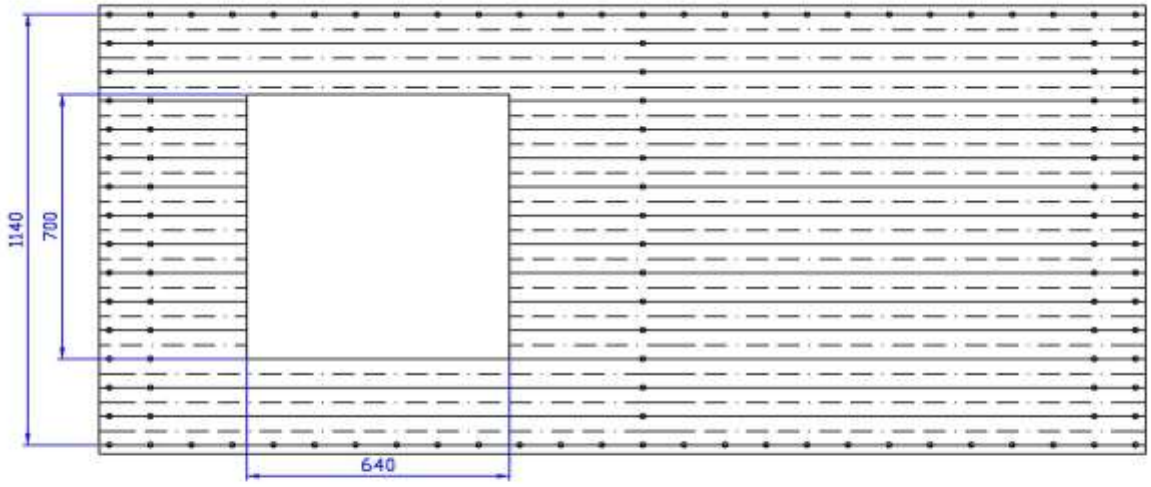
MARCA 120.779 "U" AMARRE BISAGRA
MARK 120.779 "U" FOR HINGE BASE
MARQUE 120.779 "U" ATTACHE POUR CHARNIÈRE



MARCA 120.780 "U" BISAGRA
MARK 120.780 "U" HINGE BASE
MARQUE 120.780 "U" CHARNIERE



MARCA 121.811 JUNTA DE CONTORNO L=1500mm
MARK 121.811 CONTOUR JOINT L=1500mm
MARQUE 121.811 JOINT DE CONTOUR L=1500mm



MARCA 122.983 VIROLA ESPECIAL CON PUERTA 2 REFUERZOS DOBLE JUNTA
MARK 122.983 ACCESS SPÈCIAL BODYSHEET 2 STIFFENERS DOUBLE JOINT
MARQUE 122.983 VIROLE SPECIAL AVEC PORTE 2 MONTANT DOUBLE JOINT

GENERAL WARRANTY CONDITIONS OF SYMAGA, S.A.

Symaga S.A. designs, manufactures and supplies silos for free flowing grain storage under modern production and design criteria. Load calculation in the silos follows international norms like “ANSI-ASAE” or “DIN”, always according to the specific offer.

Symaga warrants all products it manufactures to be free of defects in material and workmanship under normal usage and conditions for a period of 12 months after delivery, unless otherwise specifically provided in writing by Symaga prior to delivery.

In case Symaga’s products fail to conform the above warranty, and if Symaga is informed prior to the end of the warranty period, Symaga’s only obligation shall be to repair or replace, at its option and expense, products that, in Symaga’s sole judgement, contain a material defect due to materials or workmanship.

Off-center unloading of silos is not approved and will be structurally detrimental to a grain silo. Any off-center discharge openings should be used for the sole purpose of clean-out the silo after center discharge has been completed to the grain’s angle of repose. The user is responsible for guaranteeing the proper use of any off-center discharge opening. Any damages occurred due to an off-center unloading shall not be covered by Symaga’s structural warranty.

All delivery and shipment charges to and from Symaga’s factory will be purchaser’s responsibility. Expenses incurred by or on behalf of the purchaser without prior written authorization from Symaga shall be the sole responsibility of the purchaser.

Components manufactured by others, such motors, fans, sweep augers, control system or other trade accessories are only warranted to the extent warranted by their respective manufacturers.

Symaga does not warrant against, or shall not be liable for losses or damages arising out of circumstances not subject to its control, such us: occurrences during shipment, handling or storage, improper installation procedures not approved by Symaga in writing.

Symaga shall not be liable for loss or damage, including without limitation damage to the contents of a structure, loss of use of a product, damage to other property. Especially Symaga shall not be liable for any direct, indirect, incidental or consequential damages, including, without limitation, loss of anticipated profits or benefits.

Limited material warranty galvanised coated sheet steel protection, 450 gr/m^2 (Z-450). Galvanised coated sheet steel, protection G-140, sold for use as steel silo components, will not rupture, fail structurally or perforate within a period of 18 months after shipment from our factory due to normal atmospheric corrosion. This warranty only covers the material and not the installation.

The Manufacturer only warrants that its products are free from defects in materials and workmanship on the date of shipment from its plant.

This warranty does not apply to sheets exposed at any time to corrosive or aggressive atmospheric conditions, including but not limited to:

A- Areas subject to constant spraying of either salt of fresh water.

B- Areas subject to fallout or exposures to corrosive chemicals, ash, fumes, cement dust or animal waste.

C- Areas subject to water run-off from lead or copper flashing or areas in metallic contact with lead or copper.

D- Conditions or circumstances where corrosive fumes or condensates are generated or released inside of silos.

E- The life of the galvanization is technically regulated by the European Standards ISO 9223, 9224 and 9225.

   a. ISO-9223: Corrosion of metals and alloys –corrosivity of atmospheres- classification.

   b. ISO-9224: Corrosion of metals and alloys –corrosivity of atmospheres- guiding values for the corrosivity categories.

   c. ISO-9225: Corrosion of metals and alloys –corrosivity of atmospheres- measurement of pollution.

This warranty does not apply in the event of:

A- Mechanical, chemical or other damage sustained during the shipment, storage, erection, or after erection.

B- Damage caused by improper scouring or cleaning procedures.

C- Presence of corrosive damps or materials in contact with or close proximity to the sheets.

D- Deterioration of sheets caused directly or indirectly by overdriving the bolts.

E- Flying, blown, or falling objects, explosion, fire, acts of God, or other similar external forces beyond Symaga reasonable control.

F- Improper erection or construction methods.

G- The galvanized materials leave our plant in prime condition. Damage caused by wet or improper storage is not covered by the warranty. Store materials in dry high ground under covered area, elevated on wood blocking. Do not cover with plastic or tarpaulins so as to prevent free air circulation. Inspect bundles daily for moisture. If bundles contain moisture, it shall be immediately opened and dried.

This warranty shall be subject to the stipulations, limitations and conditions herein after set forth:

A- Symaga's liability for breach of this warranty shall be limited exclusively to repairing defective sheets or at Symaga's sole option, of furnishing F.O.B. Symaga's plant sufficient replacement sheets for the defective pieces.

B- Symaga shall not in any event be liable for the cost of labour to replace any defective sheet or for any special, indirect or consequential damages to anyone by reason of the fact that such sheets shall have been defective.

C- Title to any replaced material shall pass to Symaga.

D- Claims must be promptly reported in writing to Symaga, and Symaga shall be given a reasonable opportunity to inspect the sheets claimed to be defective. Adequate identification of the material involved in the claim, including date of installation, invoice number and date of shipment must be established by the Buyer.

E- Symaga does not warrant any part, product or material to meet local, municipal or state ordinances, codes laws or regulations.

F- The buyer shall exercise diligence in inspection of sheets as received from Symaga so as to mitigate repair or replacement.

G- This warranty shall extend only to the named owner, such named owner without the written consent of Symaga may not make this warranty subject to any assignment or transfer.

H- Symaga reserves the right to terminate this warranty at any time, (except as to orders already accepted) upon the giving of writing notice thereof.

I- Warranty does not cover damage or loss during shipment of the SYMAGA material.

The obligation of Symaga under this Warranty shall not arise unless Symaga is notified and the warranty is presented together with a writing statement specifying the claim or failure within thirty (30) days after a failure is first called to the attention of the owner and not later than the expiration of the applicable warranty period.

PLEASE, READ CAREFULLY.

Rust damage due to improper storage is not covered by the SYMAGA warranty.

Proper Storage of Grain Silos materials prior to Construction to Prevent Wet Storage Stain:

Wet storage stain (rust) will develop when closely packed bundles of galvanized material such as sidewall, roof and hopper sheets and hopper silo legs have moisture present from any source. Roof sheets and sidewall bundles should be inspected on arrival for the presence of moisture. If moisture is present, moisture must not be permitted to remain between the sheets. In the case of moisture presence, sheets or panels should be separated immediately, wiped down, dried and sprayed with a light oil or diesel fuel.

Where possible, sidewall bundles, roof sheets and other closely packed materials (e.g. hopper sheets and hopper silo legs) should be stored in a dry, climate controlled building. Storage inside a dry building should be done if at all possible. Where outdoor storage is unavoidable, the materials should be raised out of contact from the ground or vegetation. Stacking and spacing materials should not be corrosive or wet. Materials must be protected from the weather. Weather protection that permits more air movement around the bundles is best.

The storage method of the roof bundles and sidewall sheets may also help minimize moisture presence. Roof bundles should be stored inclined. The bundles should be stored and secured in a safe & stable manner. Turning the bundles over and storing with the center of the dome “up” like an arch is an option. Sidewall bundles may be stored on edge, however these bundles should be secured in such as way as they cannot fall over and cause injury.

Should “white rust” or “wet storage stain” occur, contact the manufacturer immediately concerning methods to minimize the adverse effect upon the galvanized coating.

Plasticine/sealant for silo joints has to be stored under dry conditions between +5ºC and +20ºC.

GENERAL SAFETY STATEMENT

Our principal concern is your safety and the safety of others associated with grain handling equipment. This manual is to help you understand safe operating procedures and some problems which may be encountered by the operator and other personnel.

As owner and/or operator, it is your responsibility to know what requirements, hazards and precautions exist and inform all personnel associated with the equipment or in the area. Safety precautions may be required from the personnel.

Avoid any alterations to the equipment. Such alterations may produce a very dangerous situation, where serious injury or death may occur.

You should consider the location of the bin site relative to power line locations or electrical transmission equipment. We recommend you contact your local power company to review your installation plan or for information concerning required equipment clearance.

Clearance of portable equipment that may be taken to the bin site should be reviewed and considered as well. Any electrical control equipment in contact with the bin should be properly grounded and installed in accordance with National Electric Code provisions and other local or national codes.

This product is intended for the use of grain storage only. Any other use is a misuse of the product!

This product has sharp edges! These sharp edges may cause serious injury. To avoid injury, handle sharp edges with caution and use proper protective clothing and equipment at all times.

Sidewall bundles or sheets must be stored in a safe manner. The safest method of storing sidewall bundles is laying horizontally with the arch of the sheet upward or over like a dome.

Sidewall sheets stored on edge must be secured in a way that they cannot fall over and cause injury. Care should be taken in the handling and movement of sidewall bundles.

Personnel operating or working around equipment should read this manual. This manual must be delivered with equipment to its owner. Failure to read this manual and its safety instructions is a misuse of the equipment.

To avoid anyone becoming caught or trapped by grain, do NOT empty the silo whenever there are people inside it.

Keep hands, feet and clothing away from moving parts.

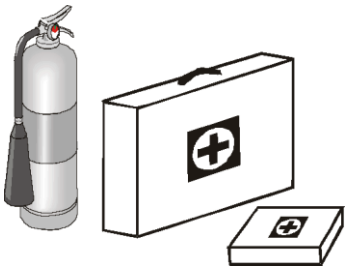
Fall from grain bins at any height can and will cause injury. Make sure all needed safety measures are taken.

PREPARE FOR EMERGENCIES

Be prepared if fire starts

Keep a first aid kit and fire extinguisher handy

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone



Keep emergency Equipment Quickly Accessible

WEAR PROTECTIVE CLOTHING

Wear close fitting clothing and safety equipment appropriate to the job.

Safety glasses should be worn at all times to protect eyes from debris.

Wear gloves to protect your hands from sharp edges on plastic or steel parts.

A respirator may be needed if a hog house has poor ventilation. Waste fumes can be toxic.

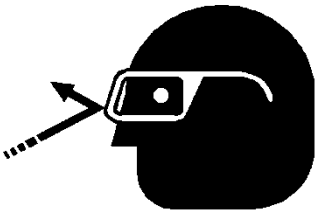
Wear hard hat and steel toe boots to help protect your head and toes from falling debris.

Remove all jewelry.

Tuck in any loose or dangling shoe strings.

Long hair should be tied up and back.

Eye protection



Gloves

Steel Toe Boots

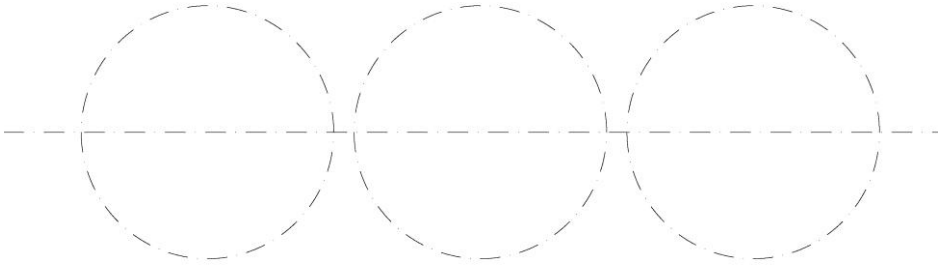
Respirator

Hard hat

PRIOR TO THE ERECTION

Axis tracing:

Trace the axis of the silos (both longitudinal and transverse) on the foundations. Trace as well the circumferences corresponding to the diameters of the silos. This will help to centre the silo properly.



Materials marking:

All the body-sheets, stiffeners and stiffener splices delivered by SYMAGA for the assembly of the silos are marked with a specific code that helps to identify the different body-sheets and stiffeners (according to their thickness and type of joint). These marks are introduced in the tables below:

Body-sheets

E 0.8	E 1	E 1.2	E 1.5	E 1.8	E 2	E 2.2	E 2.5	E 2.8	E 3	E 3.5	E 4	E 5
Body sheets with thickness of **0,8 mm**	Body sheets with thickness of **1,0 mm**	Body sheets with thickness of **1,2 mm**	Body sheets with thickness of **1,5 mm**	Body sheets with thickness of **1,8 mm**	Body sheets with thickness of **2,0 mm**	Body sheets with thickness of **2,2 mm**	Body sheets with thickness of **2,5 mm**	Body sheets with thickness of **2,8 mm**	Body sheets with thickness of **3,0 mm**	Body sheets with thickness of **3,5 mm**	Body sheets with thickness of **4,0 mm**	Body sheets with thickness of **5,0 mm**

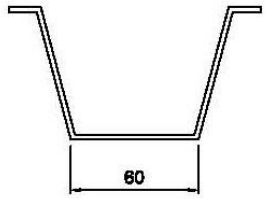
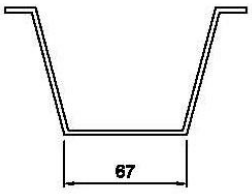
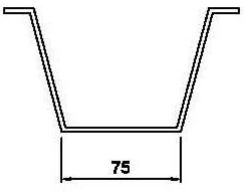
A	Body sheets with **double joint**
B	Body sheets with **triple joint**
C	Body sheets with **quadruple joint**
E	Body sheets with **quintuple joint**
G	Body sheets with **sextuple joint**

The packages of body sheets are also marked with a colour in the edge of the body sheets according to their thickness and based on the following table:

	COLOUR	THICKNESS	RAL
	White	0,80 mm	9016
	Red	1,00 mm	3020
	Yellow	1,20 mm	1016
	Blue	1,50 mm	5015
	Light green	1,80 mm	6032
	Black	2,00 mm	9017
	Gray khaki	2,20 mm	7008
	Orange	2,50 mm	1028
	Dark grey	2,80 mm	9007
	Brown	3,00 mm	8012
	Magenta	3,50 mm	4003
	Dark green	4,00 mm	7013

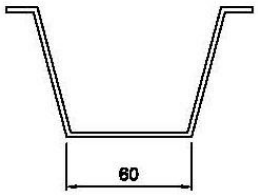
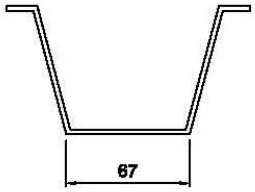
Stiffeners

E 1.5	E 2	E 2.5	E 3	E 3.5	E 4
Stiffeners with thickness of **1,5 mm**	Stiffeners with thickness of **2,0 mm**	Stiffeners with thickness of **2,5 mm**	Stiffeners with thickness of **3,0 mm**	Stiffeners with thickness of **3,5 mm**	Stiffeners with thickness of **4,0 mm**

F	I	N
		

Stiffener splices

E 1.5	E 2	E 3
Splices with thickness of **1,5 mm**	Splices with thickness of **2,0 mm**	Splices with thickness of **3,0 mm**

F	I
	

Torque value

To tighten the bolts SYMAGA suggests different torque values depending on the quality and thread of the bolts provided.

It is very important not to exceed these values because greater values could damage the bolts

TORQUE VALUE (Cs, N x m)		
THREAD	**QUALITY**	
	8.8	**10.9**
M-8	20	28,8
M-10	39,2	57,6
M-12	68	100
M-14	108	160
M-16	168	248

The indicated grip-torques are exclusively for joints without neoprene washers. In joints with neoprene washers it shall be tightened until the neoprene will be expanded.

SILOS OPERATION AND MANAGEMENT

Loading and unloading:

Silos must be loaded through the centre roof cover. Off centre loading can lead to structural damages in the silo. Especially in larger silos it is recommended not to fill it with only one stage. It should be filled with multiple stages to allow proper settlement.

Before loading, make sure all gates are closed and sweep auger (in case it is supplied) is placed over intermediate sumps.

It is necessary to know maximum silo capacity in order not to overfill the silo. Overfilling may cause grain silo failure.

Start unloading through the centre sump until there is not any more grain flowing by gravity. Off centre unloading can cause structural damage.

Do not simultaneous fill and discharge the silo. Simultaneous filling and unloading results in a fluidic behaviour of the grain. This can cause increased sidewall loads. The service life of bins can be drastically reduced and risk of structural failure, economic loss, and personnel injury will increase by simultaneously loading and unloading.

Storing material:

Silos are designed to store dry and cool grain. It is not recommended to fill grain over 16% moisture in a storage bin.

Do not fill grain to top. Maximum fill height is 3 cm below eave.

Avoid increased pressures inside the silo. For this purpose, let the air leave the silo through roof vents or manhole (make sure they are not blocked by grain).

In case temperature cables are supplied, it is advisable to attach the temperature cables among them, in order to avoid the natural displacement to the outer regions of the silo.

ASSEMBLY INSTRUCTIONS FOR GRAIN SILOS

CONCRETE FOUNDATION

The fastest and most economical way to erect the grain silos is from the top to the bottom using lifting jacks. The suggested assembly procedure is explained below.

1- Assemble the top ring of body-sheets on the finished foundation bolting the vertical joint line free of stiffener with M10x20 bolts, and doing it in the clockwise direction; in other words, placing the one on the left over the one on the right, as it is shown in the drawing. (See figure 1)

Caulk with sealant the vertical joint. The vertical lines for the holes stiffeners must be aligned with the anchor bolts in the foundation. Check to be sure that the body-sheets are positioned correctly.

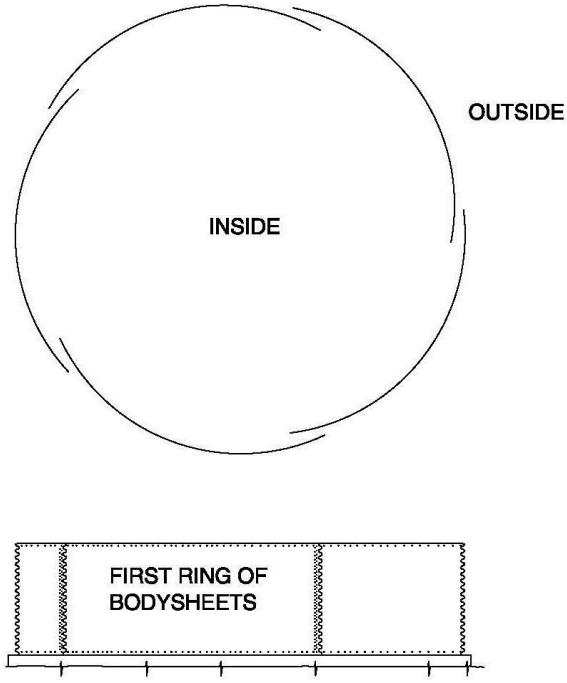


Figure 1

2- Place the central collar support in the centre of the foundation and adjust to obtain the required height (see detail). Choose the location of the manhole sheet and roof ladder and bolt the roof clips to the top of the body-sheets.

Begin the roof assembly installing four sheets at quarter points to stabilize the central collar. (See figure 2)

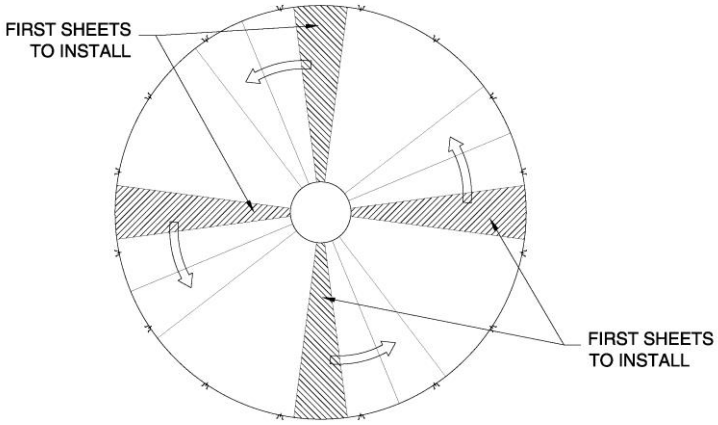


Figure 2

Complete the roof assembly and place the ladder rungs on the sheet right on the left of the manhole sheet. (See figure 3)

Assemble the manhole according to the detail drawing.

If the roof has any aeration, see the detail drawing to install it. In case no different information is given, the aeration will be distributed uniformly around the roof.

If the silo has temperature cables, see the detail drawings to install the additional support requirements.

If roof ladder has handrail, see the detail drawing to install it.

Right after the assembly of the roof it is advisable to check the sealing of the roof. For this the roof may be watered with a hose to verify all the points where the water could pass through. In case there is any point where the water can go easily through, they have to be resealed.

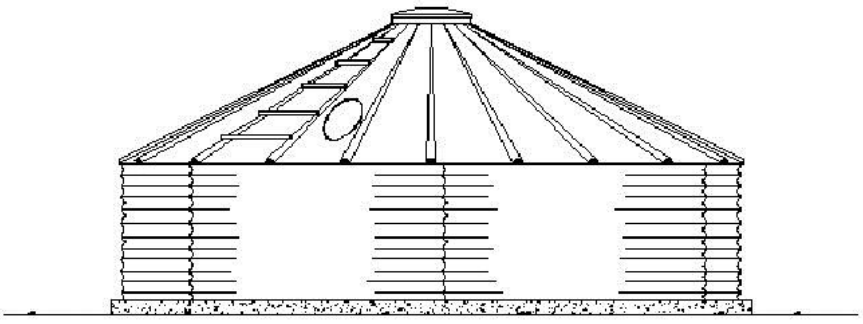


Figure 3

3- Attach the lifting jacks to the stiffeners (or to the holes lines of stiffeners in case they are not installed yet) and raise the silo high enough to let the assembly of the next body-sheets ring. (See figure 4).

Determine the number of required lifting jacks according to the diameter and weight of the silo.

The bolts must be adequate to lift the silo.

The vertical joint of body-sheets must be staggered (as shown in the drawing) to allow all the stiffener holes to be aligned. (See figure 4)

The body-sheets are assembled inside of the previous ring (see drawings).

Caulk with sealant the vertical joint.

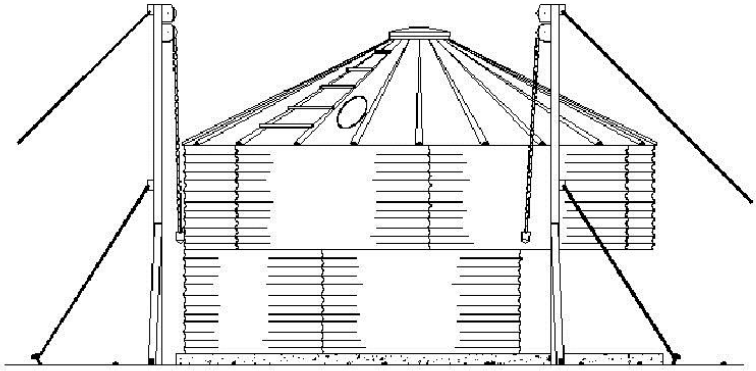


Figure 4

The stiffeners are assembled after installing one or two rings of body-sheets, depending on the length of the stiffeners used. Attach stiffeners to the body-sheets using the bolts specified in the detail. (See figure 5)

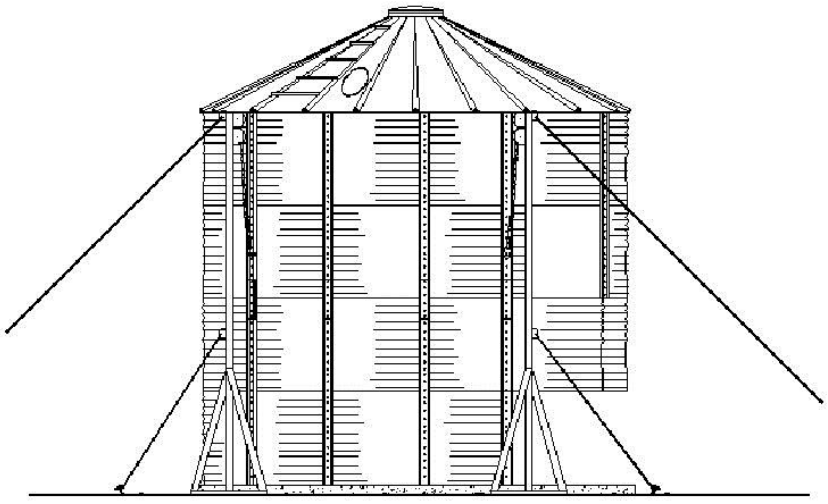


Figure 5

If the silo has any ladder, attach it to the body-sheets as the silo is raised. See ladder and safety cage details to assemble it.

If wind rings are required, see the detail drawing and assemble it as the silo is lifted.

If the silo has any columns attached to it, install these attachments according to the details included in the Columns Assembly Instructions.

While the silo is being erected the watering test should be done as well in order to check the sealing at every point.

4- Repeat step 3 as additional body-sheets are added.

Install the access body-sheet. See the drawing for the position. In silos with access body-sheet in the second ring from bottom, body-sheet with access door must be located in the axis of the silos and on the side of the bottom outlets.

5- After completing the bottom ring, level the silo, anchor it securely to the foundation and seal the base of the silo.

CAUTION

1- DO NOT LIFT THE SILO UNDER WINDY CONDITIONS. THIS COULD RESULT IN SILO DAMAGE. CONLLEVAR DAÑOS EN EL SILO.

If the wind blows during the installation so that the silo wobbles and it is unstable, proceed as follows:

1.1.-Rest the silo on the floor. Let the chain hoists tying the silo, tensed but not working.

1.2.-Fix anchor plates and tie them to the foundation by elements that can be released easily (as cables for example).

1.3.-Once that the wind stops, the anchor plates will be dismantled, and we will proceed with the assembly.

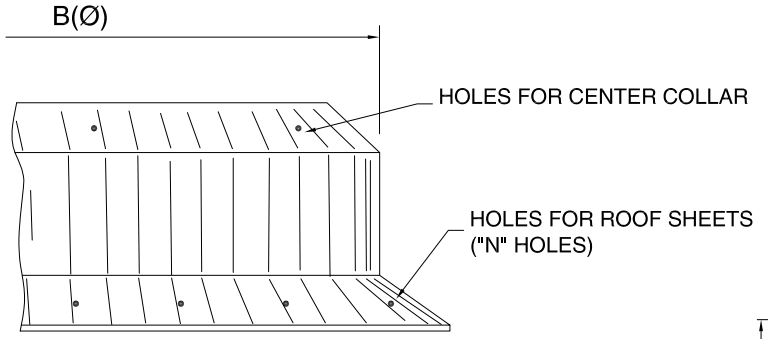
2- WHEN ASSEMBLING, RAISE THE SILO JUST ENOUGH TO ADD ONE BODY-SHEETS RING.

3- START ASSEMBLING EVERY NEW RING OF BODY-SHEETS BY THE WINDWARD SIDE OF THE TANK.

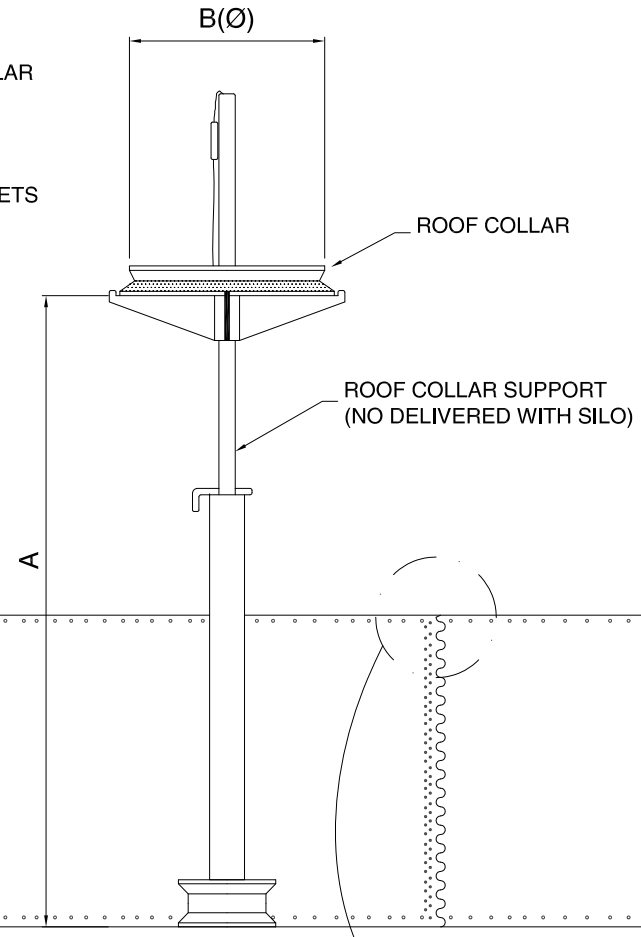
4- WHEN ASSEMBLING A NEW RING LEAVE THE BOLTS LOOSE UNTIL ALL THE BODY-SHEETS ARE ATTACHED.

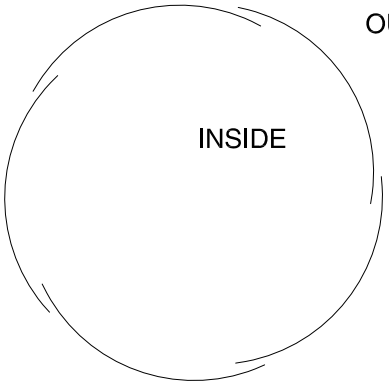
5- LOWER THE SILO AND SECURE IT TO THE FOUNDATION BEFORE LEAVING THE JOBSITE.

6- CHECK THE THICKNESS OF THE BODY-SHEETS AND STIFFENERS AND INSTALL THEM IN THE PROPER POSITION ACCORDING TO THE DRAWING.

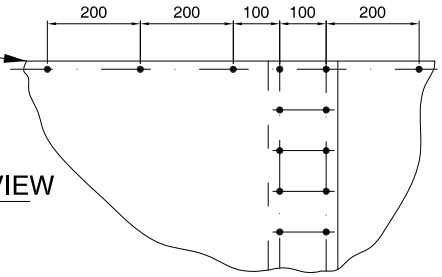


ROOF COLLAR DETAIL





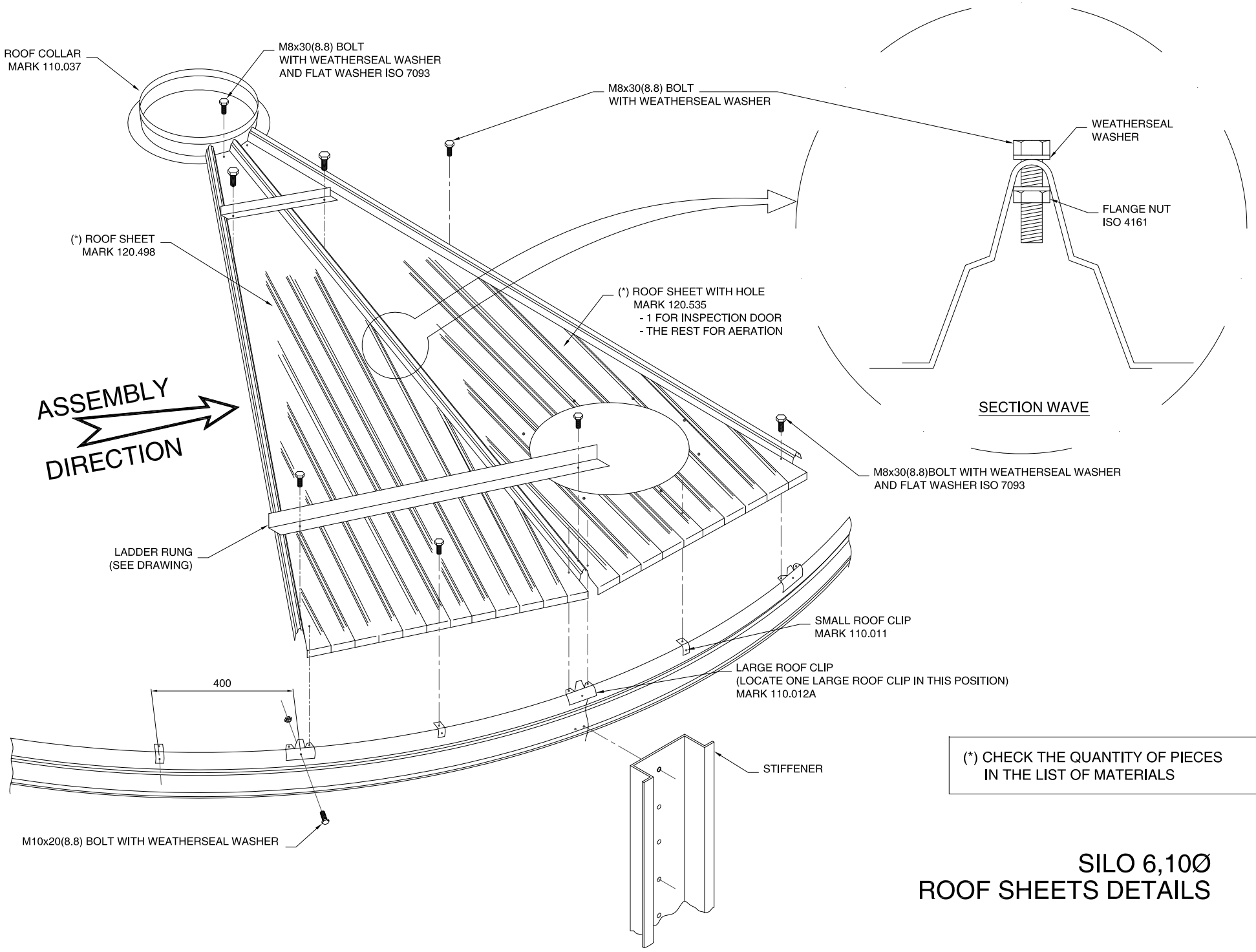
BODY SHEETS INSTALLATION



OUTSIDE VIEW

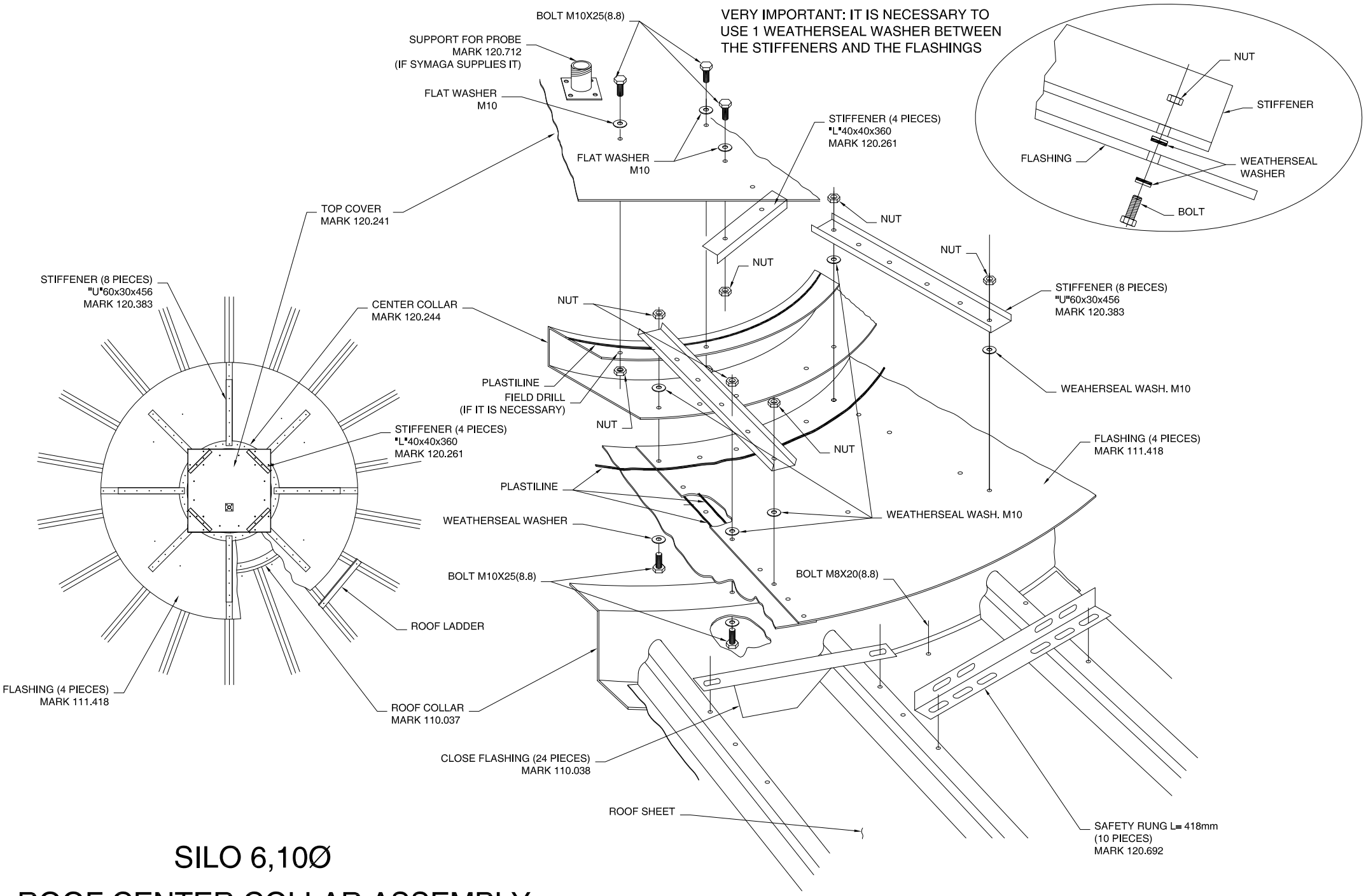
SILO	(A) mm	(B) mm	N	MARK
4.60	2.070	1.400	18	110.079
5.35	2.290	1.400	21	110.135
6.10	2.510	1.400	24	110.037
6.87	2.730	1.400	27	110.110
7.60	2.950	1.400	30	110.088
8.40	3.170	1.400	33	110.008
8.42	3.170	1.400	27	110.110
9.20	3.390	1.400	36	110.144
9.93	3.460	1.930	39	110.155
10.70	3.680	1.930	42	110.044
11.45	3.900	1.930	45	116.719
12.23	4.120	1.930	48	110.098

ROOF ASSEMBLY INSTRUCTIONS



(*) CHECK THE QUANTITY OF PIECES
IN THE LIST OF MATERIALS

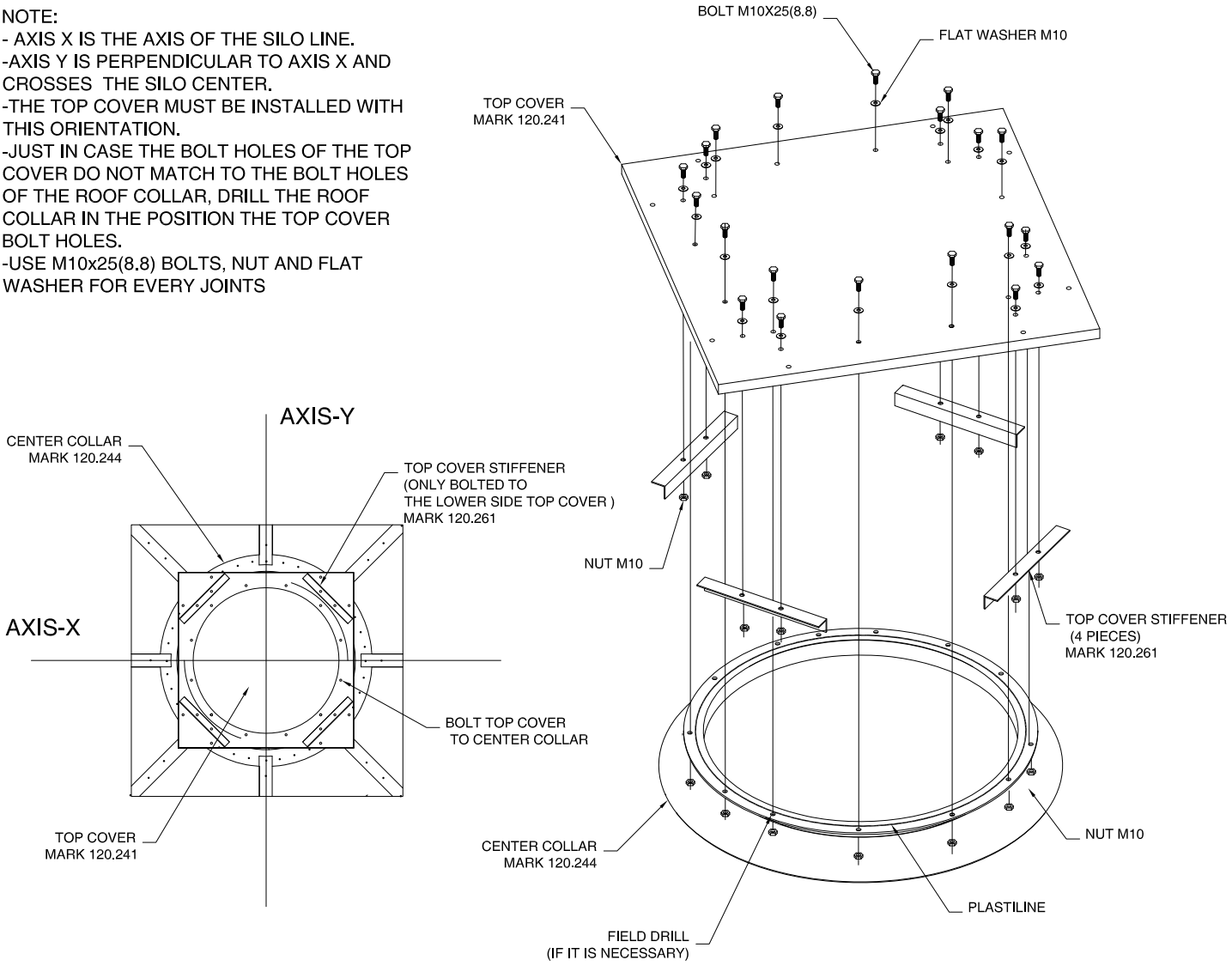
SILO 6,10Ø
ROOF SHEETS DETAILS



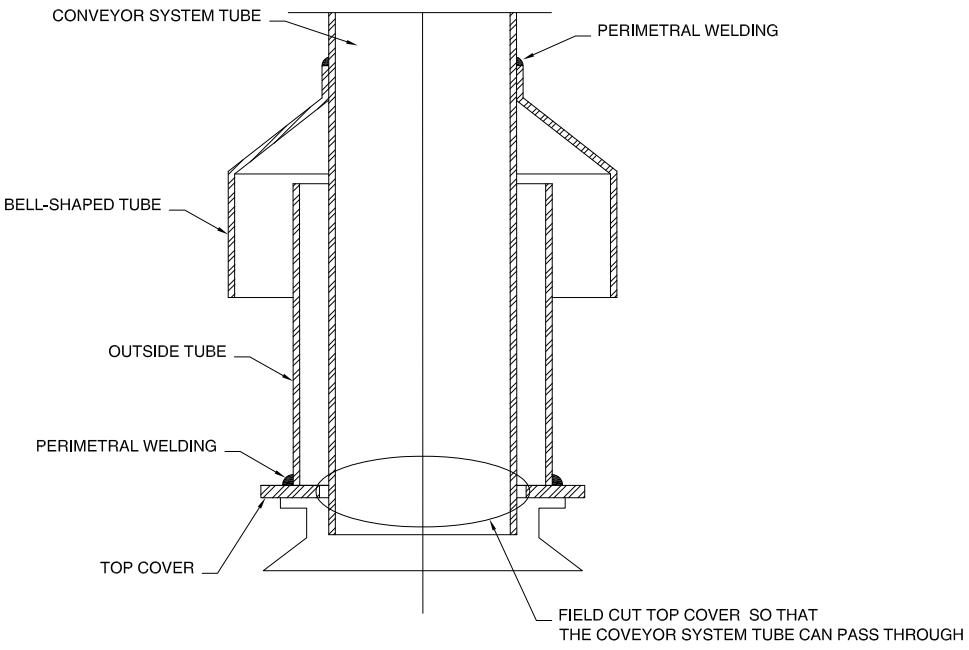
SILO 6,10Ø

ROOF CENTER COLLAR ASSEMBLY

NOTE:
- AXIS X IS THE AXIS OF THE SILO LINE.
-AXIS Y IS PERPENDICULAR TO AXIS X AND CROSSES THE SILO CENTER.
-THE TOP COVER MUST BE INSTALLED WITH THIS ORIENTATION.
-JUST IN CASE THE BOLT HOLES OF THE TOP COVER DO NOT MATCH TO THE BOLT HOLES OF THE ROOF COLLAR, DRILL THE ROOF COLLAR IN THE POSITION THE TOP COVER BOLT HOLES.
-USE M10x25(8.8) BOLTS, NUT AND FLAT WASHER FOR EVERY JOINTS

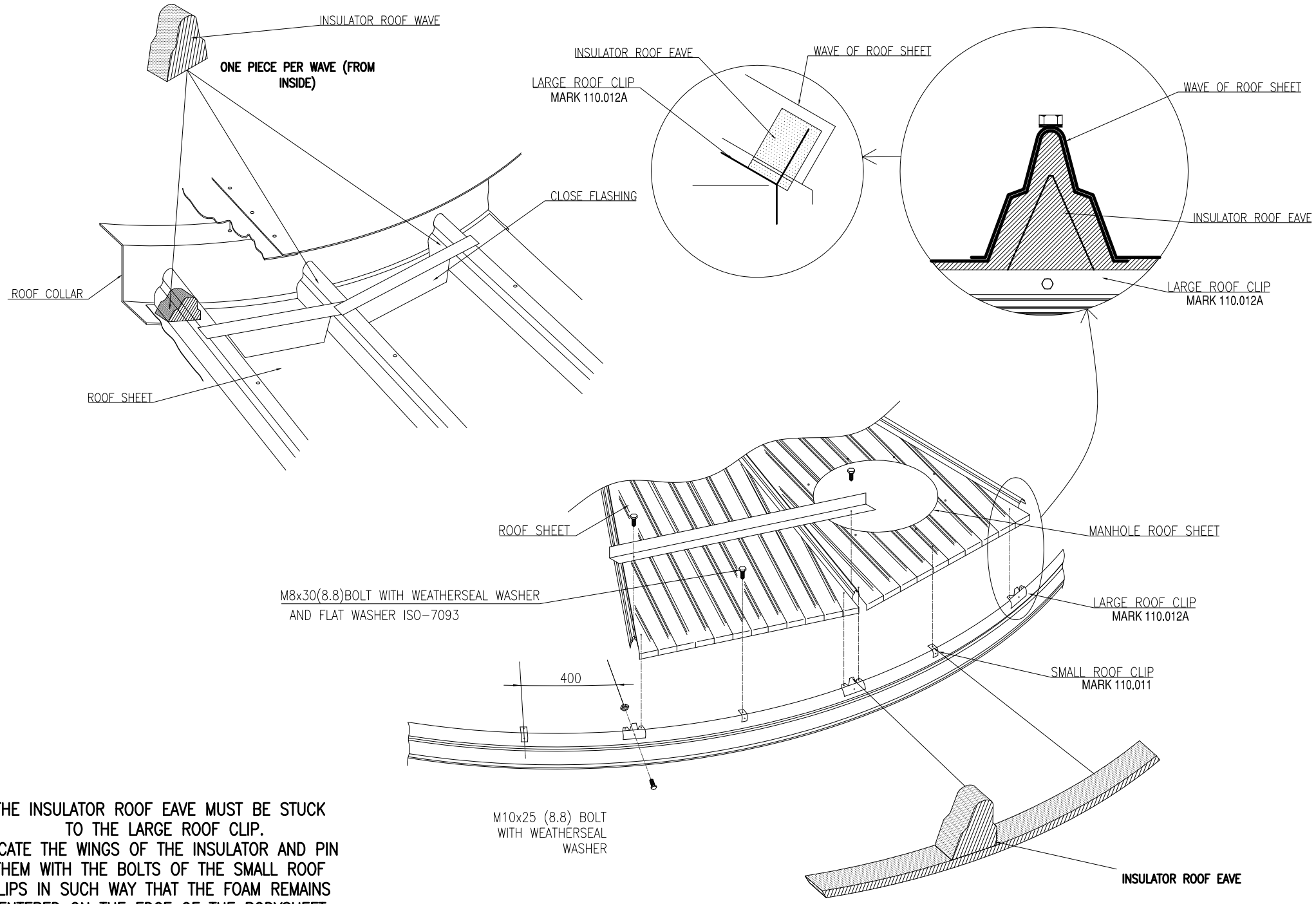


TOP COVER-CENTER COLLAR UNION DETAIL



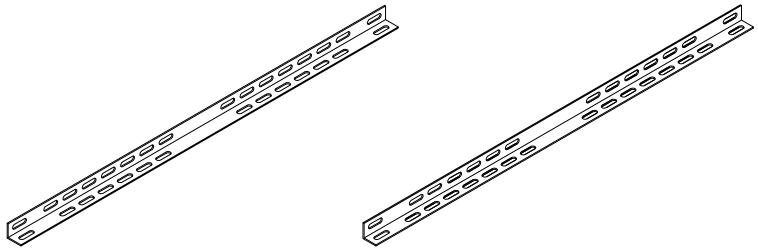
RECOMMENDED CONVEYOR SYSTEM-TOP COVER UNION

ASSEMBLY TOP COVER DETAIL



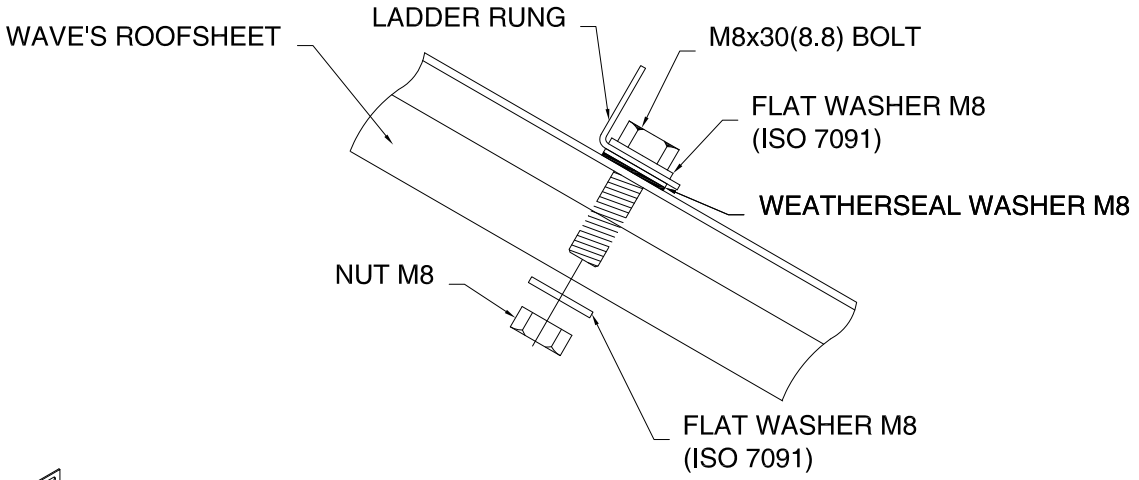
THE INSULATOR ROOF EAVE MUST BE STUCK TO THE LARGE ROOF CLIP.
LOCATE THE WINGS OF THE INSULATOR AND PIN THEM WITH THE BOLTS OF THE SMALL ROOF CLIPS IN SUCH WAY THAT THE FOAM REMAINS CENTERED ON THE EDGE OF THE BODYSHEET.

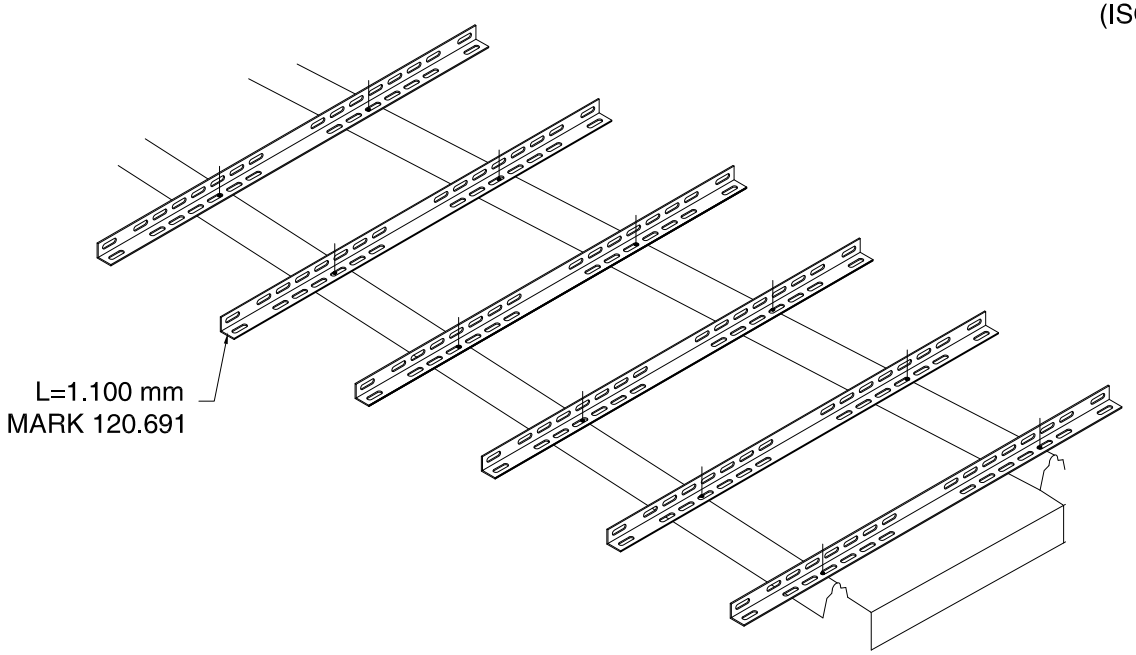
SEALING DETAIL OF ROOF SHEETS WAVES



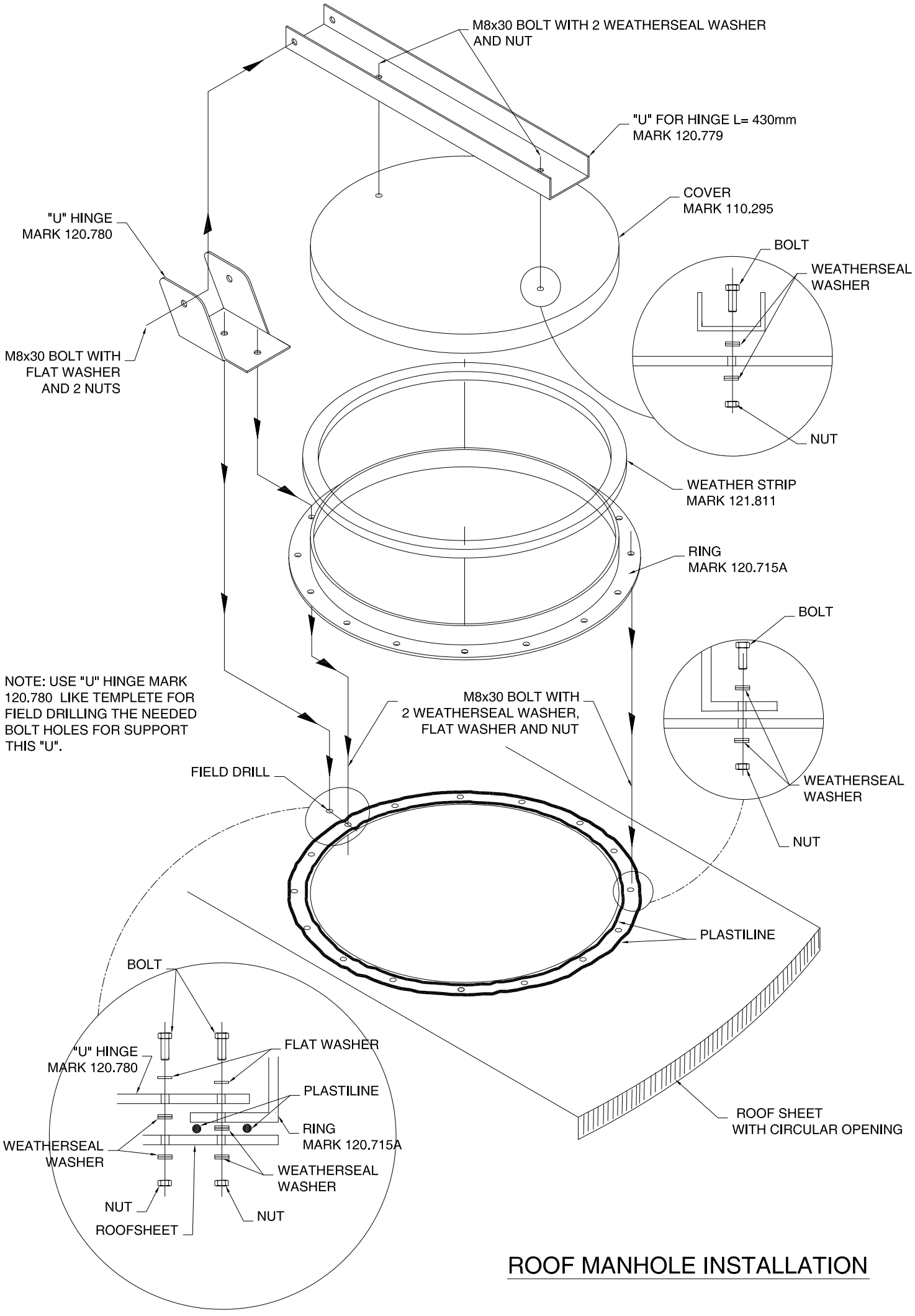
POSITION "A" POSITION "B"

NOTE:
-INSTALL THE RUNGS IN THE POSITION WHERE THE LONG HOLES FIT BETTER WITH THE BOLT HOLE OF ROOF SHEETS.
-TAKE INTO ACCOUNT THE RUNGS ARE SEPARATED 500 mm AMONG THEM

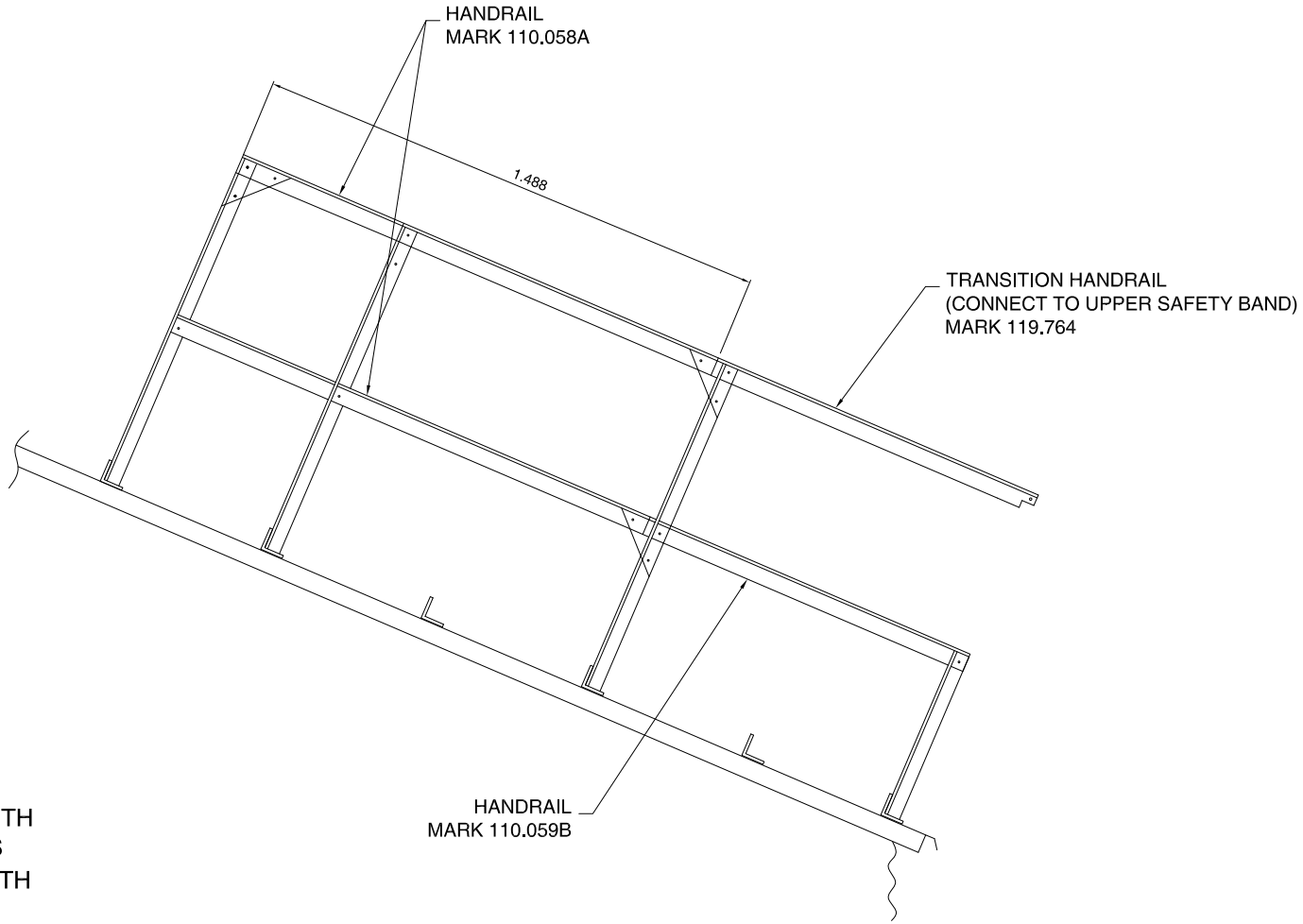




LADDER RUNG ROOF ASSEMBLY SILO 6,10Ø

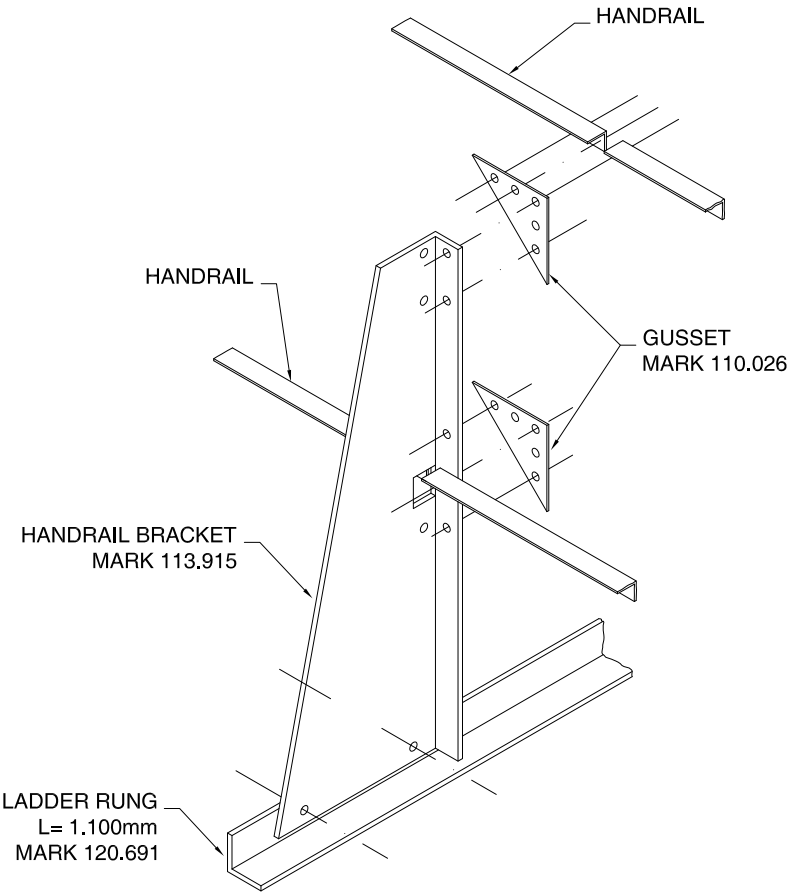


ROOF MANHOLE INSTALLATION

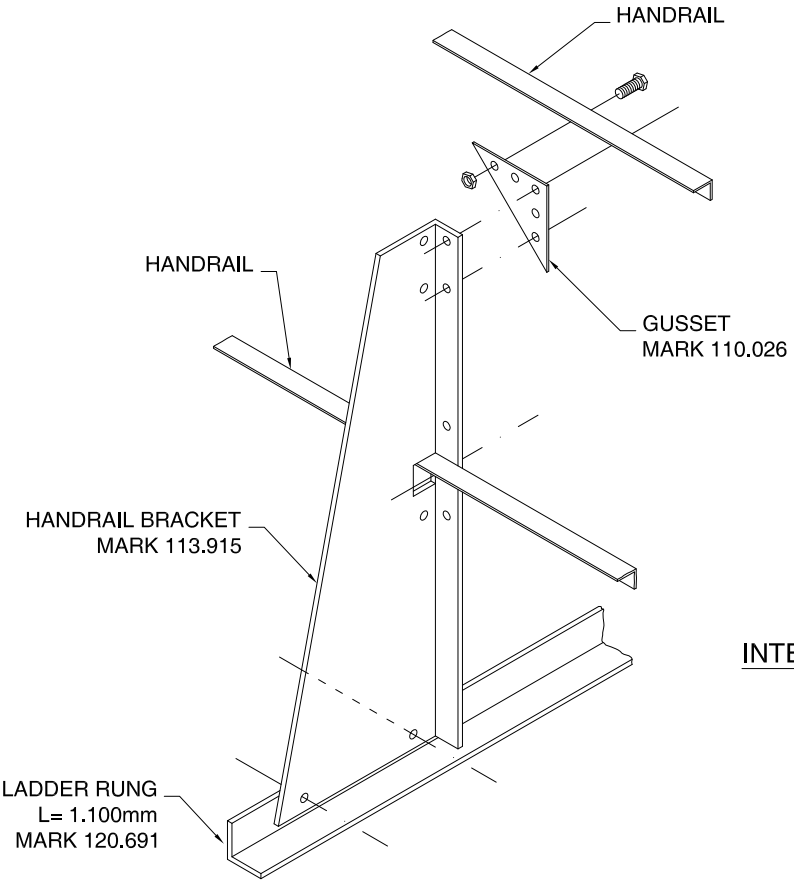


- USE M10x20(8.8) BOLTS WITH NUTS IN ALL CONNECTIONS
- INSTALL HANDRAIL ON BOTH SIDES OF ROOF LADDER

SILO 6,10Ø
ROOF HANDRAIL DETAILS



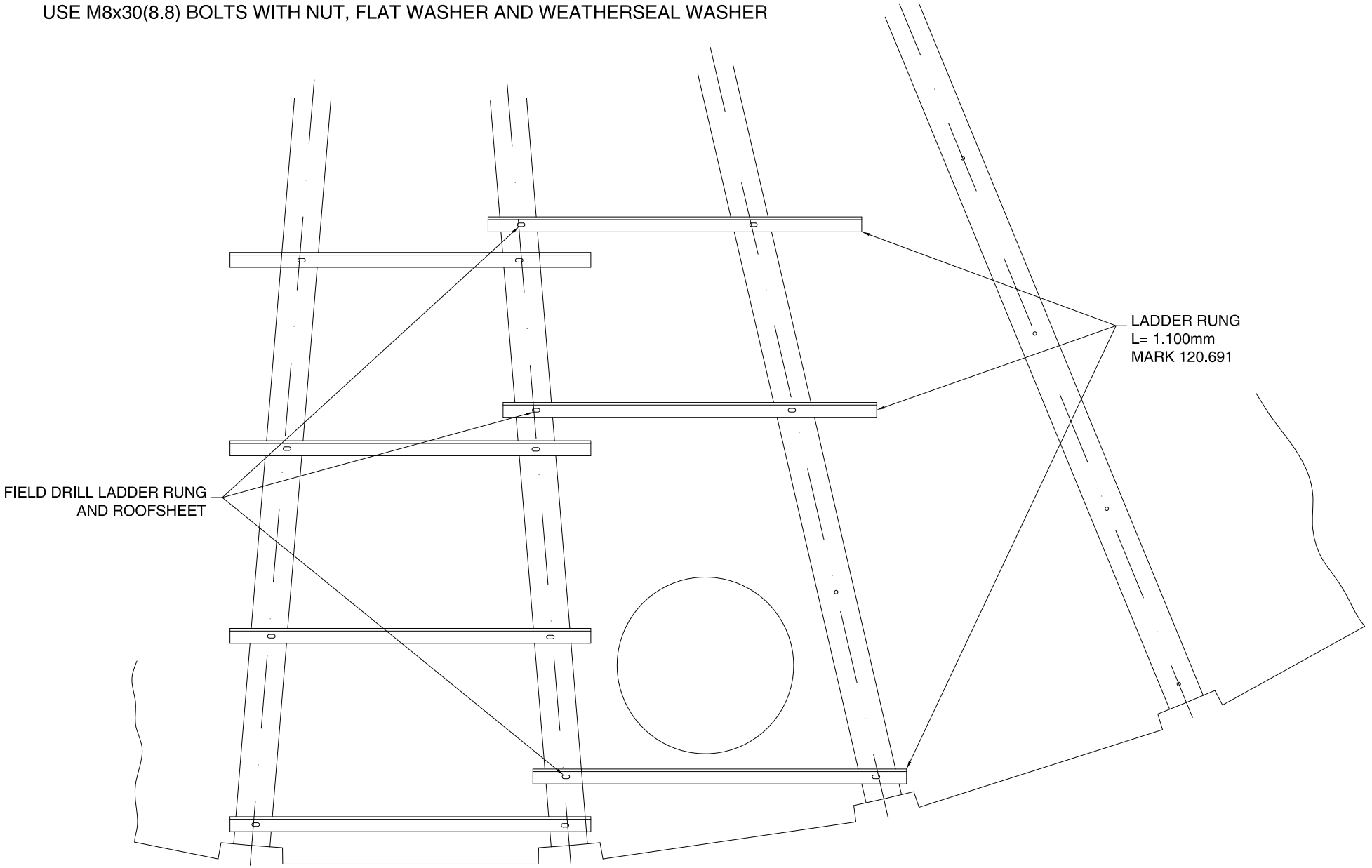
SPLICE DETAIL



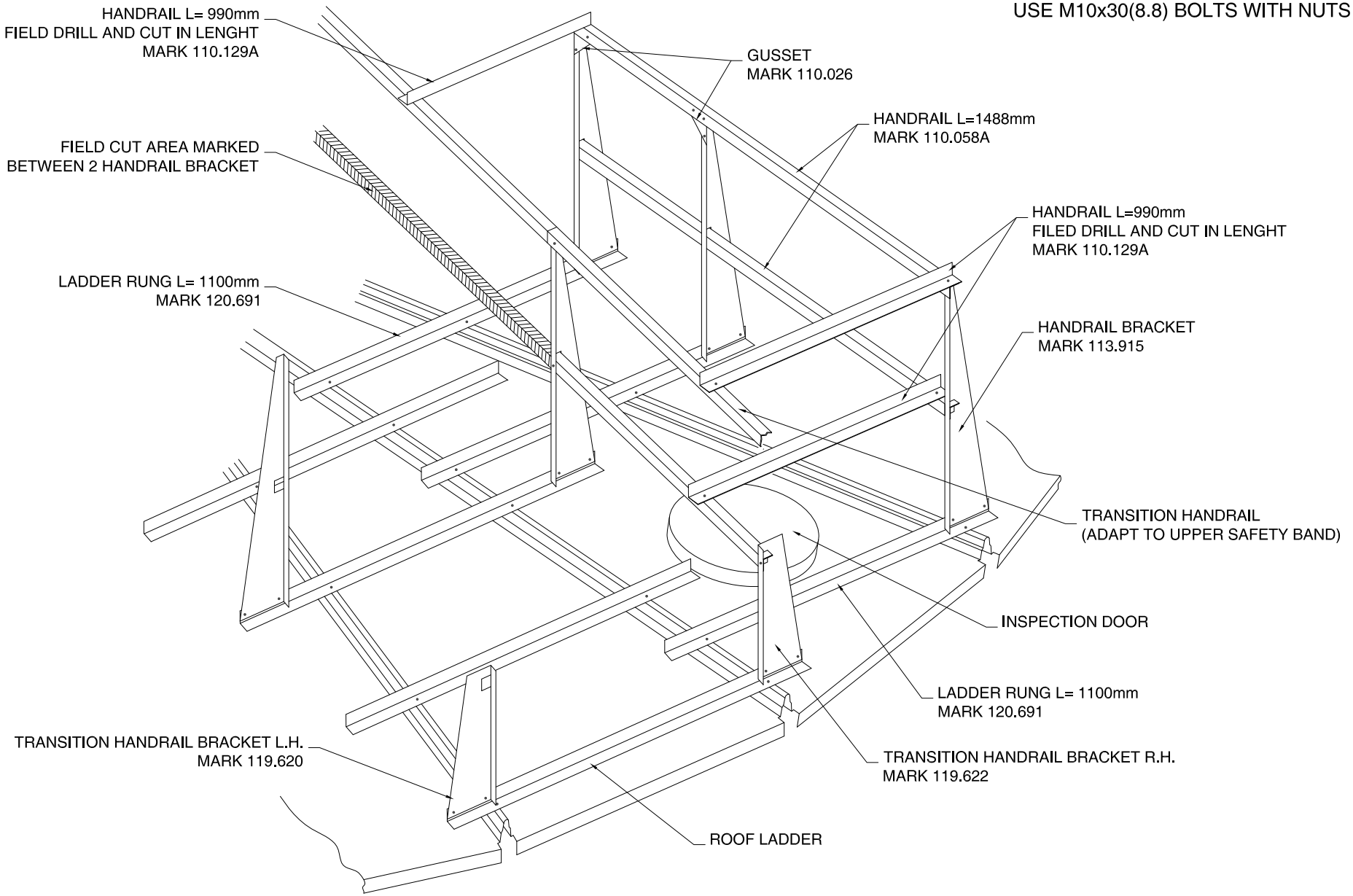
INTERMEDIATE DETAIL

ROOF HANDRAIL DETAILS

USE M8x30(8.8) BOLTS WITH NUT, FLAT WASHER AND WEATHERSEAL WASHER



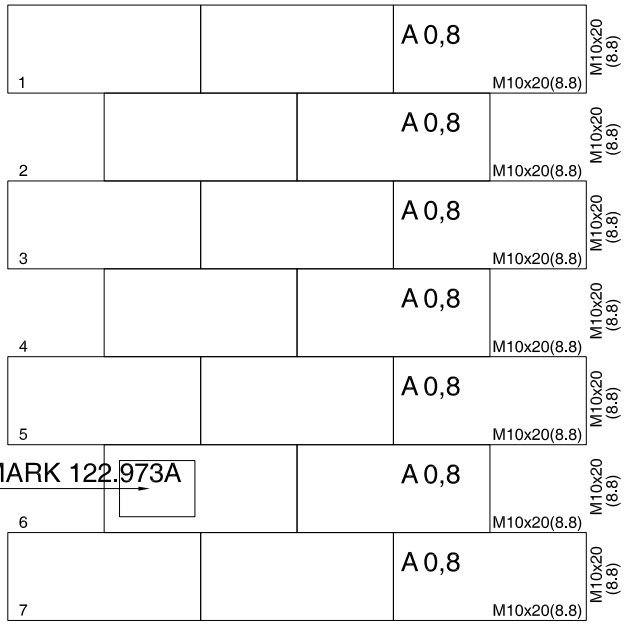
INSTALLATION OF LADDER RUNGS FOR PROTECTION OF INSPECTION DOOR



PROTECTION OF INSPECTION DOOR

VERY IMPORTANT:
THE FOREMAN IN CHARGE MUST CHECK THAT THERE ARE ENOUGH BODYSHEETS WITH THEIR CORRESPONDING THICKNESS TO INSTALL EVERY SILO.

SILO 6,1 / 7



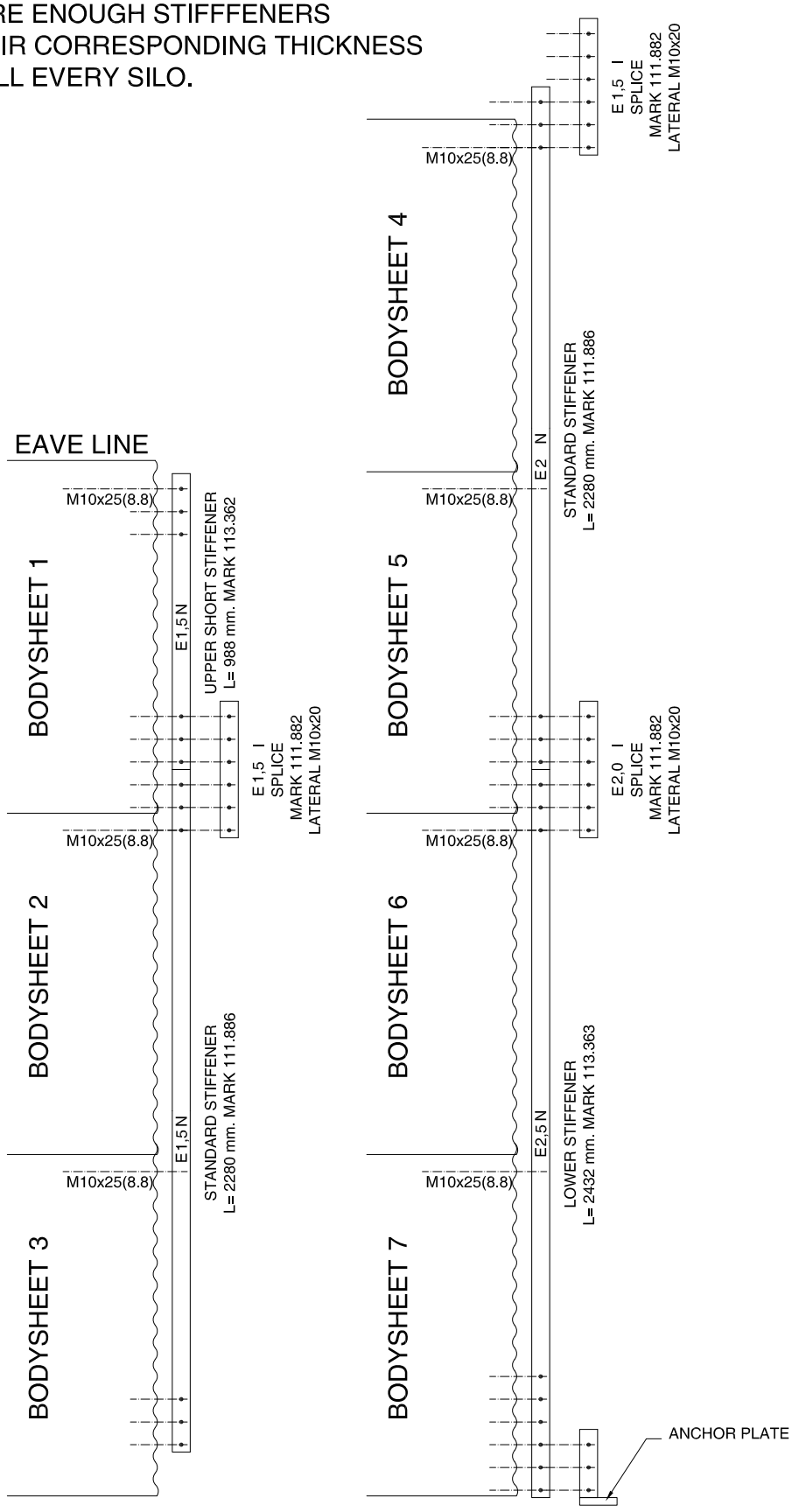
DOOR SET MARK 122.973A

QUANT.	THICKNESS (mm)	MARK
8	0,8	110.000A
8	0,8	110.000A
8	0,8	110.000A
8	0,8	110.000A
8	0,8	110.000A
8	0,8	110.000A
8	0,8	110.000A

*BODY SHEET-BODY SHEET SEAM:
Use bolts with head and weatherseal wash. outside, and flat wash. and nut inside.

BODY SHEET COMPOSITION

VERY IMPORTANT:
THE FOREMAN IN CHARGE MUST CHECK THAT
THERE ARE ENOUGH STIFFFENERS
WITH THEIR CORRESPONDING THICKNESS
TO INSTALL EVERY SILO.



TWO STIFFENER PER BODYSHEET
SILO 6,1 /7

STIFFENERS INSTALLATION

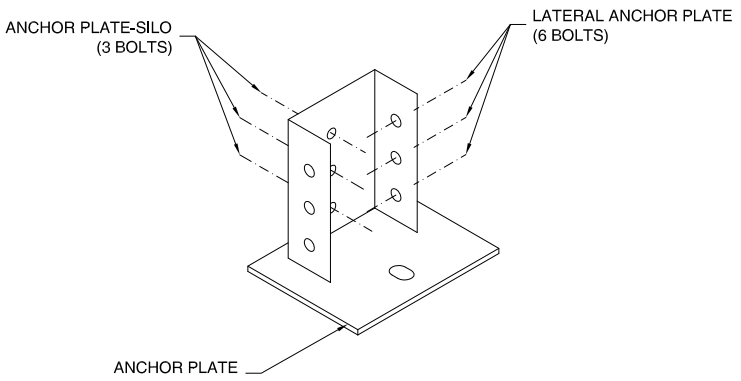
*BODY SHEET-STIFFENER SEAM:

Use bolts with head and weatherseal wash. inside, and nut outside.

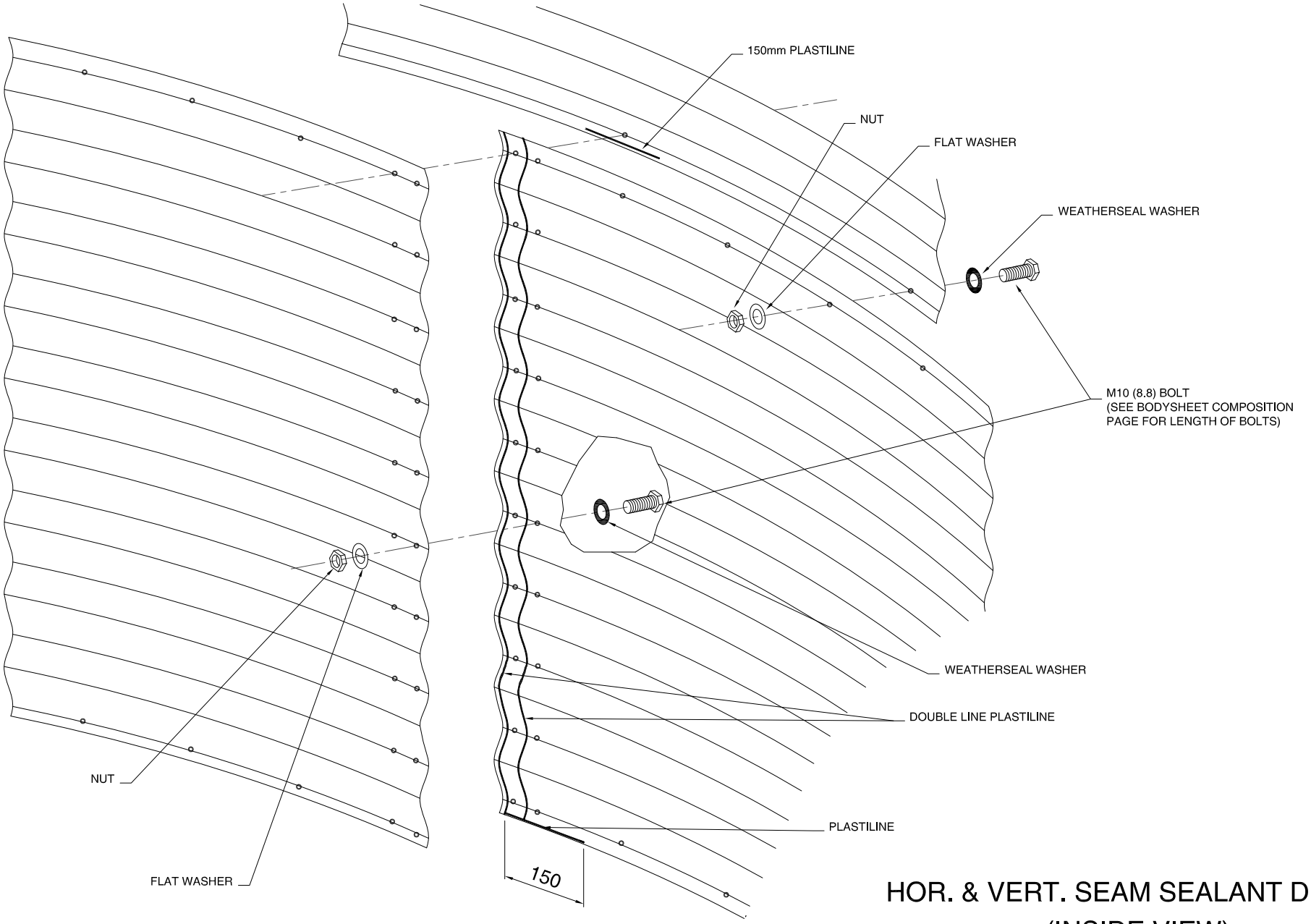
*STIFFENER-STIFFENERS SPLICE:

Use bolts with nut and two flat washers.

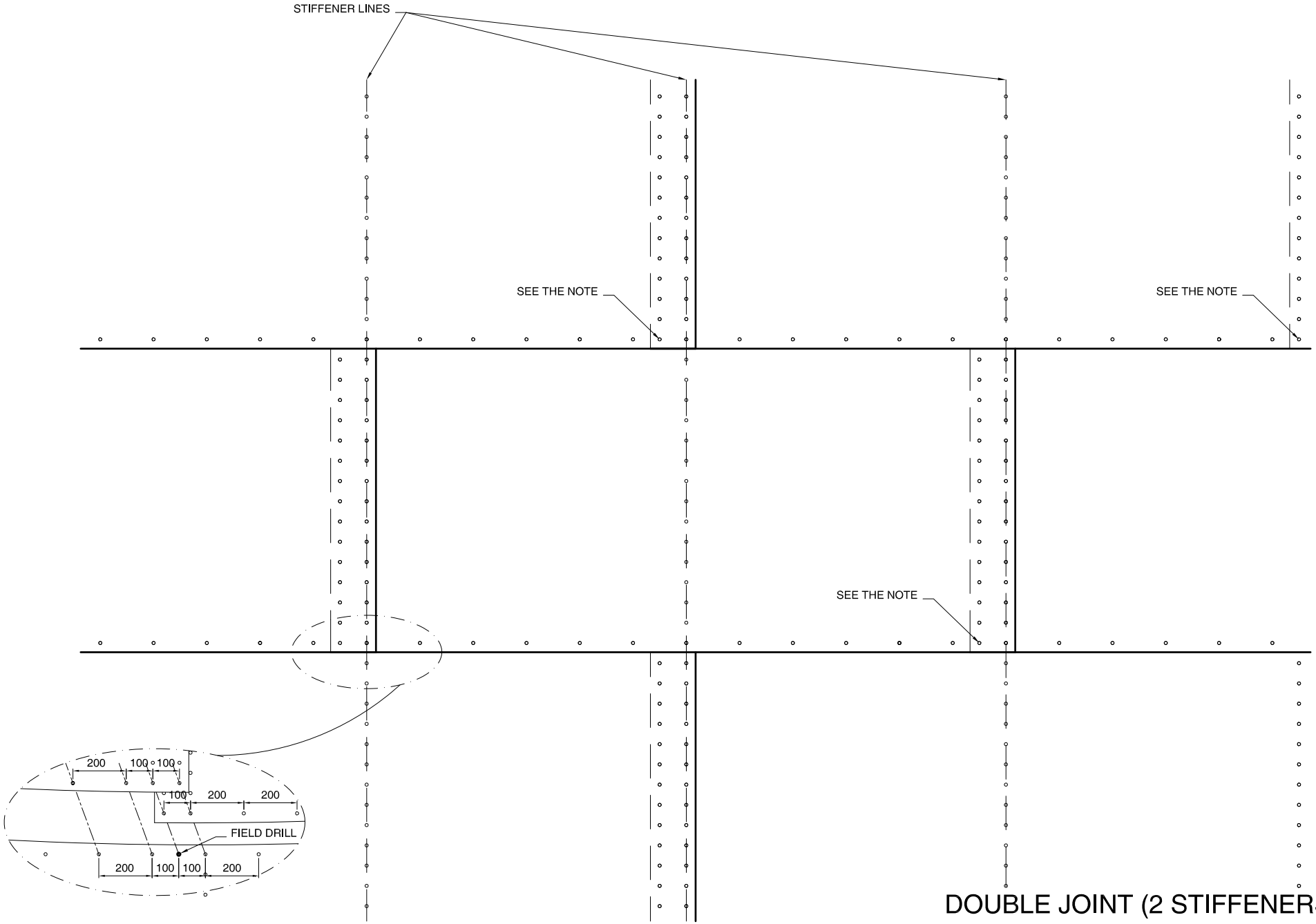
ANCHOR PLATE	LATERAL ANCHOR PLATE	ANCHOR PLATE-SILO
MARK 119.972	M10x30 (8.8) BOLT	M10x35 (8.8) BOLT
MARK 119.973	M10x35 (8.8) BOLT	M10x40 (8.8) BOLT
MARK 119.974	M10x40 (8.8) BOLT	M10x50 (8.8) BOLT
MARK 119.975	M10x30 (8.8) BOLT	M10x35 (8.8) BOLT
MARK 119.976	M10x35 (8.8) BOLT	M10x40 (8.8) BOLT
MARK 119.977	M10x40 (8.8) BOLT	M10x50 (8.8) BOLT
MARK 119.983	M10x40 (8.8) BOLT	M10x50 (8.8) BOLT
MARK 121.077	M10x40 (8.8) BOLT	M10x50 (8.8) BOLT



BOLTS FOR ANCHOR PLATE



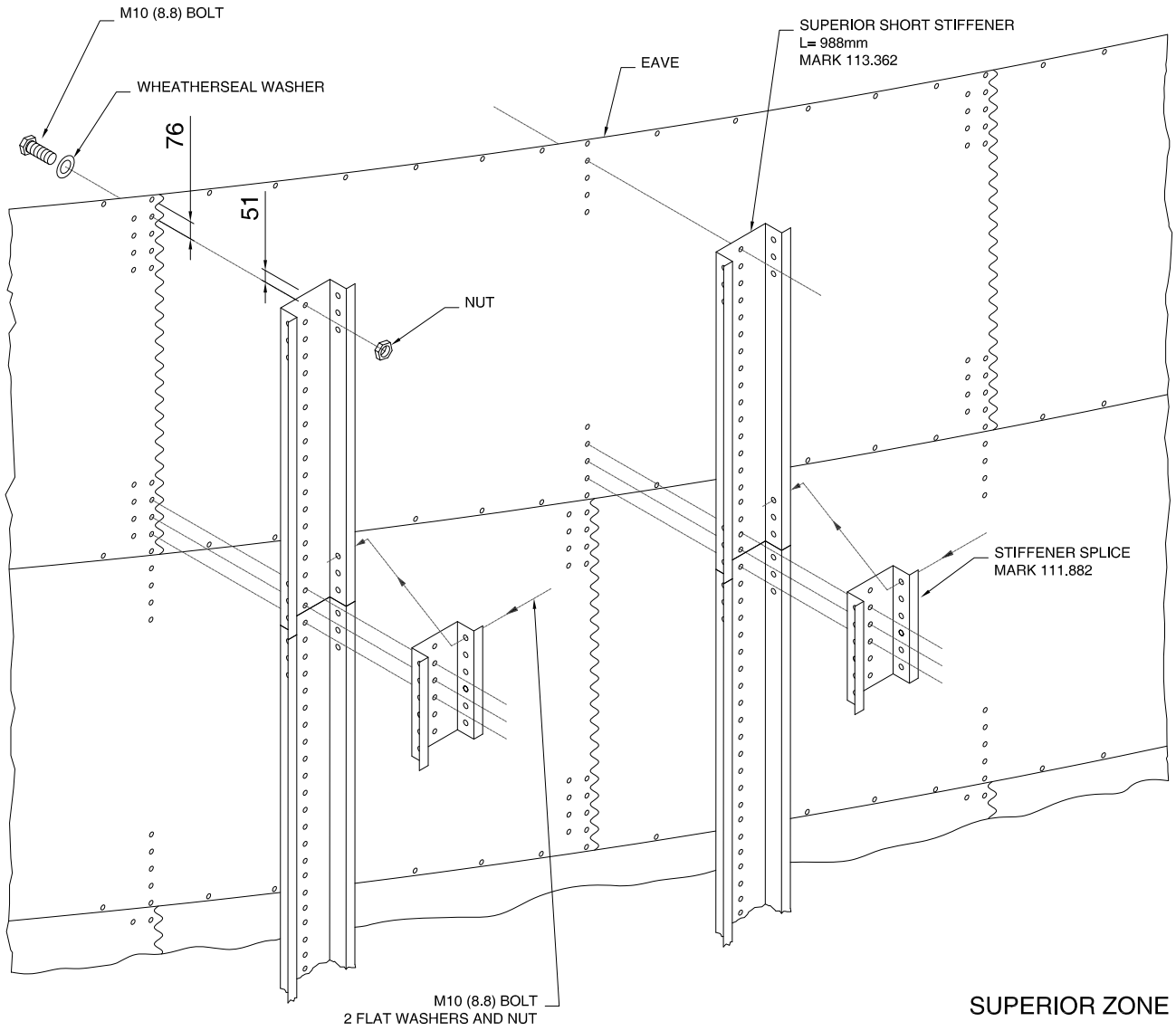
HOR. & VERT. SEAM SEALANT DETAIL
(INSIDE VIEW)



DOUBLE JOINT (2 STIFFENERS)
BODYSHEETS AND STIFFENERS INSTALLATION (OUTSIDE VIEW)

NOTE:
IT IS NOT NECESSARY FIELD DRILL HOLES IN THE BODYSHEETS BECAUSE SILO WAS CALCULATED WITHOUT THE CONTRIBUTION OF THESE ADDITIONAL BOLTS, IT IS ONLY AN ESTHETIC ISSUE.

* SEE BODYSHEET COMPOSITION PAGE FOR LENGTH OF BOLTS



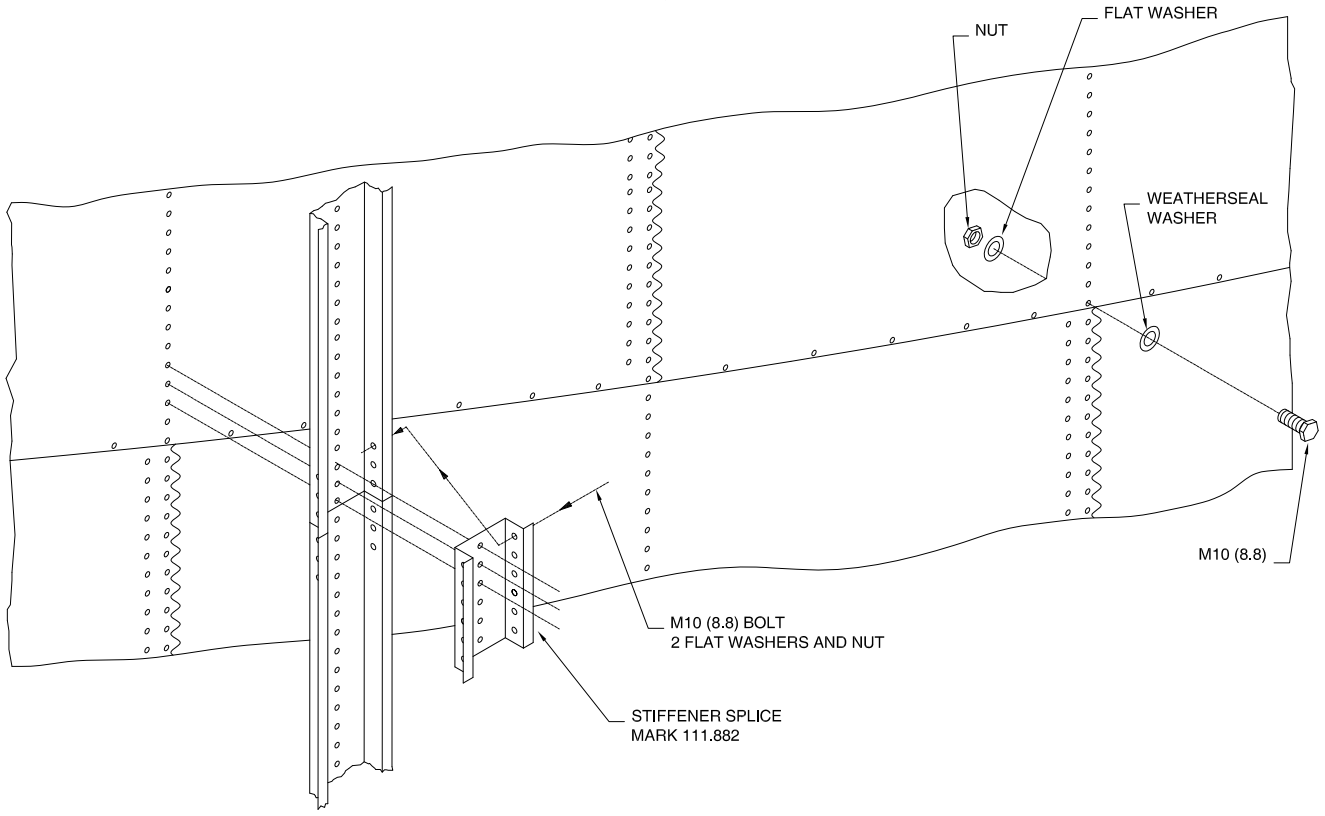
SUPERIOR ZONE

NOTE:
WHEN INSTALL STIFFENERS, IT IS VERY IMPORTANT
NOT TO ALLOW STIFFENERS TO SLIP DOWNWARD WHEN TIGHTENING.
STIFFENERS MUST BE IN CONTACT.

BODYSHEETS AND STIFFENERS DETAILS (OUTSIDE VIEW)

* SEE BODYSHEET COMPOSITION PAGE FOR LENGTH OF BOLTS

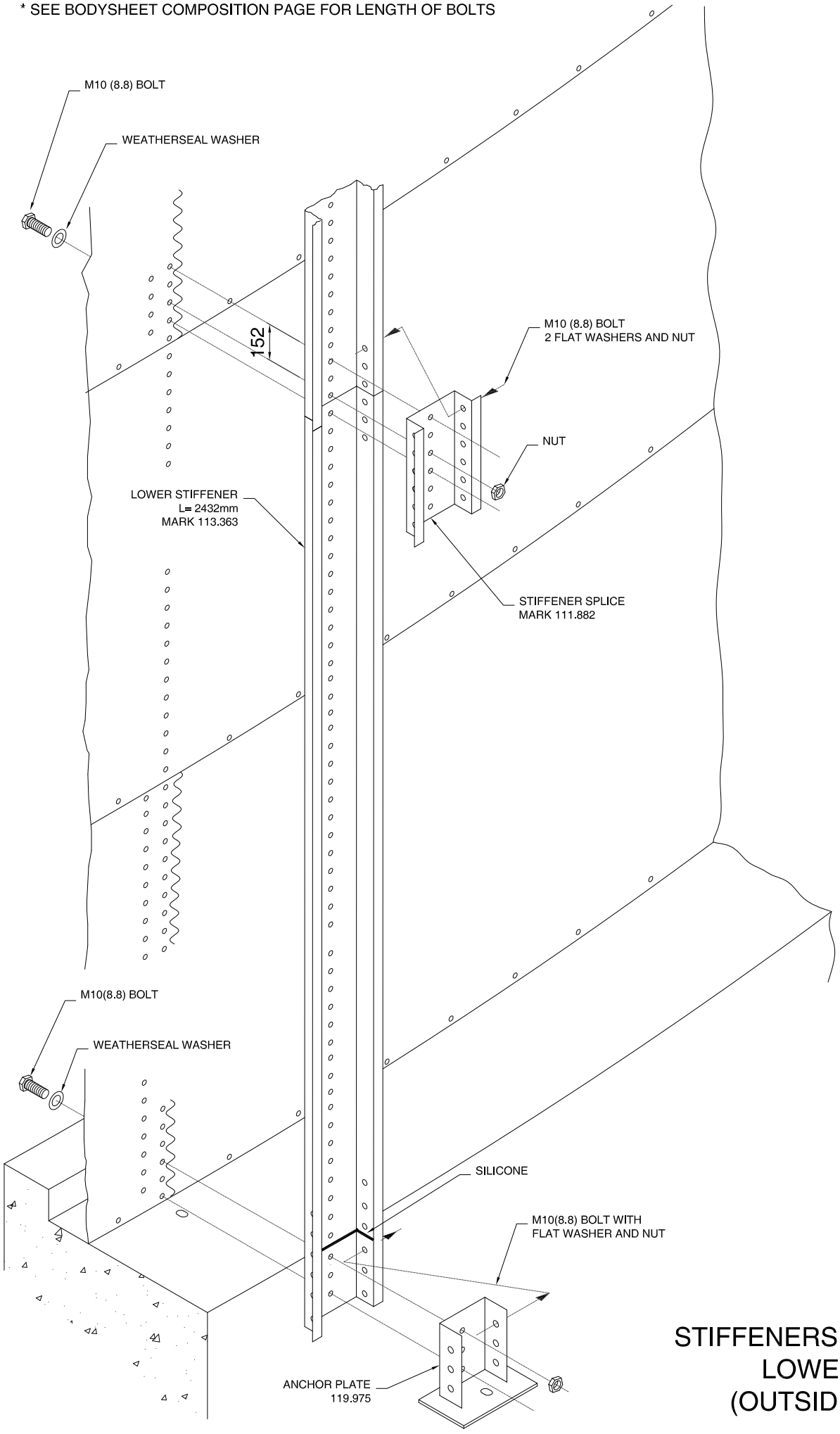
INTERMEDIATE ZONE



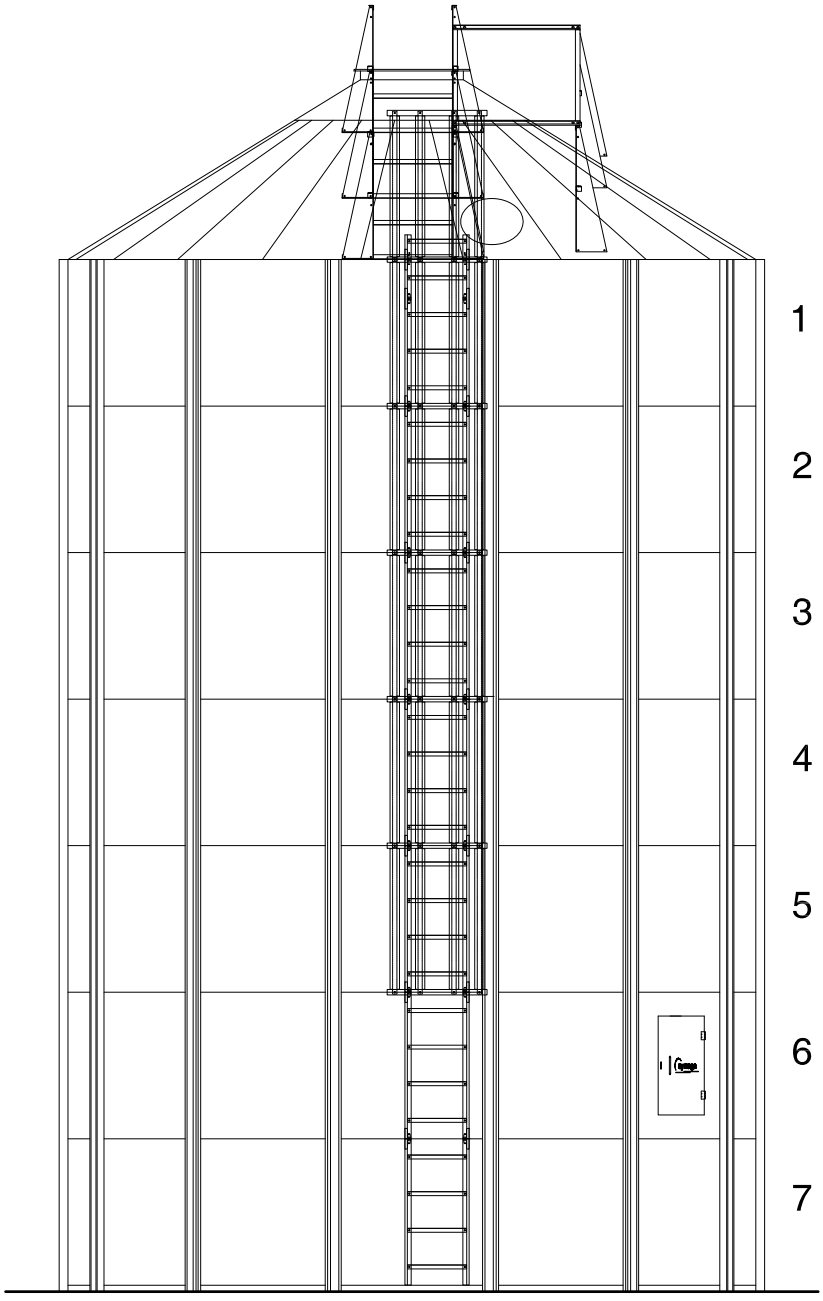
NOTE:
WHEN INSTALL STIFFENERS, IT IS VERY IMPORTAN
NOT TO ALLOW STIFFENERS TO SLIP DOWNWARD WHEN TIGHTENING.
STIFFENERS MUST BE IN CONTACT.

BODYSHEETS AND STIFFENERS DETAILS (OUTSIDE VIEW)

* SEE BODYSHEET COMPOSITION PAGE FOR LENGTH OF BOLTS

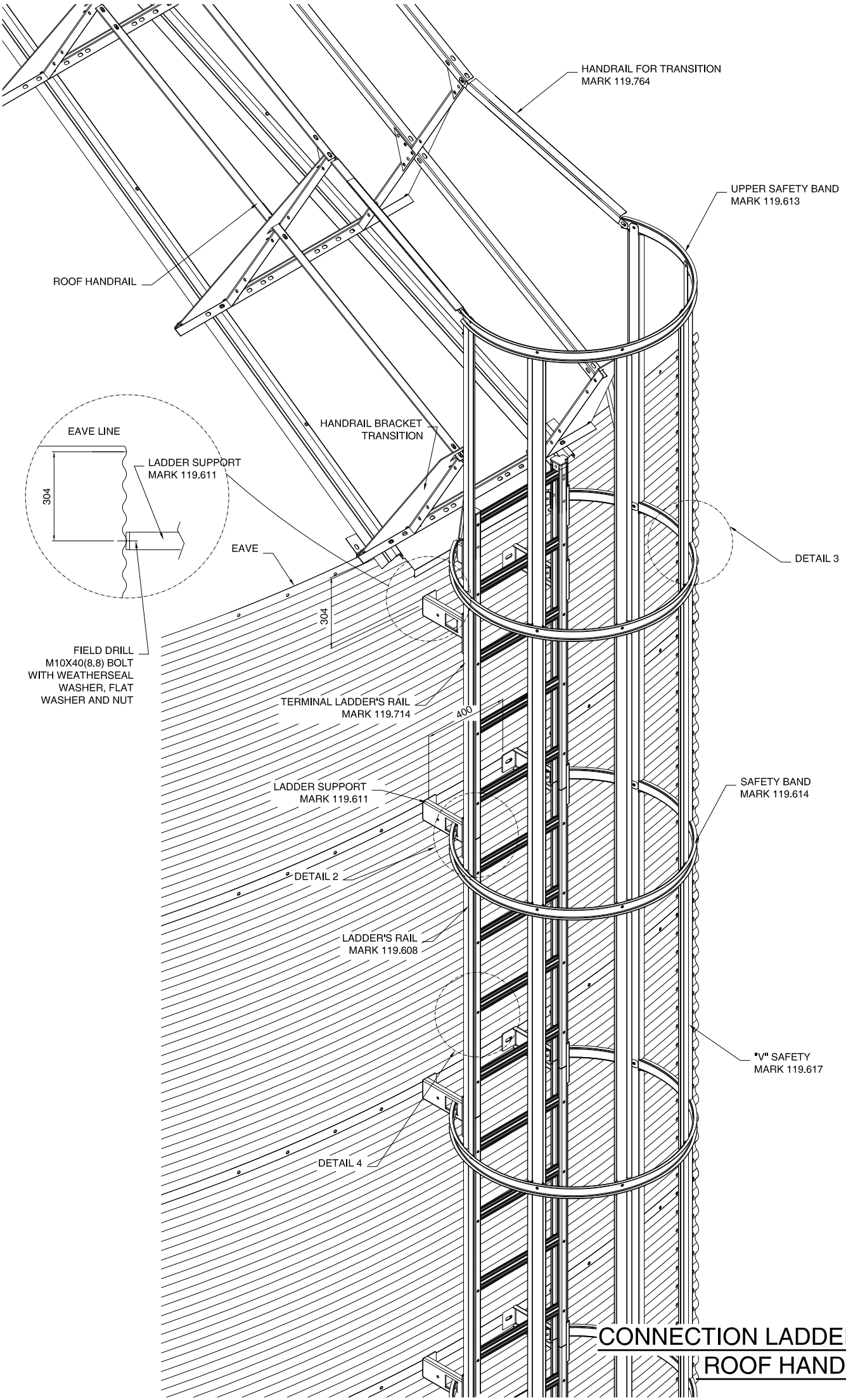


STIFFENERS DETAIL
LOWER ZONE
(OUTSIDE VIEW)

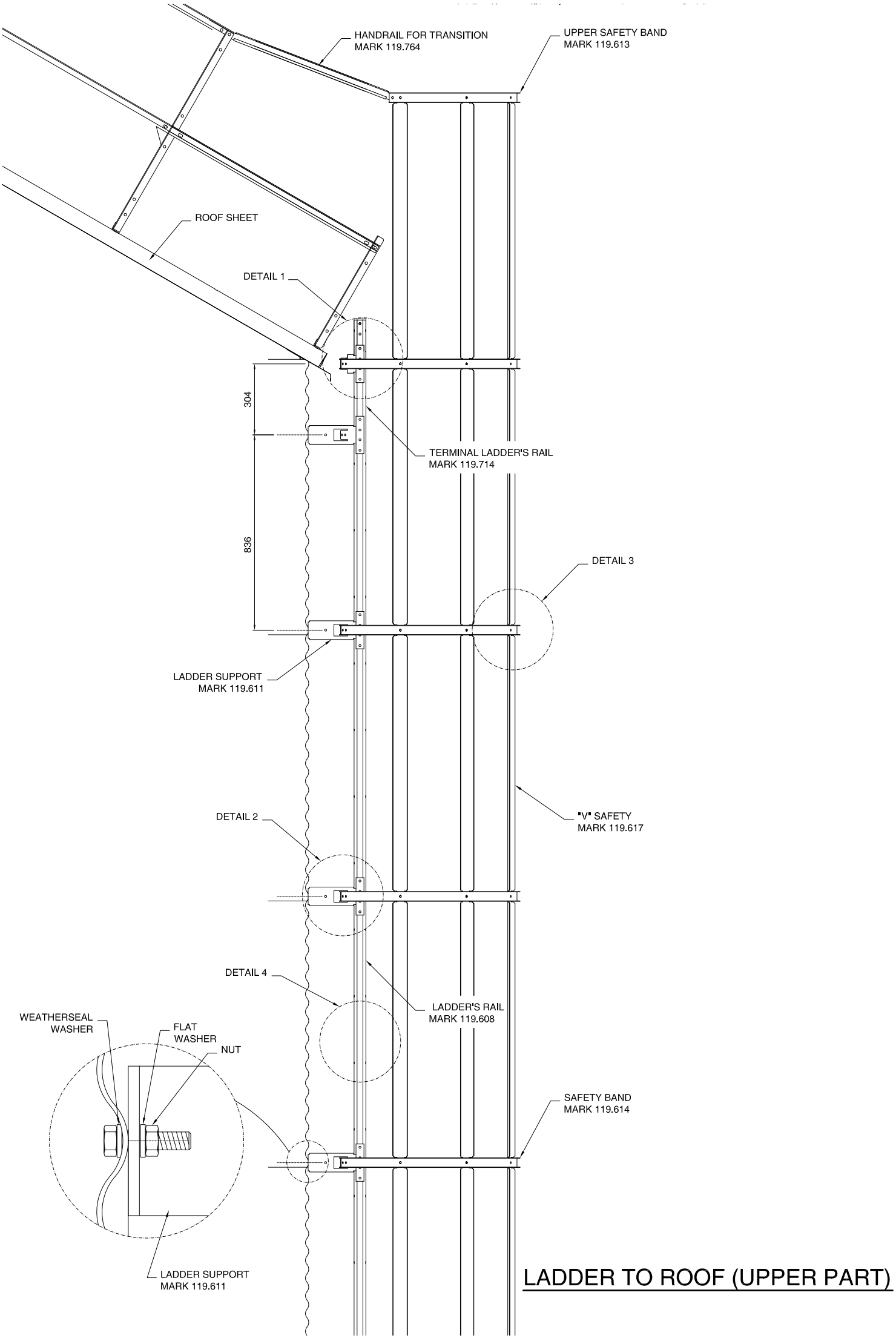


SILO 7 RINGS FOR 1 SILO

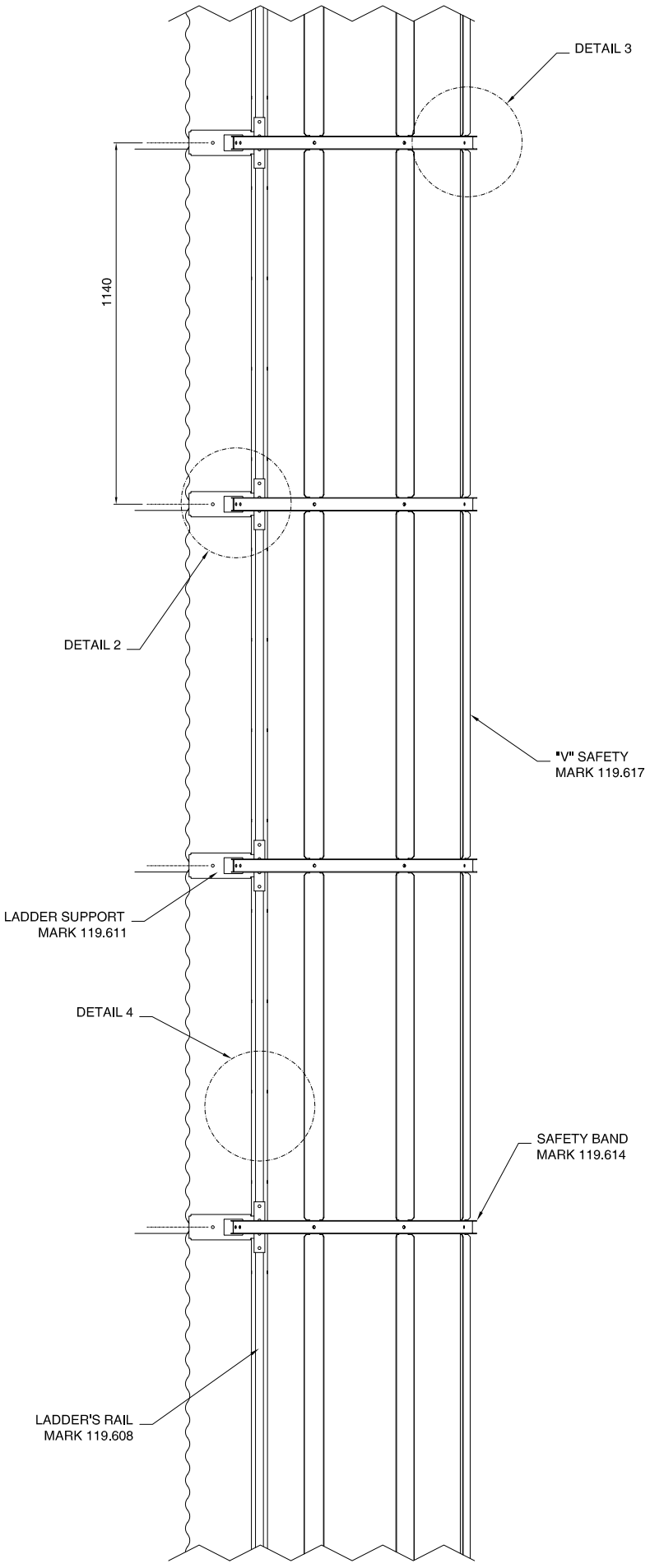
LADDER TO ROOF INSTRUCTIONS



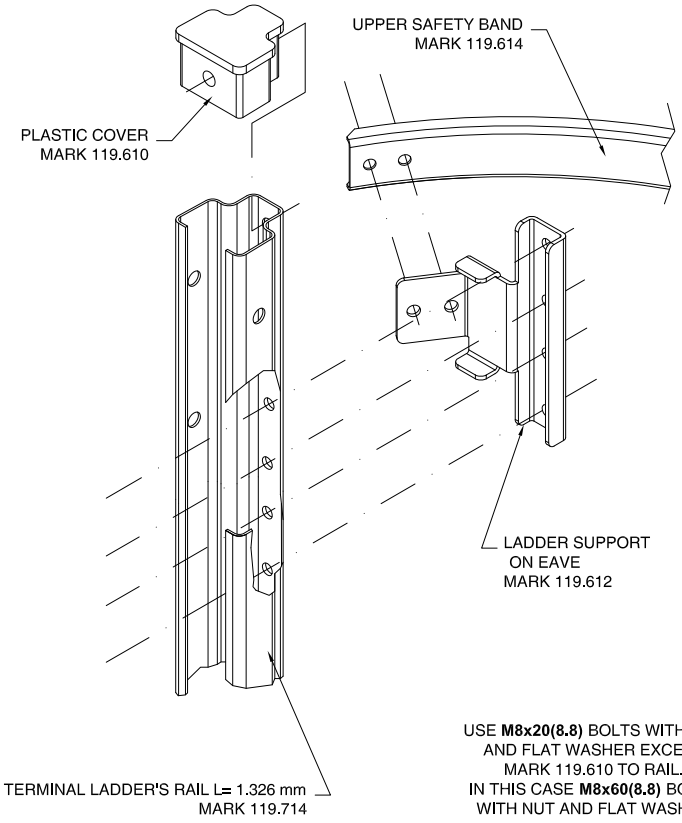
CONNECTION LADDER TO ROOF HANDRAIL



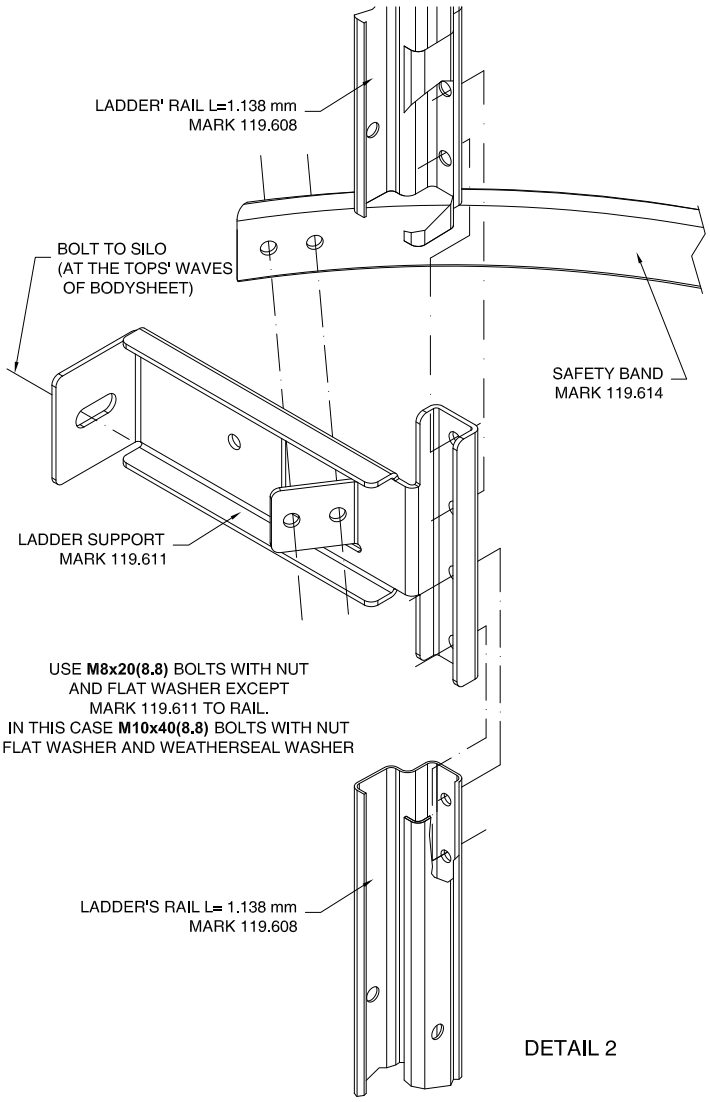
LADDER TO ROOF (UPPER PART)



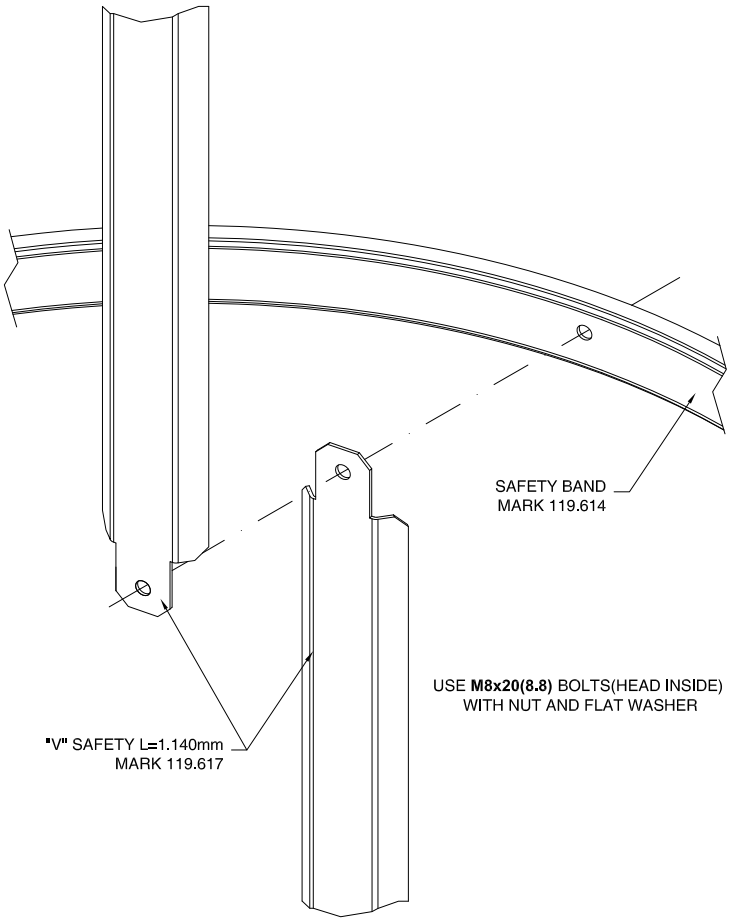
LADDER TO ROOF
(INTERMEDIATE PART)



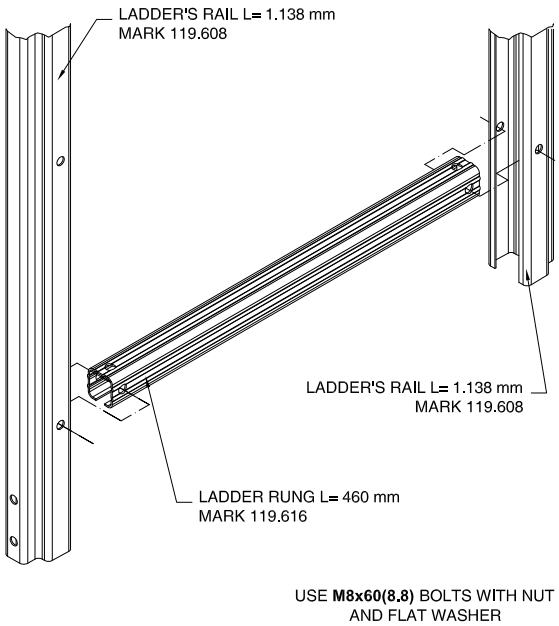
DETAIL 1



DETAIL 2

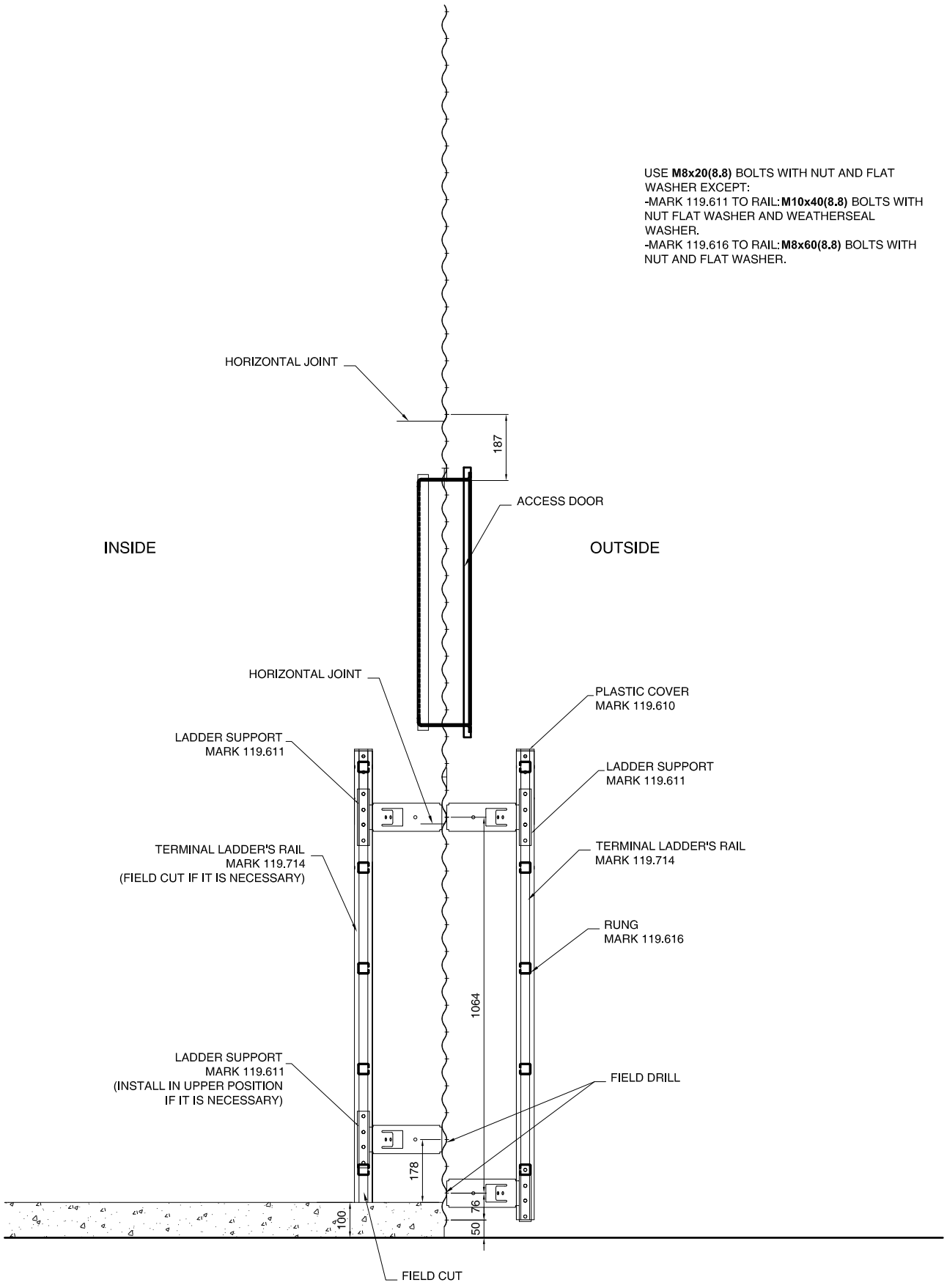


DETAIL 3

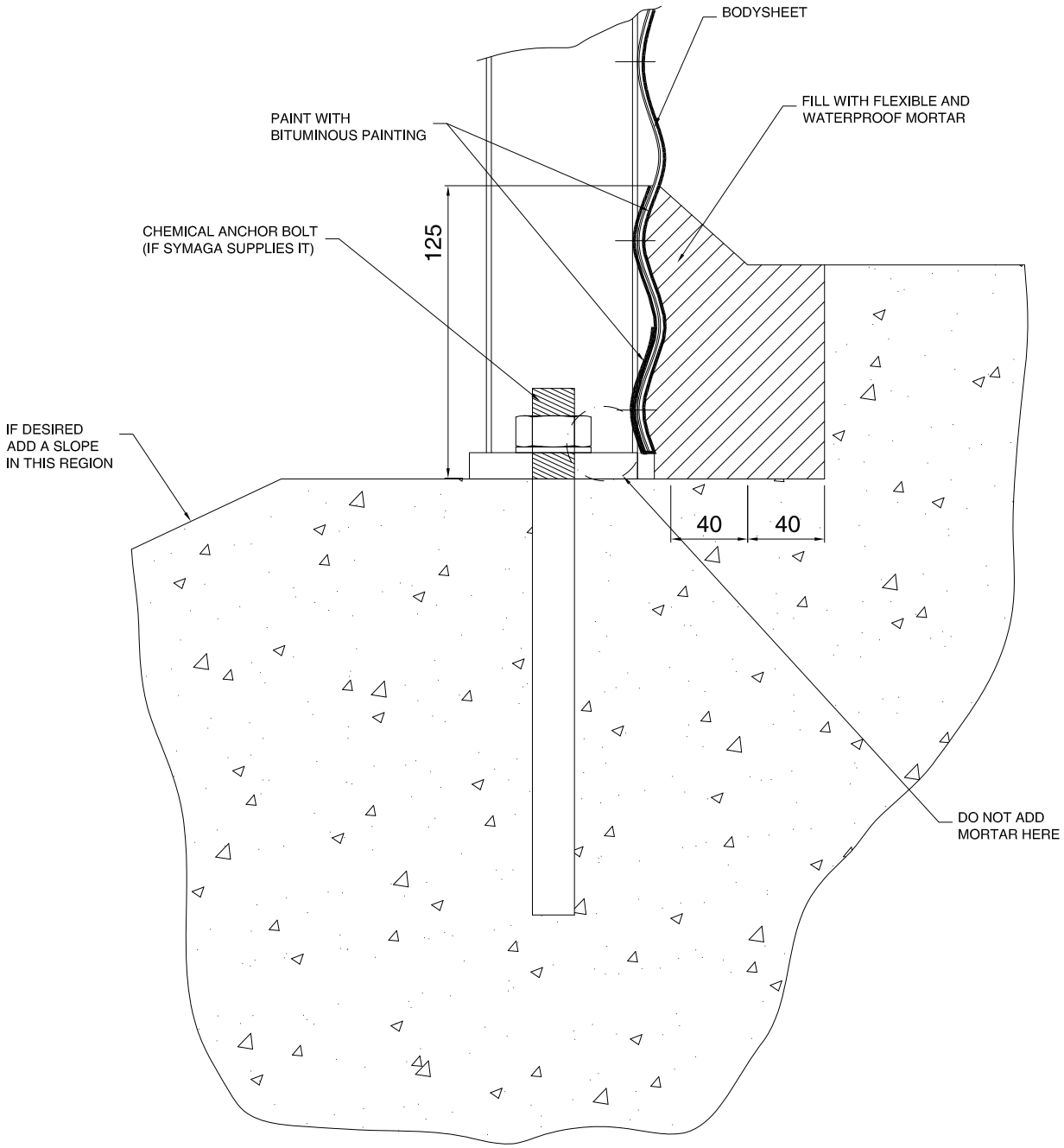


DETAIL 4

LADDER DETAILS



LADDER TO ACCESS DOOR



PROCEDURE TO SEAL THE FOUNDATION:
1.-ONCE THE FINAL ANCHOR PLATE POSITIONS ARE KNOWN, USE THE ANCHOR PLATE HOLE TO DRILL THE CHEMICAL ANCHOR BOLTS.
2.-CLEAN THE CAVITY AROUND THE SILO AND PAINT THE BODYSHEETS WITH A BITUMIOUS PAINTING, INSIDE AND OUTSIDE, AS INDICATED IN THE DRAWING.
3.-FILL THE GAP BETWEEN BODYSHEETS AND FOUNDATION WITH FLEXIBLE AND WATERPROOF MORTAR.
4.-IF DESIRED, ADD A SLOPE IN THE FOUNDATION. IMPORTANT: DO NOT ADD MORTAR OUTSIDE OF THE BODYSHEET (SEE DRAWING).

ANCHORAGE SYSTEM