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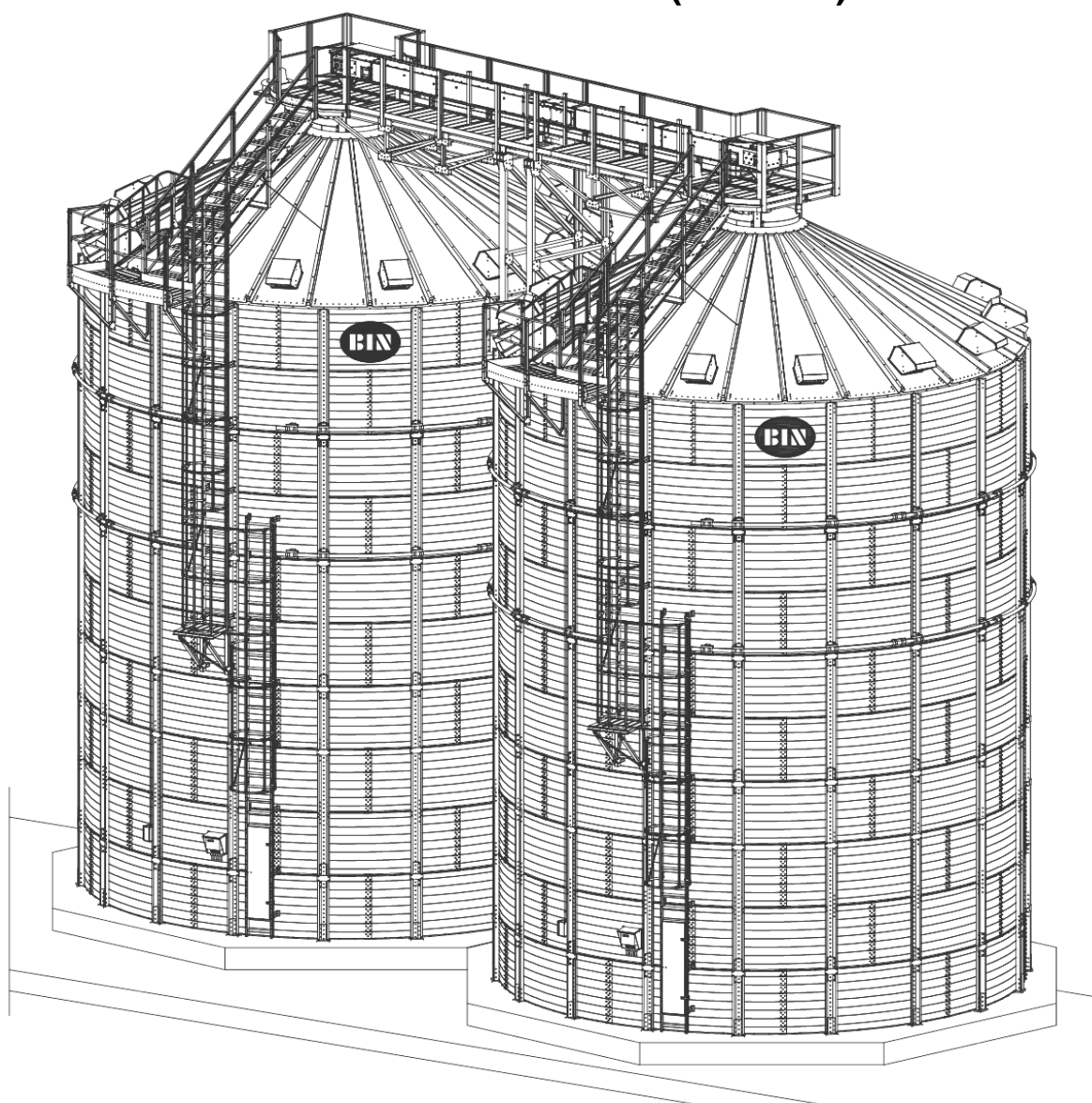
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## FLAT BOTTOM FBIN SILOS

FOR STORAGE OF GRAIN, MAIZE AND OILSEEDS AERATED BY ACTIVE VENTILATION SYSTEMS

TYPE: FBIN7, FBIN9, FBIN11, FBIN14, FBIN17, FBIN19

### OPERATING MANUAL (IO:SIL/F)



Drawings and descriptions included in this manual may contain optional and special components, not provided in the standard version. Before placing an order, the Customer may obtain comprehensive and up-to-date information on the products to be ordered. We reserve the right to make changes in our products. All rights reserved. Any reproduction, even partial, solely with our consent.



Aleksandrów Kujawski/A4 format



## INTRODUCTION

Thank you for purchasing a BIN silo. The silos equipment are provided with safety devices to protect operators and the silo during its normal use in process. However, these devices cannot ensure safety in all circumstances, and, therefore, before operators start to use it, they must thoroughly read this Operating Manual and understand it. This way errors during the silo installation, and during its operation itself can be avoided. Please, do not attempt to use the silo before you get acquainted with all sections of this manual, and not understand each of its functions and all procedures.

The Operating Manual aims at acquainting the user with a correct operation of the purchased product. It contains practical guidelines that must be known to a user during the silo operation.

**If any content of this Operating Manual is not understood by or is unclear for the user, please, contact the producer or its representative.**



**This operating manual forms an integral part of the product, and should be kept for further use.**



**Before starting to operate the silo, read this operating manual, and, in particular, the chapter concerning safety at work.**



**Each use of the silo for purposes other than those specified in the operating manual will be treated as the misuse. The manufacturer of the product shall not be held responsible for any resultant damages. The user bears the sole risk related to the misuse. All and any unauthorised changes to the product design exclude the manufacturer's responsibility regarding any resultant**



**The warning sign in the operating manual indicates that the special caution must be exercised because of the danger to people and possibility of product damage.**



**It is strictly forbidden to make additional openings and holes in the silo bottom or shell (walls) for unloading or installation of additional unloading equipment.**  
**It is forbidden to make additional non-central discharge openings in the silo floor.**  
**Making such openings and holes in the silo shell or floor may result in deformation or even bursting of the silo shell during unloading.**

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# 1. Safety

## 1.1. Basic safety rules

1. People operating, performing maintenance or overhauls of silos are obliged to adhere to general occupational safety regulations.
2. The user is obliged to read and understand operating manuals for the silo and for all other auxiliary equipment, and to strictly adhere to them.
3. The silo can only be operated by able-bodied adults. These persons need to be fully aware of undertaken activities.
4. In particular, the following is forbidden:
  - operation by any “third” persons, who are not familiar with the Operating Manual;
  - operation by people who are ill, or under influence of alcohol or narcotic drugs;
5. The silo should be secured against access of children.
6. A silo owner is obliged to provide the silo with detailed occupational health and safety instructions.
7. It is recommended to equip people employed to operate and use silos with anti-static tools (spades, brooms, hammers, spanners, etc.), clothes and footwear.
8. Each entry into the silo must be preceded by a command issued by an employer or a person authorised by them.
9. The silo and its surroundings should always be kept tidy and clean.
10. It is forbidden to leave any tools, items, etc., on the silo or its structure due to a risk of an operator or any third persons being hit by objects falling from height.
11. It is strictly forbidden to climb onto a layer of grain in the silo, except when only a small amount of grain remained in the silo, and the inlet opening to the unloading device is not covered and clearly visible. Then it is necessary to enter to shovel grain into that opening or to start the shovelling device.
12. Overhaul works inside the silo can be performed after emptying the silo and removing grain remains, locking and disconnecting from power source feeding and unloading equipment, and after placing an information board “Attention: do not start, overhaul”.
13. A worker working in the silo should be assisted by another person and provided with relevant personal protection equipment.
14. A person entering the silo through a roof hatch should be assisted by two people and provided with equipment protecting against falling from heights, including an automatic fall arrest system.
15. It is strictly forbidden to disconnect a lifeline protecting against a fall from height while working in the silo.
16. While workers are present in the silo, the roof - maintenance hatch and a bottom access manhole should be kept open, with a shutter of the underfloor conveyor closed.
17. Regardless of the level of silo loading with the stored material, it is strictly forbidden to enter the pit under the steel floor on the steel trusses and under the floor of the concrete transport duct, if it is not adapted for access of people.
18. When there are hazards related to noise, causing problems in communication, then special equipment for smooth communication between workers is required.
19. It is forbidden for people to stay near the silo while any works at height are in progress, and the area around the silo should be secured against any access of third parties.
20. Ban on use of naked flame, smoking, and conducting welding works or similar in the silo and within 10 m radius of the silo or the unloading outlet should be strictly adhered to.
21. Before entering the silo, disconnect the power supply to all electrical devices working with the silo and secure them against accidental switching on by any third persons.
22. It is strictly forbidden for people to be present in the silo during its loading or unloading, or when grain is aerated.
23. Before starting loading or unloading equipment, or a grain ventilation fan, make sure there are no people in the silo.
24. When BIN loading or unloading equipment is installed in the silo, and the silo is provided with limit switches on an external ladder and near the bottom access manhole, then it is forbidden to:
  - dismantle the limit switches;
  - block the switches;
  - attempt to bypass them.
25. When loading or unloading equipment from other manufacturers is installed in the silo, then the silo owner is obliged to construct the electrical wiring of these devices in such way that any attempt to access the silo through the bottom access manhole automatically stops their work immediately.
26. When loading or unloading equipment manufactured by companies other than BIN is installed in the silo, then the silo owner is obliged to equip these devices with a main switch with a padlock, so power supply to those devices can be effectively disconnected before entering the silo.



27. Manual shovelling of grain into the silo discharge outlet in the floor requires all silo auxiliary equipment to be stopped first.
28. It is strictly forbidden to place hands into inlets of conveyors installed in the silo.
29. It is strictly forbidden to enter the space under the silo floor.
30. All covers and security devices provided in the silo by the manufacturer must be installed.
31. The bottom access manhole must be locked.
32. The keys for access to the silo (the to the bottom access manhole) must be kept by an authorised person.
33. If any activities are conducted in the silo, safe voltage portable lighting must be used. While operating, components of the portable lighting cannot heat up to a temperature that may cause grain dust fire or explosion.
34. Do not store in the silo any grain that is contaminated or of excessive moisture content (Table 11).
35. The user is responsible for construction and operational condition of the lightning system and the protective grounding of the silo.
36. The user is responsible for correct connection of power delivery points and their correct operation.
37. In case of any outage in power supply, switch all devices working with the silo off.
38. The silo and its direct surroundings must be used and maintained in a way preventing fire, and it should be provided with handheld fire extinguishing equipment, including a dry powder or carbon-dioxide extinguisher.
39. In the event of the fire:
  - evacuate people from the danger zone;
  - call the fire brigade;
  - disconnect devices from the power supply;
  - start extinguishing the fire.
40. It is forbidden to extinguishing fires of electric systems with water or a foam extinguisher.
41. When any situation hazardous to human life or health is discovered, the equipment must be stopped immediately and switch power supply to the equipment with the main switch.
42. When any defects or damages to the silo are found, which may affect human safety or safety of materials stored in the silo, the investor is obliged to immediately notify them in writing to the silo manufacturer.
43. The repair and maintenance operations can only be conducted by able-bodied adults holding relevant qualifications.
44. Do not attempt any works in adverse weather conditions (rain, heavy frost, ice, strong wind, lightnings, poor visibility).
45. Fumigation, pest control, and similar operations in the silo or on the stored grain should be ordered at specialist companies. After these activities, relevant OHS regulations concerning use of chemicals in confined spaces should be strictly adhered to.
46. People working inside the silo at manual shovelling the grain or cleaning must be equipped with protective goggles and respiratory protection.
47. Observe rules for complete control over auxiliary equipment connected to the grid.
48. In the event of the unloading equipment failure, when the failure cannot be repaired due to large quantities of grain stored in the silo and limited access to those devices, unload the grain through an emergency duct in the silo, at the speed not exceeding 20 tonnes per hour. Higher rates may result in permanent deformations of the silo.
49. It is forbidden to make any changes in design or to change the intended use of the equipment without the producer's consent in writing.
50. Any design changes in the finished product require the new technical acceptance by the manufacturer or its authorised representative.
51. It is strictly forbidden to make unauthorised additional openings and holes in the silo bottom or shell (walls) for unloading or installation of additional unloading equipment. It is forbidden to make additional non-central discharge openings in the silo floor. Making such openings and holes in the silo shell or floor may result in deformation or even bursting of the silo shell during unloading.
52. All equipment and systems connected to the silo (e.g., feeding pipes of conveyors) must be constructed in such way that they do not damage the silo.
53. The silo loading and unloading should be conducted at the speed not exceeding 150 tonnes per hour; higher speeds may result in the permanent deformation of the silo.
54. Do not start a fan in the silo without grain.
55. When the silo is equipped in any BIN device or sets of devices (loading, unloading, active ventilation, and similar equipment), then necessary information on their operation, including control, switching on/off, lubrication, operation of electrical equipment, and other, can be found in relevant operating manuals for that equipment. The manufacturer accepts a possibility of equipping the silo with devices or sets of devices from other manufacturers, provided they are "CE" marked and have the "EU declaration of

conformity". This forms a basis for use of relevant operating manuals of this equipment as a part of their correct operation.

56. Each silo loaded through an inlet in a silo collar must be provided with an external access to it. The access to a collar is understood as a possibility to access it using appropriate lifting equipment, through roof stairs with a collar platform and/or through a service catwalk.
57. When the silo owner does not purchase and install equipment (manufactured by BIN) ensuring access to the roof collar with the loading inlet, it is obliged to construct itself (in accordance with relevant current legislation) equipment for using and operating the above units. If those conditions are not met, then the Declaration of Conformity EC attached by BIN to this Operating Manual becomes invalid.
58. The silos are labelled with safety marks. Each user is obliged to become acquainted with their meaning.
59. In no device included in this Operating Manual the equivalent acoustic pressure level does not exceed 70dB(A), as measured in accordance with PN-EN ISO 11201:2012 and PN-N-01307:1994.

## 1.2. Information and warning signs

### Warning signs



**DO NOT ENTER OR REACH INTO THE CRUSHING ZONE, WHEN ANY ELEMENTS CAN MOVE!**

### Other warning signs



**READ  
OPERATING  
MANUAL**



**ATTENTION!  
DANGER**



**RISK OF FALL  
FROM HEIGHT**



**NO ENTRY – NO  
TRAMPLING OVER**



**NO ENTRY FOR  
UNAUTHORISED  
PERSONS**



**USE PROTECTIVE  
GLOVES**



**USE  
PROTECTIVE  
FOOTWEAR**



**NO USE OF NAKED FLAME  
OR SMOKING**



**USE LIFELINE  
WHEN ENTERING  
THE SILO**



**USE RESPIRATORY  
PROTECTION WHEN  
ENTERING THE SILO**

All warning and safety signs are installed on the silo shell, at the height of ca. 1.7 m from the foundation surface. Additionally, warning signs: "do not enter or reach into the crushing zone when the parts can move", "use of a lifeline is obligatory when entering the silo", "no entry - no trampling over" and "no entry to unauthorised persons" signs are installed on the cover of the silo roof hatch.

**The nominal plate** is installed on the silo shell, at the height of ca. 1.7 m from the foundation surface.

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Model: FBIN XXXX		
Production year 20XX		
Serial number XX - XXX		
Weight: XXX kg		
Declaration of Performance Properties : SZJ/029/XXXXX		
Harmonised standard: : PN-EN 1090-1+A1:20XX		
ZKP certificate No.: XXXX-CPR-XXXX		
ZKP certifying body No.: j ZKP: XXXX		
Further information: Operating manual and declaration		
Year of first labelling of the product: XX		
Construction class: EXC1, EXC2		
		



Note! Warning signs, nominal plates and other information provided on the equipment must be kept legible and clean. When the signs or marks mentioned above are damaged or destroyed, or a part containing them is replaced, new plates should be purchased from BIN Company and installed on the product.

## 2. General product description

### 2.1. Intended use of the product

- for storage of corn and maize grain, and oilseeds
- aeration of grain or seed mass;

Stored grain and seeds must have appropriate moisture content (Table 11) and be free of contamination. Material of such optimum parameters can be stored in high layers for a long time without deterioration in its quality. The silos are not designed for preservation of grain and seeds that are strongly contaminated, or of moisture content that cannot be reduced by aeration using active ventilation methods. It is forbidden to store in the silo materials other than listed, and in particular, materials of density exceeding 800 kg/m<sup>3</sup>. When the silo is used contrary to its intended use, the manufacturer shall not be held responsible for any resultant damage.

### 2.2. Recommended methods for silo loading and unloading

*Table 1. Recommended methods for FBIN silo loading and unloading*

*Key to the table:*

*PK250 – a bucket (scoop) elevator, type PK250,*

*PK290 – a bucket (scoop) elevator, type PK290,*

*PS220 – a system of screw conveyors, type PS220,*

*RED250 – a system of scrapper conveyors (Redler), type RED250,*

*PSW220-BIN200, PSW500, PSW1000, PSW1500 – an internal screw conveyor of PSW type*

*PSW-F11-7.5, PSW-F11-11.0, PSW-F14-7.5, PSW-F14-11.0, PSW-F17-7.5, PSW-F17-11.0,*

*PSW-F19-7.5, PSW-F19-11.0 - an internal screw conveyor of PSW-F type.*

FBIN7/5 FBIN7/6 FBIN7/7 FBIN7/8 FBIN7/9 FBIN7/10 FBIN7/11	Loading	PK250 + RED250 or PS220, or a system of downpipes ø 200mm
	Unloading	PS220 or RED250 + PSW220-BIN200
FBIN9/10 FBIN9/11 FBIN9/12 FBIN9/13 FBIN9/14	Loading	PK250 or PK290 + RED250 or PS220, or a system of downpipes ø 200/300 mm
	Unloading	PS220 or RED250 + PSW500
FBIN11/10 FBIN11/11 FBIN11/12	Loading	PK250 or PK290 + RED250 or PS220, or a system of downpipes ø 200/300 mm
	Unloading	PS220 or RED250 + PSW1000 or PSW-F11-7.5/PSW-F11-11.0
FBIN11/13 FBIN11/14 FBIN11/15 FBIN11/16 FBIN11/17	Loading	PK250 or PK290 + RED250 or PS220, or a system of downpipes ø 200/300 mm
	Unloading	PS220 or RED250 + PSW-F11-7.5/PSW-F11-11.0
FBIN14/10 FBIN14/11 FBIN14/12	Loading	PK250 or PK290 + RED250 or PS220, or a system of downpipes ø 200/300 mm
	Unloading	PS220 or RED250 + PSW1500 or PSW-F14-7.5/PSW-F14-11.0
FBIN14/13 FBIN14/14 FBIN14/15 FBIN14/16 FBIN14/17	Loading	PK250 or PK290 + RED250 or PS220, or a system of downpipes ø 200/300 mm
	Unloading	PS220 or RED250 + PSW-F14-7.5/PSW-F14-11.0
FBIN17/14 FBIN17/15 FBIN17/16 FBIN17/17 FBIN17/18 FBIN17/19	Loading	PK250 or PK290 + RED250 or PS220, or a system of downpipes ø 200/300 mm
	Unloading	PS220 or RED250 + PSW-F17-7.5/PSW-F17-11.0
FBIN19/15 FBIN19/16 FBIN19/17 FBIN19/18	Loading	PK250 or PK290 + RED250 or PS220, or a system of downpipes ø 200/300 mm
	Unloading	PS220 or RED250 + PSW-F19-7.5/PSW-F19-11.0

### 2.3. Silo technical data

Comments to:

Table 2. Basic characteristics of FBIN7 type silos – standard and optional equipment.  
Table 3. Basic characteristics of FBIN9 type silos – standard and optional equipment.  
Table 4. Basic characteristics of FBIN11 type silos – standard and optional equipment.  
Table 5. Basic characteristics of FBIN14 type silos – standard and optional equipment.  
Table 6. Basic characteristics of FBIN17 type silos – standard and optional equipment.  
Table 7. Basic characteristics of FBIN19 type silos – standard and optional equipment.

- 1.A nominal usable capacity corresponds to a total volume of the space inside the silo, above the concrete or steel floor, with or without a screed.
- 2.The nominal loading capacity of the silo corresponds to its maximum loading capacity in relation to its nominal usable, for wheat of density of 780 kg/m<sup>3</sup>. The actual volume of grain stored in the silo is always smaller and depends on the following factors: loading method, equipment installed in the silo, grain pour parameters, and other.
- 3.The nominal volume of the silo corresponds to the total volume of the silo inner space, with no floor. A theoretical value, used solely for designing purposes.
- 4.When a concrete floor or a steel perforated floor with or without sealing screed is constructed in the silo, its nominal usable volume and loading capacity changes.
- 5.The net silo weight of the silo does not include the weight of optional equipment.

*Table 2. Basic characteristics of FBIN7 type silos – standard and optional equipment.*

Table 21: Basic characteristics of FBIN type silos - Standard and optional equipment											
S - standard / O - optional	Item	Product Name		FBIN7/5	FBIN7/6	FBIN7/7	FBIN7/8	FBIN7/9	FBIN7/10	FBIN7/11	
	1	Nominal usable volume of the silo/The nominal loading capacity of the silo (for wheat of density of 780kg/m³)	steel floor on blocks	213 m³ / 166 t		252 m³ / 197 t	293 m³ / 228 t	333 m³ / 259 t	373 m³ / 291 t	413 m³ / 322 t	452 m³ / 352 t
			steel floor on blocks + 150 mm screed	207 m³ / 162 t		247 m³ / 193 t	287 m³ / 224 t	327 m³ / 255 t	367 m³ / 286 t	407 m³ / 318 t	446 m³ / 348 t
	2	Silo nominal volume	m³	223		262.6	303	343	383	423	462
	3	Shell (cylindrical part of the silo) nominal diameter	m	Ø 6.7							
	4	Shell (cylindrical part of the silo) nominal height	m	5.74		6.88	8.02	9.16	10.30	11.44	12.58
	5	Total silo height (from the anchoring level to the loading inlet)	m	7.68		8.82	9.96	11.10	12.24	13.38	14.52
6	Net silo weight (without optional equipment)	kg	2800		3100	3400	3600	4050	4400	4750	
S	7	A digital copy of the structural product design (File No. SZJ/008)		Delivered free of charge on the customer request (for BIN customers only)							
S	8	A hardcopy of the silo operating manual (File No. SZJ/031)		IO:SIL/F: 1							
S	9	A hardcopy of the Declaration of Functional Parameters (File No. SZJ/029)		1							
S	10	Lockable hinged bottom access manhole		WLAZDOLNY-F7: 1 (in the silos equipped with the steel floor on blocks this item is installed on the second section of the shell)							
O	11	Platform of the bottom access hole		PODESTDOLNY: 1 (used only when the bottom access manhole is installed in the second segment of the shell)							
S	12	An internal ladder to the bottom access manhole		WLAZDOL-DRABW: 1 (an internal short leaning ladder from the floor to the bottom access manhole)							
O	13	Additional bottom access manhole - emergency		WLAZDOLNY-F7: 1 (required in silos without an internal ladder)							
O	14	Internal ladder		FDRAB/W-5-KPL	FDRAB/W-6-KPL	FDRAB/W-7-KPL	FDRAB/W-8-KPL	FDRAB/W-9-KPL	FDRAB/W-10-KPL	FDRAB/W-11-KPL	
O	15	External ladder with secured access		FDRABZ/5-6		FDRABZ/7-8		FDRABZ/10		FDRABZ/11-12	
O	16	Spiral stairs		F7-SCH-SPIR-SEG: 3 F7-SCH-SPIR-AKC: 1	F7-SCH-SPIR-SEG: 3 F7-SCH-SPIR-AKC: 1	F7-SCH-SPIR-SEG: 4 F7-SCH-SPIR-AKC: 1	F7-SCH-SPIR-SEG: 4 F7-SCH-SPIR-AKC: 1	F7-SCH-SPIR-SEG: 5 F7-SCH-SPIR-AKC: 1	F7-SCH-SPIR-SEG: 5 F7-SCH-SPIR-AKC: 1	F7-SCH-SPIR-SEG: 6 F7-SCH-SPIR-AKC: 1	
O	17	Roof stairs with a collar platform		SCHODYDACH200: 1 (require installation of 1 WLAZDACH-2 or 1 SCHODYDACH-AKC )							
O	18	A set of rails for upper platforms		POR-PORECZE: 1 (used when a silo is not equipped with an external ladder, but has roof stairs and/or roof hatch)							
O	19	Roof hatch with an access platform		WLAZDACH-2: 1							
S	20	Closing of the roof hatch opening, with a securing grate		WLAZDACH_ZASL: 1							
O	21	Service catwalk		POM200-KRAT: 1 or 2 + POM200-PLAT: 1 (solely in silos not equipped with roof stairs) + POM200-FWAS: 1 or 2 (1 for each grating POM200-KRAT)							
O	22	Fan for ventilation of stored grain	of wheat and other corn, and maize	WPR-4: 1 + WPR-4/5-K400: 1 + UWLP/KONF400: 1		WPR-5: 1 + WPR-4/5-K400: 1 + UWLP/KONF400: 1	WPR-7: 1 + WPR-7-K400: 1 + UWLP/KONF400: 1	WPR-11: 1 + WPR11-UWLP/K: 1 + UWLP/KONF: 1	WPR-15: 1 + WPR18-UWLP/K: 1 + UWLP/KONF: 1	WPR-18: 1 + WPR18-UWLP/K: 1 + UWLP/KONF: 1	
			of wheat and other corn, and maize and rapeseed	WPR-5: 1 + WPR-4/5-K400: 1 + UWLP/KONF400: 1	WPR-7: 1 + WPR-7-K400: 1 + UWLP/KONF400: 1	WPR-15: 1 + WPR18-UWLP/K: 1 + UWLP/KONF: 1	WPR-18: 1 + WPR18-UWLP/K: 1 + UWLP/KONF: 1				
O	23	Roof exhaust fan		OWS250-10-200: 1							
S	24	Roof exhausters		WYWIETRZNIK: 10 pcs							
S	25	Central loading inlet for grain loading into a silo		Ø200mm							
O	26	Silo control module		MKS-100/2: 1							
O	27	Portable emergency duct on the floor		OSLONAKAN/F: 1 + KANALAW-2: 2							
O	28	Apron of the corrugated shell		FFARTUCH: 7 (used in silos with a steel floor, without sealing screed)							
O	29	Steel floor on blocks	A complete floor for the silo 200 + Floor connector for FBIN silos, L=1.5 m	PODLOGA200: 1 + FLACZ/P-1: 14							
Silo floor support + Alternate floor support for silos with a large fan			ELEM.CERAM: 400 + PODL_RUSZT: 1								
Central inlet from a silo to a PS220 screw conveyor			PSU220-WL-CENT: 1								
Internal screw conveyor PSW			PSW220-BIN200: 1								
Air inlet frame for silos of the FBIN7 type			UWLP/F7: 1								

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*Table 3. Basic characteristics of FBIN9 type silos – standard and optional equipment.*

Item				Product Name	FBIN9/10	FBIN9/11	FBIN9/12	FBIN9/13	FBIN9/14
S - standard / O - optional	1	Nominal usable volume of the silo/The nominal loading capacity of the silo (for wheat of density of 780kg/m³)	steel floor on blocks		692 m³ / 540 t	758 m³ / 591 t	825 m³ / 644 t	-	-
			steel floor on blocks + 150 mm screed		683 m³ / 533 t	749 m³ / 584 t	816 m³ / 637 t	-	-
			steel floor on trusses		657 m³ / 513 t	723 m³ / 564 t	790 m³ / 616 t	856 m³ / 668 t	922 m³ / 719 t
			steel floor on trusses + 150 mm screed		649 m³ / 506 t	715 m³ / 558 t	782 m³ / 610 t	848 m³ / 661 t	914 m³ / 713 t
			concrete floor with ventilation ducts		688 m³ / 537 t	754 m³ / 588 t	821 m³ / 640 t	887 m³ / 692 t	953 m³ / 743 t
	2	Silo nominal volume	m³	709	775	842	908	974	
3	Shell (cylindrical part of the silo) nominal diameter	m	Ø 8.6						
4	Shell (cylindrical part of the silo) nominal height	m	11.44	12.58	13.72	14.86	16.00		
5	Total silo height (from the anchoring level to the loading inlet)	m	13.88	15.00	16.15	17.30	18.44		
6	Net silo weight (without optional equipment)	kg	5934	6409	7007	7745	8351		
S	7	A digital copy of the structural product design (File No. SZJ/008)			Delivered free of charge on the customer request (for BIN customers only)				
S	8	A hardcopy of the silo operating manual (File No. SZJ/031)			IO:SIL/F: 1				
S	9	A hardcopy of the Declaration of Functional Parameters (File No. SZJ/029)			1				
S	10	Lockable hinged bottom access manhole			WLAZDOLNY-F9: 1 (a height of the manhole depends on the floor height)				
O	11	Platform of the bottom access hole			PODESTDOLNY: 1 (used only when the bottom access manhole is installed in the second segment of the shell)				
O	12	Access platform with an external ladder to the bottom access manhole			WLAZDOL-DRABZ: 1 (An access platform with an external ladder to the bottom access manhole installed in the third segment of the shell)				
S	13	An internal ladder to the bottom access manhole			WLAZDOL-DRABW: 1 (an internal short leaning ladder from the floor to the bottom access manhole)				
O	14	Additional bottom access manhole - emergency			WLAZDOLNY-F9: 1 (required in silos without an internal ladder)				
O	15	Internal ladder			FDRAB/W-10-KPL	FDRAB/W-11-KPL	FDRAB/W-12-KPL	We do not provide ladders of this type for design reasons	
O	16	External ladder with secured access			FDRABZ/10	FDRABZ/11-12		FDRABZ/13-15	
O	17	Spiral stairs			F9-SCH-SPIR-SEG: 5 F9-SCH-SPIR-AKC: 1	F9-SCH-SPIR-SEG: 6 F9-SCH-SPIR-AKC: 1	F9-SCH-SPIR-SEG: 6 F9-SCH-SPIR-AKC: 1	F9-SCH-SPIR-SEG: 7 F9-SCH-SPIR-AKC: 1	F9-SCH-SPIR-SEG: 7 F9-SCH-SPIR-AKC: 1
O	18	Roof stairs			SCHODYDACH500: 1 (require installation of 1 WLAZDACH-2 or 1 SCHODYDACH-AKC )				
O	19	A set of rails for upper platforms			POR-PORECZE: 1 (used when a silo is not equipped with an external ladder, but has roof stairs and/or roof hatch)				
O	20	Roof hatch with an access platform			WLAZDACH-2: 1				
O	21	Collar platform			PODEST-WIENCA1: 1 (used when a silo is equipped with roof stairs, but is not equipped with a service catwalk)				
S	22	Closing of the roof hatch opening, with a securing grate			WLAZDACH_ZASL: 1				
O	23	Service catwalk			POM500-KRAT: 1 or 2 + POM1500-PLAT: 1 + POM2200-WEJ: 1 + POM500-FWAS: 1 or 2 (1 for each grating POM500-KRAT)				
O	24	Fan for ventilation of stored material	Steel floor on blocks or on trusses	WPR11: 1 + WPR11-UWLP/K: 1 + UWLP/KONF: 1					
			Concrete floor with ventilation ducts	WPR11: 2 + WPR11-PDB: 2					
O	25	Roof exhaust fan			OWS250-500+: 1				
S	26	Roof exhausters			WYWIETRZNIK: 12				
S	27	Central loading inlet for grain loading into a silo			Ø 300 mm				
O	28	Silo control module			MKS-100/2: 1				
O	29	Portable emergency duct on the floor			OSLONAKAN/F: 1 + KANALAW-2: 2				
O	30	Apron of the corrugated shell			FFARTUCH: 9 (used in silos with a steel floor, without sealing screed)				
O	31	Steel floor on blocks	A complete floor for the silo 500 + Floor connector for FBIN silos, L=1.5 m	PODLOGA500: 1 + FLACZ/P-1: 18				Not applicable	
			Silo floor support + Alternate floor support for silos with a large fan	ELEM.CERAM: 800 + PODL_RUSZT: 1					
			Central inlet from a silo to a PS220 screw conveyor	PSU220-WL-CENT: 1					
			Internal screw conveyor PSW	PSW500: 1					
			Air inlet frame for silos of the FBIN9 type	UWLP/F9: 1					
O	32	Steel floor on trusses	Perforated steel floor of a total height of 890 mm or 1040 mm for the FBIN9 silo (with steel trusses).	PODLOGAF9_NIS: 1 or PODLOGAF9_WYS: 1					
			Floor grain inlet equipped with ties and a hydraulic drive mechanism, manually or electrically controlled.	ZPR-WLOT-1: 1 + ZPR-CIEGNO-1: 2 + ZPR-CYLINDER-1: 1 + ZPR-POMPA-M-1:1, or ZPR-POMPA-E-1:1 + ZPR-PSW-1: 1					
			Internal screw conveyor PSW	PSW500: 1					
			Air inlet frame for silos of the FBIN9 type	UWLP/F9: 1					
O	33	Concrete floor with ventilation ducts	Floor panels to cover ventilation ducts and the concrete transport duct, with gaskets and grain inlets	PDB-PAN37/71: 73 + PDB-PAN43/91: 21 + PDB-USZCZ: 29 + PDB-PAN-WLOT: 1 + PD-USZCZELKA: 8					
			Floor grain inlet equipped with ties and a hydraulic drive mechanism, manually or electrically controlled.	ZPR-WLOT-1: 1 + ZPR-CIEGNO-1: 2 + ZPR-CYLINDER-1: 1 + ZPR-POMPA-M-1:1, or ZPR-POMPA-E-1:1 + ZPR-PSW-1: 1 + ZPR-MOCBET-1: 1					
			Internal screw conveyor PSW	PSW500: 1					
			Air inlet frame for silos with concrete floor	PDB-WLOTPOW1: 2					
O	34	A concrete floor with ventilation ducts and a man-accessible maintenance channel requires customised design, together with standard and optional equipment							

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*Table 4. Basic characteristics of FBIN11 type silos – standard and optional equipment.*

Product Name				FBIN11/10	FBIN11/11	FBIN11/12	FBIN11/13	FBIN11/14	FBIN11/15	FBIN11/16	FBIN11/17	
S-standard / O - optional	1	Nominal usable volume of the silo/The nominal loading capacity of the silo (for wheat of density of 780kg/m³)	steel floor on blocks	1258 m³ / 981 t	1376 m³ / 1073 t	1494 m³ / 1165 t	-	-	-	-	-	
			steel floor on blocks + 150 mm screed	1242 m³ / 969 t	1360 m³ / 1061 t	1478 m³ / 1153 t	-	-	-	-	-	
			steel floor on trusses	1197 m³ / 934 t	1315 m³ / 1026 t	1433 m³ / 1118 t	1550 m³ / 1209 t	1668 m³ / 1301 t	1785 m³ / 1392 t	1903 m³ / 1484 t	2020 m³ / 1576 t	
			steel floor on trusses + 150 mm screed	1181 m³ / 921 t	1299 m³ / 1013 t	1417 m³ / 1105 t	1534 m³ / 1197 t	1652 m³ / 1289 t	1769 m³ / 1380 t	1887 m³ / 1472 t	2004 m³ / 1563 t	
			concrete floor with ventilation ducts	1251 m³ / 976 t	1369 m³ / 1068 t	1487 m³ / 1160 t	1604 m³ / 1251 t	1722 m³ / 1343 t	1839 m³ / 1434 t	1957 m³ / 1527 t	2074 m³ / 1618 t	
	2	Silo nominal volume	m³	1289	1407	1525	1642	1760	1877	1995	2112	
3	Shell (cylindrical part of the silo) nominal diameter	m	Ø 11.5									
4	Shell (cylindrical part of the silo) nominal height	m	11.44	12.58	13.72	14.86	16.00	17.14	18.28	19.42		
5	Total silo height (from the anchoring level to the loading inlet)	m	14.74	15.88	17.02	18.16	19.30	20.44	21.58	22.70		
6	Net silo weight (without optional equipment)	kg	9460	10386	11376	12609	13665	15133	16255	17548		
S	7	A digital copy of the structural product design (File No. SZJ/008)		Delivered free of charge on the customer request (for BIN customers only)								
S	8	A hardcopy of the silo operating manual (File No. SZJ/031)		IO:SIL/F: 1								
S	9	A hardcopy of the Declaration of Functional Parameters (File No. SZJ/029)		1								
S	10	Lockable hinged bottom access manhole		WLAZDOLNY-F11: 1 (a height of the manhole depends on the floor height)								
O	11	Platform of the bottom access hole		PODESTDOLNY: 1 (used only when the bottom access manhole is installed in the second segment of the shell)								
O	12	Access platform with an external ladder to the bottom access manhole		WLAZDOL-DRABZ: 1 (An access platform with an external ladder to the bottom access manhole installed in the third segment of the shell)								
S	13	An internal ladder to the bottom access manhole		WLAZDOL-DRABW: 1 (an internal short leaning ladder from the floor to the bottom access manhole)								
O	14	Additional bottom access manhole - emergency		WLAZDOLNY-F11: 1 (required in silos without an internal ladder)								
O	15	Internal ladder		FDRAB/W-10-KPL	FDRAB/W-11-KPL	FDRAB/W-12-KPL	We do not provide ladders of this type for design reasons					
O	16	External ladder with secured access		FDRABZ/10	FDRABZ/11-12		FDRABZ/13-15			FDRABZ/16-17		
O	17	Spiral stairs		F11-SCH-SPIR-SEG: 5 F11-SCH-SPIR-AKC: 1	F11-SCH-SPIR-SEG: 6 F11-SCH-SPIR-AKC: 1	F11-SCH-SPIR-SEG: 6 F11-SCH-SPIR-AKC: 1	F11-SCH-SPIR-SEG: 7 F11-SCH-SPIR-AKC: 1	F11-SCH-SPIR-SEG: 7 F11-SCH-SPIR-AKC: 1	F11-SCH-SPIR-SEG: 8 F11-SCH-SPIR-AKC: 1	F11-SCH-SPIR-SEG: 8 F11-SCH-SPIR-AKC: 1	F11-SCH-SPIR-SEG: 9 F11-SCH-SPIR-AKC: 1	
O	18	Roof stairs		SCHODYDACH1000: 1 (require installation of 1 WLAZDACH-2 or 1 SCHODYDACH-AKC )								
O	19	A set of rails for upper platforms		POR-PORECZE: 1 (used when a silo is not equipped with an external ladder, but has roof stairs and/or roof hatch)								
O	20	Roof hatch with an access platform		WLAZDACH-2: 1								
O	21	Collar platform		PODEST-WIENCA1: 1 (used when a silo is equipped with roof stairs, but is not equipped with a service catwalk)								
S	22	Closing of the roof hatch opening, with a securing grate		WLAZDACH_ZASL: 1								
O	23	Service catwalk		POM1000-KRAT: 1 or 2 + POM1500-PLAT: 1 + POM2200-WEJ: 1 + POM1000-FWAS: 1 or 2 (1 for each grating POM1000-KRAT)								
O	24	Fan for ventilation of stored material	Steel floor on blocks or on trusses	WPR15: 1 + WPR18-UWLP/K: 1 + UWLP/KONF: 1								
			Concrete floor with ventilation ducts	WPR11: 2 + WPR11-PDB: 2								
O	25	Roof exhaust fan		OWS250-500+: 1								
S	26	Roof exhausters		WYWIETRZNIK: 18								
S	27	Central loading inlet for grain loading into a silo		Ø 300 mm								
O	28	Silo control module		MKS-100/2: 1								
O	29	Portable emergency duct on the floor		OSLONAKAN/F: 1 + KANALAW-2: 3								
O	30	Apron of the corrugated shell		FFARTUCH: 12 (used in silos with a steel floor, without sealing screed)								
O	31	Steel floor on blocks	PSW1000	A complete floor for the BIN1000 silo + Floor connector for FBIN silos, L=1.5 m	PODLOGA1000: 1 + FLACZ/P-1: 24		Not applicable					
				Silo floor support + Alternate floor support for silos with a large fan	ELEM.CERAM: 1600 + PODL_RUSZT: 1							
				Central inlet from a silo to a PS220 screw conveyor	PSU220-WL-CENT: 1							
				Internal screw conveyor PSW	PSW-1000 :1							
				Air inlet frame for silos of the FBIN11 type	UWLP/F11: 1							
O	32	Steel floor on trusses	PSW1000	Perforated steel floor of a total height of 890 mm or 1040 mm for the FBIN11 silo (with steel trusses)	PODLOGAF11_NIS: 1 or PODLOGAF11_WYS: 1		Not applicable					
				210 cm long symmetrical panel of the perforated floor	PD-PAN37/210: 4							
				Floor grain inlet equipped with ties and a hydraulic drive mechanism, manually or electrically controlled.	ZPR-WLOT-1: 1 + ZPR-CIEGNO-1: 3 + ZPR-CYLINDER-1: 1 + ZPR-POMPA-M-1: 1, or ZPR-POMPA-E-1:1 + ZPR-PSW-1: 1							
				Internal screw conveyor PSW	PSW-1000 :1							
				Air inlet frame for silos of the FBIN11 type	UWLP/F11: 1							
			PSW-F11-7.5 PSW-F11-11.0	Perforated steel floor of a total height of 890 mm or 1040 mm for the FBIN11 silo (with steel trusses)	PODLOGAF11_NIS: 1 or PODLOGAF11_WYS: 1							
				Floor panel with an opening for grain inlet	PD-PAN-WLOT: 1							
				Floor grain inlet equipped with ties and a hydraulic drive mechanism, manually or electrically controlled.	ZPR-WLOT-1: 2 + ZPR-CIEGNO-1: 4 + ZPR-CYLINDER-1: 2 + ZPR-POMPA-M-1:1, or ZPR-POMPA-E-1:1 (for the central inlet) + ZPR-POMPA-M-1: 1 (for inlets relieving PSW)							
				Internal screw conveyor PSW + Accessories	PSW-F11-7.5: 1 or PSW-F11-11.0: 1 + PSW-FAKC-PDS: 1							
				Air inlet frame for silos of the FBIN11 type	UWLP/F11: 1							
O	33	Concrete floor with ventilation ducts	PSW1000	Floor panels to cover ventilation ducts and the concrete transport duct, with gaskets and grain inlets	PDB-PAN37/71: 126 + PDB-PAN43/91: 28 + PDB-USZCZ: 45 + PDB-PAN-WLOT: 1 + PD-USZCZELKA: 8		Not applicable					
				Floor grain inlet equipped with ties and a hydraulic drive mechanism, manually or electrically controlled.	ZPR-WLOT-1: 1 + ZPR-CIEGNO-1: 3 + ZPR-CYLINDER-1: 1 + ZPR-POMPA-M-1: 1, or ZPR-POMPA-E-1:1 + ZPR-PSW-1: 1 + ZPR-MOCBET-1: 1							
				Internal screw conveyor, PSW (manufactured by BIN)	PSW-1000 :1							
				Air inlet frame for silos with concrete floor	PDB-WLOTPOW1: 2							
			PSW-F11-7.5 PSW-F11-11.0	Floor panels to cover ventilation ducts and the concrete transport duct, with gaskets and grain inlets	PDB-PAN37/71: 126 + PDB-PAN43/91: 21 + PDB-USZCZ: 45 + PDB-PAN-WLOT: 2 + PD-USZCZELKA: 8							
		Floor grain inlet equipped with ties and a hydraulic drive mechanism, manually or electrically controlled.	ZPR-WLOT-1: 2 + ZPR-CIEGNO-1: 4 + ZPR-CYLINDER-1: 2 + ZPR-POMPA-M-1:1, or ZPR-POMPA-E-1:1 (for the central inlet) + ZPR-POMPA-M-1: 1 (for inlets relieving PSW) + ZPR-MOCBET-1: 2									
		Internal screw conveyor PSW + Accessories	PSW-F11-7.5: 1 or PSW-F11-11.0: 1 + PSW-FAKC-PDB1: 1									
		Air inlet frame for silos with concrete floor	PDB-WLOTPOW1: 2									
O	34	A concrete floor with ventilation ducts and a man-accessible maintenance channel requires customised design, together with standard and optional equipment										

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*Table 5. Basic characteristics of FBIN14 type silos – standard and optional equipment.*

Item				Product Name	FBIN14/10	FBIN14/11	FBIN14/12	FBIN14/13	FBIN14/14	FBIN14/15	FBIN14/16	FBIN14/17	
S - standard / O - optional				Nominal usable volume of the silo/The nominal loading capacity of the silo (for wheat of density of 780kg/m³)	steel floor on blocks	2011 m³ / 1569 t	2195 m³ / 1712 t	2379 m³ / 1856 t	-	-	-	-	
				steel floor on blocks + 150 mm screed	1987 m³ / 1550 t	2171 m³ / 1693 t	2355 m³ / 1837 t	-	-	-	-		
				steel floor on trusses	1916 m³ / 1495 t	2100 m³ / 1638 t	2284 m³ / 1782 t	2467 m³ / 1924 t	2651 m³ / 2068 t	2835 m³ / 2211 t	3018 m³ / 2354 t	3202 m³ / 2498 t	
				steel floor on trusses + 150 mm screed	1892 m³ / 1476 t	2076 m³ / 1619 t	2260 m³ / 1763 t	2443 m³ / 1906 t	2627 m³ / 2049 t	2811 m³ / 2192 t	2994 m³ / 2335 t	3178 m³ / 2479 t	
				concrete floor with ventilation ducts	2000 m³ / 1560 t	2184 m³ / 1704 t	2368 m³ / 1847 t	2551 m³ / 1990 t	2735 m³ / 2133 t	2919 m³ / 2277 t	3102 m³ / 2420 t	3286 m³ / 2563 t	
2		Silo nominal volume	m³	2059	2243	2427	2610	2794	2978	3161	3345		
3		Shell (cylindrical part of the silo) nominal diameter	m	Ø 14.3									
4		Shell (cylindrical part of the silo) nominal height	m	11.44	12.58	13.72	14.86	16.00	17.14	18.28	19.42		
5		Total silo height (from the anchoring level to the loading inlet)	m	15.57	16.71	17.85	18.99	20.13	21.27	22.41	23.55		
6		Net silo weight (without optional equipment)	kg	14806	16206	17625	19356	21122	23026	24763	26806		
S	7	A digital copy of the structural product design (File No. SZJ/008)			Delivered free of charge on the customer request (for BIN customers only)								
S	8	A hardcopy of the silo operating manual (File No. SZJ/031)			IO:SIL/F: 1								
S	9	A hardcopy of the Declaration of Functional Parameters (File No. SZJ/029)			1								
S	10	Lockable hinged bottom access manhole			WLAZDOLNY-F14: 1 (a height of the manhole depends on the floor height)								
O	11	Platform of the bottom access hole			PODESTDOLNY: 1 (used only when the bottom access manhole is installed in the second segment of the shell)								
O	12	Access platform with an external ladder to the bottom access manhole			WLAZDOL-DRABZ: 1 (An access platform with an external ladder to the bottom access manhole installed in the third segment of the shell)								
S	13	An internal ladder to the bottom access manhole			WLAZDOL-DRABW: 1 (an internal short leaning ladder from the floor to the bottom access manhole)								
O	14	Additional bottom access manhole - emergency			WLAZDOLNY-F14: 1 (required in silos without an internal ladder)								
O	15	Internal ladder			FDRAB/W-10-KPL	FDRAB/W-11-KPL	FDRAB/W-12-KPL	We do not provide ladders of this type for design reasons					
O	16	External ladder with secured access			FDRABZ/10	FDRABZ/11-12		FDRABZ/13-15			FDRABZ/16-17		
O	17	Spiral stairs			F14-SCH-SPIR-SEG: 5 F14-SCH-SPIR-AKC: 1	F14-SCH-SPIR-SEG: 6 F14-SCH-SPIR-AKC: 1	F14-SCH-SPIR-SEG: 6 F14-SCH-SPIR-AKC: 1	F14-SCH-SPIR-SEG: 7 F14-SCH-SPIR-AKC: 1	F14-SCH-SPIR-SEG: 7 F14-SCH-SPIR-AKC: 1	F14-SCH-SPIR-SEG: 8 F14-SCH-SPIR-AKC: 1	F14-SCH-SPIR-SEG: 8 F14-SCH-SPIR-AKC: 1	F14-SCH-SPIR-SEG: 9 F14-SCH-SPIR-AKC: 1	
O	18	Roof stairs			SCHODYDACH1500: 1 (require installation of 1 WLAZDACH-2 or 1 SCHODYDACH-AKC )								
O	19	A set of rails for upper platforms			POR-PORECZE: 1 (used when a silo is not equipped with an external ladder, but has roof stairs and/or roof hatch)								
O	20	Roof hatch with an access platform			WLAZDACH-2: 1								
O	21	Collar platform			PODEST-WIENCA1: 1 (used when a silo is equipped with roof stairs, but is not equipped with a service catwalk)								
S	22	Closing of the roof hatch opening, with a securing grate			WLAZDACH_ZASL: 1								
O	23	Service catwalk			POM1500-KRAT: 1 or 2 + POM1500-PLAT: 1 + POM2200-WEJ: 1 + POM1500-FWAS: 1 or 2 (1 for each grating POM1500-KRAT)								
O	24	Fan for ventilation of stored material		Steel floor on blocks or on trusses Concrete floor with ventilation ducts	WPR18: 1 + WPR18-UWLP/K: 1 + UWLP/KONF: 1 or WPS-40 + UWLP/KONF: 1								
O	25	Roof exhaust fan			WPR15: 2 + WPR18-PDB: 2								
S	26	Roof exhausters			OWS250-500+: 1								
S	27	Central loading inlet for grain loading into a silo			WYWIETRZNIK: 32								
O	28	Silo control module			Ø 300 mm								
O	29	Portable emergency duct on the floor			MKS-100/2: 1								
O	30	Apron of the corrugated shell			OSLONAKAN/F: 1 + KANALAW-2: 4								
O	31	Steel floor on blocks	PSW1500	A complete floor for the BIN1500 silo + Floor connector for FBIN silos, L=1.5 m	PODLOGA1500: 1 + FLACZ/P-1: 30			Not applicable					
Silo floor support + Alternate floor support for silos with a large fan				ELEM.CERAM: 2200 + PODL_RUSZT: 1									
Central inlet from a silo to a PS220 screw conveyor				PSU220-WL-CENT: 1									
Internal screw conveyor PSW				PSW1500: 1									
Air inlet frame for silos of the FBIN14 type				UWLP/F14-19: 1									
O	32	Steel floor on trusses	PSW1500	Perforated steel floor of a total height of 890 mm or 1040 mm for the FBIN14 silo (with steel trusses).	PODLOGAF14_NIS: 1 or PODLOGAF14_WYS: 1			Not applicable					
210 cm long symmetrical panel of the perforated floor				PD-PAN37/210: 4									
Floor grain inlet equipped with ties and a hydraulic drive mechanism, manually or electrically controlled.				ZPR-WLOT-1: 1 + ZPR-CIEGNO-1: 3 + ZPR-CYLINDER-1: 1 + ZPR-POMPA-M-1:1, or ZPR-POMPA-E-1:1 + ZPR-PSW-1: 1									
Internal screw conveyor PSW				PSW1500: 1									
Air inlet frame for silos of the FBIN14 type				UWLP/F14-19: 1									
O	32	Steel floor on trusses	PSW-F14-7.5 PSW-F14-11.0	Perforated steel floor of a total height of 890 mm or 1040 mm for the FBIN14 silo (with steel trusses).	PODLOGAF14_NIS: 1 or PODLOGAF14_WYS: 1								
Floor panel with an opening for grain inlet				PD-PAN-WLOT: 1									
Floor grain inlet equipped with ties and a hydraulic drive mechanism, manually or electrically controlled.				ZPR-WLOT-1: 2 + ZPR-CIEGNO-1: 4 + ZPR-CYLINDER-1: 2 + ZPR-POMPA-M-1:1, or ZPR-POMPA-E-1:1 (for the central inlet) + ZPR-POMPA-M-1: 1 (for inlets relieving PSW)									
Internal screw conveyor PSW + Accessories				PSW-F14-7.5: 1 or PSW-F14-11.0: 1 + PSW-FAKC-PDS: 1									
Air inlet frame for silos of the FBIN14 type				UWLP/F14-19: 1									
O	33	Concrete floor with ventilation ducts	PSW1500	Floor panels to cover ventilation ducts and the concrete transport duct, with gaskets and grain inlets	PDB-PAN37/71: 176 + PDB-PAN43/91: 36 + PDB-USZCZ: 59 + PDB-PAN-WLOT: 1 + PD-USZCZELKA: 8			Not applicable					
Floor grain inlet equipped with ties and a hydraulic drive mechanism, manually or electrically controlled.				ZPR-WLOT-1: 1 + ZPR-CIEGNO-1: 3 + ZPR-CYLINDER-1: 1 + ZPR-POMPA-M-1: 1 or ZPR-POMPA-E-1:1 + ZPR-PSW-1: 1 + ZPR-MOCBET-1: 1									
Internal screw conveyor PSW				PSW1500: 1									
Air inlet frame for silos with concrete floor				PDB-WLOTPOW1: 2									
O				33	Concrete floor with ventilation ducts	PSW-F14-7.5 PSW-F14-11.0	Floor panels to cover ventilation ducts and the concrete transport duct, with gaskets and grain inlets						PDB-PAN37/71: 176 + PDB-PAN43/91: 27 + PDB-USZCZ: 59 + PDB-PAN-WLOT: 2 + PD-USZCZELKA: 8
Floor grain inlet equipped with ties and a hydraulic drive mechanism, manually or electrically controlled.	ZPR-WLOT-1: 2 + ZPR-CIEGNO-1: 4 + ZPR-CYLINDER-1: 2 + ZPR-POMPA-M-1:1, or ZPR-POMPA-E-1:1 (for the central inlet) + ZPR-POMPA-M-1: 1 (for inlets relieving PSW) + ZPR-MOCBET: 2												
Internal screw conveyor PSW + Accessories	PSW-F14-7.5: 1 or PSW-F14-11.0: 1 + PSW-FAKC-PDB1: 1												
Air inlet frame for silos with concrete floor	PDB-WLOTPOW1: 2												
O	34	A concrete floor with ventilation ducts and a man-accessible maintenance channel requires customised design, together with standard and optional equipment											

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*Table 6. Basic characteristics of FBIN17 type silos – standard and optional equipment.*

Table of Basic Characteristics of FBIN17 Type Silos - Standard and Optional Equipment			FBIN17/14	FBIN17/15	FBIN17/16	FBIN17/17	FBIN17/18	FBIN17/19	
Item	Product Name								
S - standard / O - optional		Nominal usable volume of the silo/The nominal loading capacity of the silo (for wheat of density of 780kg/m³)	steel floor on trusses	3658 m³ / 2853 t	3908 m³ / 3048 t	4158 m³ / 3243 t	4408 m³ / 3438 t	4658 m³ / 3633 t	4909 m³ / 3829 t
			steel floor on trusses + 150 mm screed	3625 m³ / 2828 t	3875 m³ / 3023 t	4125 m³ / 3218 t	4375 m³ / 3413 t	4625 m³ / 3608 t	4876 m³ / 3803 t
			concrete floor with ventilation ducts	3772 m³ / 2942 t	4022 m³ / 3137 t	4272 m³ / 3332 t	4522 m³ / 3527 t	4772 m³ / 3722 t	5023 m³ / 3918 t
	2	Silo nominal volume	m³	3853	4103	4353	4603	4853	5104
	3	Shell (cylindrical part of the silo) nominal diameter	m	Ø16.7					
	4	Shell (cylindrical part of the silo) nominal height	m	16.00	17.14	18.28	19.42	20.56	21.70
	5	Total silo height (from the anchoring level to the loading inlet)	m	20.87	22.01	23.15	24.29	25.43	26.57
	6	Net silo weight (without optional equipment)	kg	31522	33925	36320	39209	42003	44852
	S 7	A digital copy of the structural product design (File No. SZJ/008)		Delivered free of charge on the customer request (for BIN customers only)					
	S 8	A hardcopy of the silo operating manual (File No. SZJ/031)		IO:SIL/F: 1					
S 9	A hardcopy of the Declaration of Functional Parameters (File No. SZJ/029)		1						
S 10	Lockable hinged bottom access manhole		WLAZDOLNY-F17: 1 (a height of the manhole depends on the floor height)						
O 11	Platform of the bottom access hole		PODESTDOLNY: 1 (used only when the bottom access manhole is installed in the second segment of the shell)						
O 12	Access platform with an external ladder to the bottom access manhole		WLAZDOL-DRABZ: 1 (An access platform with an external ladder to the bottom access manhole installed in the third segment of the shell)						
S 13	An internal ladder to the bottom access manhole		WLAZDOL-DRABW: 1 (an internal short leaning ladder from the floor to the bottom access manhole)						
O 14	Additional bottom access manhole - emergency		WLAZDOLNY-F17: 1 (required in silos without an internal ladder)						
O 15	Internal ladder		We do not provide ladders of this type for design reasons						
O 16	External ladder with secured access		FDRABZ/13-15		FDRABZ/16-17		FDRABZ/18-19		
O 17	Spiral stairs		F17-SCH-SPIR-SEG: 7 + F17-SCH-SPIR-AKC: 1	F17-SCH-SPIR-SEG: 8 + F17-SCH-SPIR-AKC: 1	F17-SCH-SPIR-SEG: 9 + F17-SCH-SPIR-AKC: 1	F17-SCH-SPIR-SEG: 9 + F17-SCH-SPIR-AKC: 1	F17-SCH-SPIR-SEG: 10 pcs + F17-SCH-SPIR-AKC: 1		
O 18	Roof stairs		SCHODYD-FBIN17: 1 (require installation of 1 WLAZDACH-2 or 1 SCHODYDACH-AKC )						
O 19	A set of rails for upper platforms		POR-PORECZE: 1 (used when a silo is not equipped with an external ladder, but has roof stairs and/or roof hatch)						
O 20	Roof hatch with an access platform		WLAZDACH-2: 1						
O 21	Central platform with an entrance		POM-FBIN-PLAT: 1 + POM-FBIN-WEJ: 1 (used when a silo is equipped with roof stairs, but is not equipped with a service catwalk)						
S 22	Closing of the roof hatch opening, with a securing grate		WLAZDACH_ZASL: 1						
O 23	Service catwalk		POM-FBIN17-KRAT: 1 or 2 + POM-FBIN-PLAT: 1 + POM-FBIN-WEJ: 1						
O 24	Fan for ventilation of stored material	Steel floor on trusses Concrete floor with ventilation ducts	WPR18: 1 + WPR18-UWLP/K: 1 + UWLP/KONF: 1 or WPS-40 + UWLP/KONF: 1 WPR15: 2 + WPR18-PDB: 2						
O 25	Roof exhaust fan		OWS250-F17+: 1						
S 26	Roof exhausters		WYWIETRZNIK: 10 pcs						
S 27	Central loading inlet for grain loading into a silo		Ø 600mm						
O 28	Silo control module		MKS-100/2: 1						
O 29	Portable emergency duct on the floor		OSLONAKAN/F: 1 + KANALAW-2: 5						
O 30	Apron of the corrugated shell		FFARTUCH: 21 (used in silos with a steel floor, without sealing screed)						
O	31	Steel floor on trusses	Perforated steel floor of a total height of 890 mm or 1040 mm for the FBIN17 silo (with steel trusses).	PODLOGAF17_NIS: 1 or PODLOGAF17_WYS: 1					
O			Floor panel with an opening for grain inlet	PD-PAN-WLOT: 1					
O			Floor grain inlet equipped with ties and a hydraulic drive mechanism, manually or electrically controlled.	ZPR-WLOT-1: 2 + ZPR-CIEGNO-1: 5 + ZPR-CYLINDER-1: 2 + ZPR-POMPA-M-1:1, or ZPR-POMPA-E-1:1 (for the central inlet) + ZPR-POMPA-M-1: 1 (for inlets relieving PSW)					
O			Internal screw conveyor PSW + Accessories	PSW-F17-7.5: 1 or PSW-F17-11.0: 1 + PSW-FAKC-PDS: 1					
O			Air inlet frame for silos of the FBIN17 type	UWLP/F14-19: 1					
O	32	Concrete floor with ventilation ducts	Floor panels to cover ventilation ducts and the concrete transport duct, with gaskets and grain inlets	PDB-PAN37/71: 250 + PDB-PAN43/91: 33 + PDB-USZCZ: 80 + PDB-PAN-WLOT: 2 + PD-USZCZELKA: 8					
O			Floor grain inlet equipped with ties and a hydraulic drive mechanism, manually or electrically controlled.	ZPR-WLOT-1: 2 + ZPR-CIEGNO-1: 5 + ZPR-CYLINDER-1: 2 + ZPR-POMPA-M-1:1, or ZPR-POMPA-E-1:1 (for the central inlet) + ZPR-POMPA-M-1: 1 (for inlets relieving PSW) + ZPR-MOCBET: 2					
O			Internal screw conveyor PSW + Accessories	PSW-F17-7.5: 1 or PSW-F17-11.0: 1 + PSW-FAKC-PDB1: 1					
O			Air inlet frame for silos with concrete floor	PDB-WLOTPOW1: 2					
O 33	A concrete floor with ventilation ducts and a man-accessible maintenance channel requires customised design, together with standard and optional equipment								



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*Table 7. Basic characteristics of FBIN19 type silos – standard and optional equipment.*

FBIN19/15			FBIN19/16		FBIN19/17		FBIN19/18	
Item	Product Name							
S - standard / O - optional		Nominal usable volume of the silo/The nominal loading capacity of the silo (for wheat of density of 780kg/m³)	steel floor on trusses	5170 m³ / 4033 t	5497 m³ / 4288 t	5823 m³ / 4542 t	6150 m³ / 4797 t	
			steel floor on trusses + 150 mm screed	5127 m³ / 3999 t	5454 m³ / 4254 t	5780 m³ / 4508 t	6107 m³ / 4764 t	
			concrete floor with ventilation ducts	5319 m³ / 4149 t	5646 m³ / 4404 t	5972 m³ / 4658 t	6299 m³ / 4913 t	
	2	Silo nominal volume	m³	5425	5752	6078	6405	
	3	Shell (cylindrical part of the silo) nominal diameter	m	Ø 19.1				
	4	Shell (cylindrical part of the silo) nominal height	m	17.14	18.28	19.42	20.56	
	5	Total silo height (from the anchoring level to the loading inlet)	m	22.70	23.84	24.98	26.12	
	6	Net silo weight (without optional equipment)	kg	42290	45740	49245	52455	
	S	7	A digital copy of the structural product design (File No. SZJ/008)		Delivered free of charge on the customer request (for BIN customers only)			
	S	8	A hardcopy of the silo operating manual (File No. SZJ/031)		IO:SIL/F: 1			
S	9	A hardcopy of the Declaration of Functional Parameters (File No. SZJ/029)		1				
S	10	Lockable hinged bottom access manhole		WLAZDOLNY-F19: 1 (a height of the manhole depends on the floor height)				
O	11	Platform of the bottom access hole		PODESTDOLNY: 1 (used only when the bottom access manhole is installed in the second segment of the shell)				
O	12	Access platform with an external ladder to the bottom access manhole		WLAZDOL-DRABZ: 1 (An access platform with an external ladder to the bottom access manhole installed in the third segment of the shell)				
S	13	An internal ladder to the bottom access manhole		WLAZDOL-DRABW: 1 (an internal short leaning ladder from the floor to the bottom access manhole)				
O	14	Additional bottom access manhole - emergency		WLAZDOLNY-F19: 1 (required in silos without an internal ladder)				
O	15	Internal ladder		We do not provide ladders of this type for design reasons				
O	16	External ladder with secured access		FDRABZ/13-15	FDRABZ/16-17		FDRABZ/18-19	
O	17	Spiral stairs		F19-SCH-SPIR-SEG: 8 + F19-SCH-SPIR-AKC: 1	F19-SCH-SPIR-SEG: 8 + F19-SCH-SPIR-AKC: 1	F19-SCH-SPIR-SEG: 9 + F19-SCH-SPIR-AKC: 1	F19-SCH-SPIR-SEG: 9 + F19-SCH-SPIR-AKC: 1	
O	18	Roof stairs		SCHODYD-FBIN19: 1 (require installation of 1 WLAZDACH-2 or 1 SCHODYDACH-AKC )				
O	19	A set of rails for upper platforms		POR-PORECZE: 1 (used when a silo is not equipped with an external ladder, but has roof stairs and/or roof hatch)				
O	20	Roof hatch with an access platform		WLAZDACH-2: 1				
O	21	Central platform with an entrance		POM-FBIN-PLAT: 1 + POM-FBIN-WEJ: 1 (used when a silo is equipped with roof stairs, but is not equipped with a service catwalk)				
S	22	Closing of the roof hatch opening, with a securing grate		WLAZDACH_ZASL: 1				
O	23	Service catwalk		POM-FBIN19-KRAT: 1 or 2 + POM-FBIN-PLAT: 1 + POM-FBIN-WEJ: 1				
O	24	Fan for ventilation of stored material	Steel floor on trusses	WPR18: 1 + WPR18-UWLP/K: 1 + UWLP/KONF: 1 or WPS-40 + UWLP/KONF: 1				
			Concrete floor with ventilation ducts	WPR15: 2 + WPR18-PDB: 2				
O	25	Roof exhaust fan		OWS250-F17+: 1				
S	26	Roof exhausters		WYWIETRZNIK: 12				
S	27	Central loading inlet for grain loading into a silo		Ø 600mm				
O	28	Silo control module		MKS-100/2: 1				
O	29	Portable emergency duct on the floor		OSLONAKAN/F: 1 + KANALAW-2: 5				
O	30	Apron of the corrugated shell		FFARTUCH: 24 (used in silos with a steel floor, without sealing screed)				
O	31	Steel floor on trusses	Perforated steel floor of a total height of 890 mm or 1040 mm for the FBIN19 silo (with steel trusses).	PODLOGAF19_NIS: 1 or PODLOGAF19_WYS: 1				
			Floor panel with an opening for grain inlet	PD-PAN-WLOT: 2				
			Floor grain inlet equipped with ties and a hydraulic drive mechanism, manually or electrically controlled.	ZPR-WLOT-1: 3 + ZPR-CIEGNO-1: 6 + ZPR-CYLINDER-1: 2 + ZPR-POMPA-M-1:1, or ZPR-POMPA-E-1:1 (for the central inlet) + ZPR-POMPA-M-1: 1 (for inlets relieving PSW)				
			Internal screw conveyor PSW + Accessories	PSW-F19-7.5: 1 or PSW-F19-11.0: 1 + PSW-FAKC-PDS: 1				
			Air inlet frame for silos of the FBIN19 type	UWLP/F14-19: 1				
O	32	Concrete floor with ventilation ducts	Floor panels to cover ventilation ducts and the concrete transport duct, with gaskets and grain inlets	PDB-PAN37/71: 316 + PDB-PAN43/91: 37 + PDB-USZCZ: 98 + PDB-PAN-WLOT: 3 + PD-USZCZELKA: 8				
			Floor grain inlet equipped with ties and a hydraulic drive mechanism, manually or electrically controlled.	ZPR-WLOT-1: 3 + ZPR-CIEGNO-1: 6 + ZPR-CYLINDER-1: 2 + ZPR-POMPA-M-1:1, or ZPR-POMPA-E-1:1 (for the central inlet) + ZPR-POMPA-M-1: 1 (for inlets relieving PSW) + ZPR-MOCBET: 2				
			Internal screw conveyor PSW + Accessories	PSW-F19-7.5: 1 or PSW-F19-11.0: 1 + PSW-FAKC-PDB1: 1				
			Air inlet frame for silos with concrete floor	PDB-WLOTPOW1: 2				
O	33	A concrete floor with ventilation ducts and a man-accessible maintenance channel requires customised design, together with standard and optional equipment						

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## 2.4. Design description

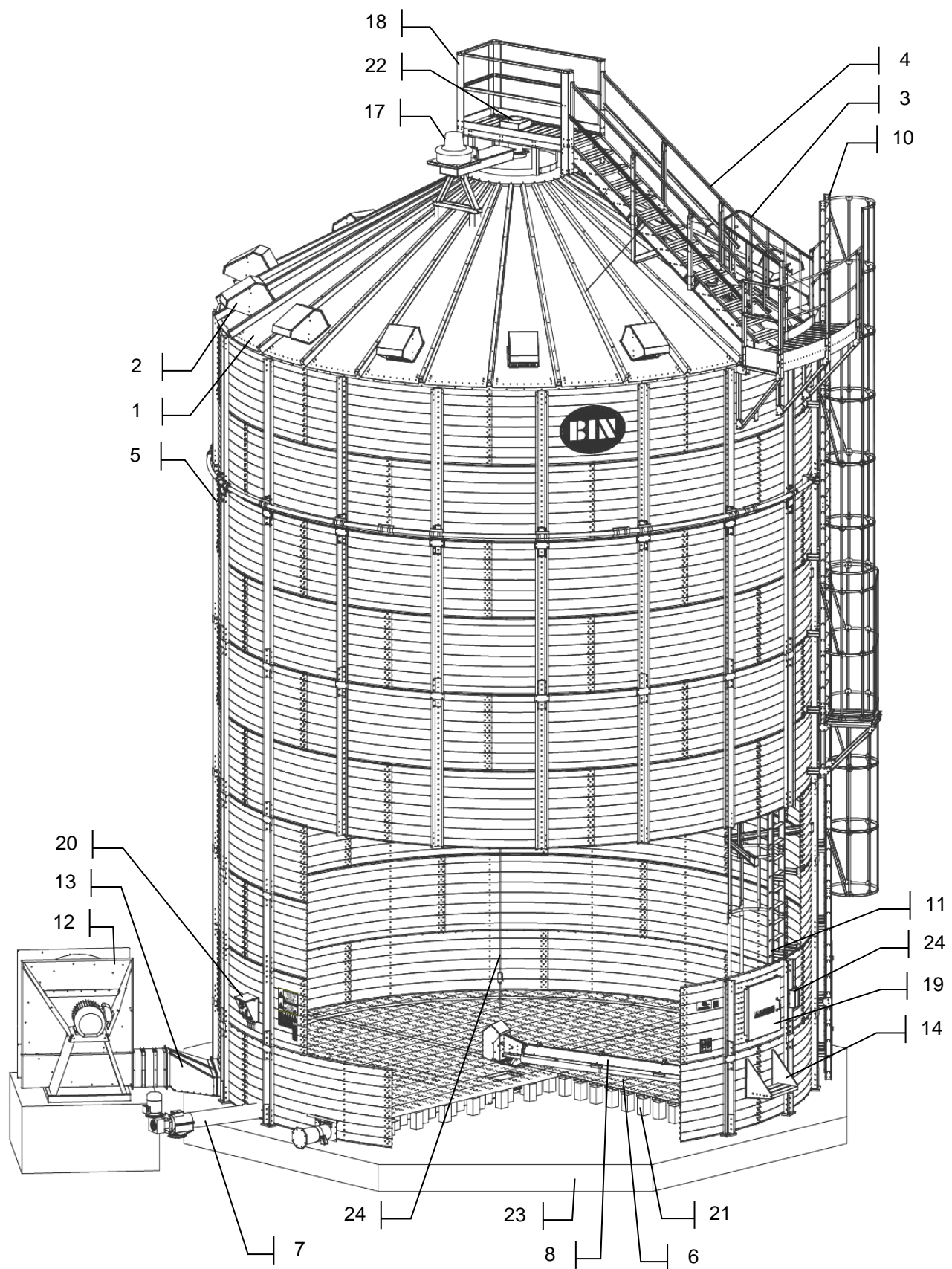


Figure 1. A diagram of a silo of the FBIN type, with steel floor on concrete blocks, and with standard and optional equipment.

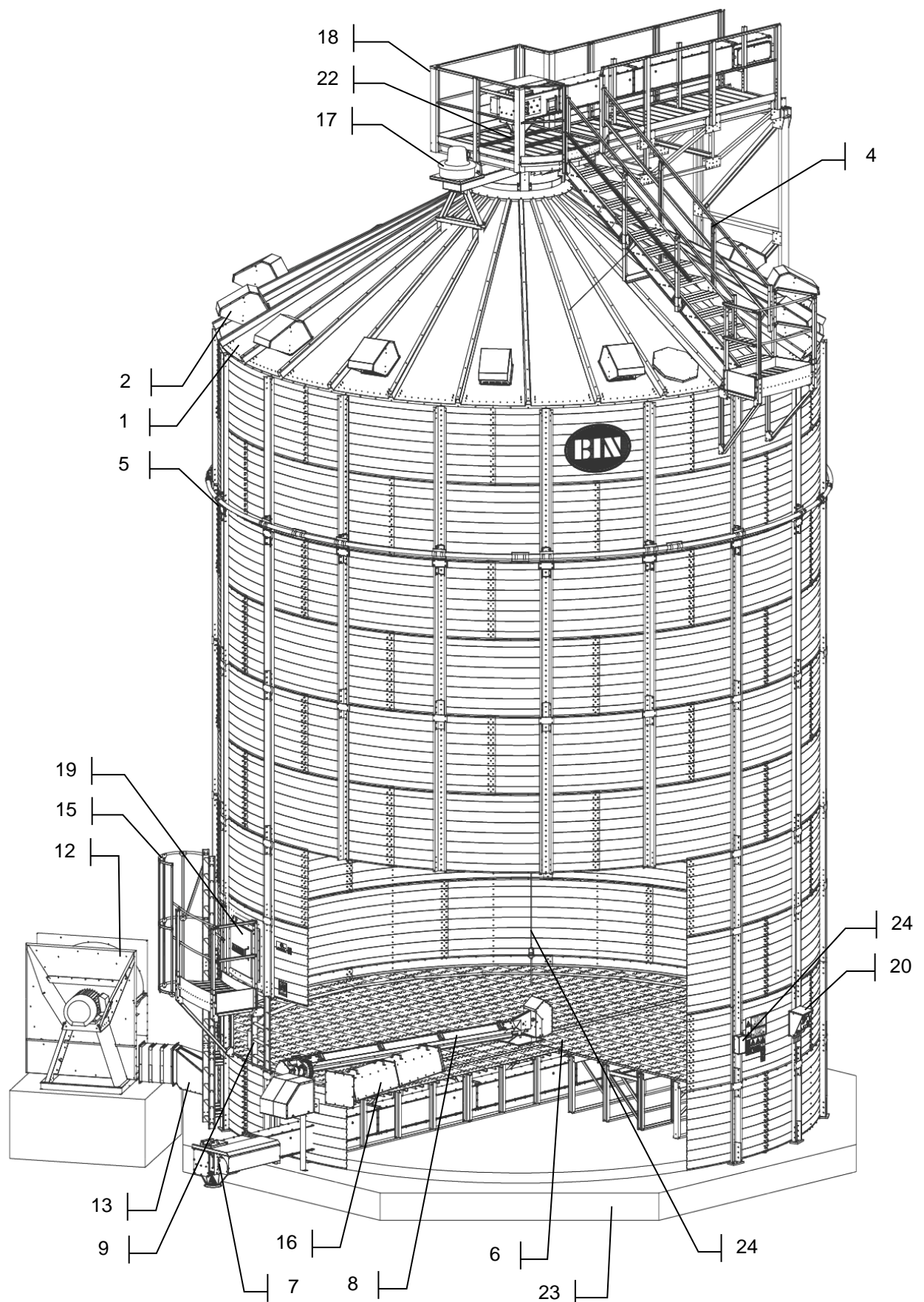


Figure 2. A diagram of a silo of the FBIN type, with steel floor on concrete blocks, and with standard and optional equipment.



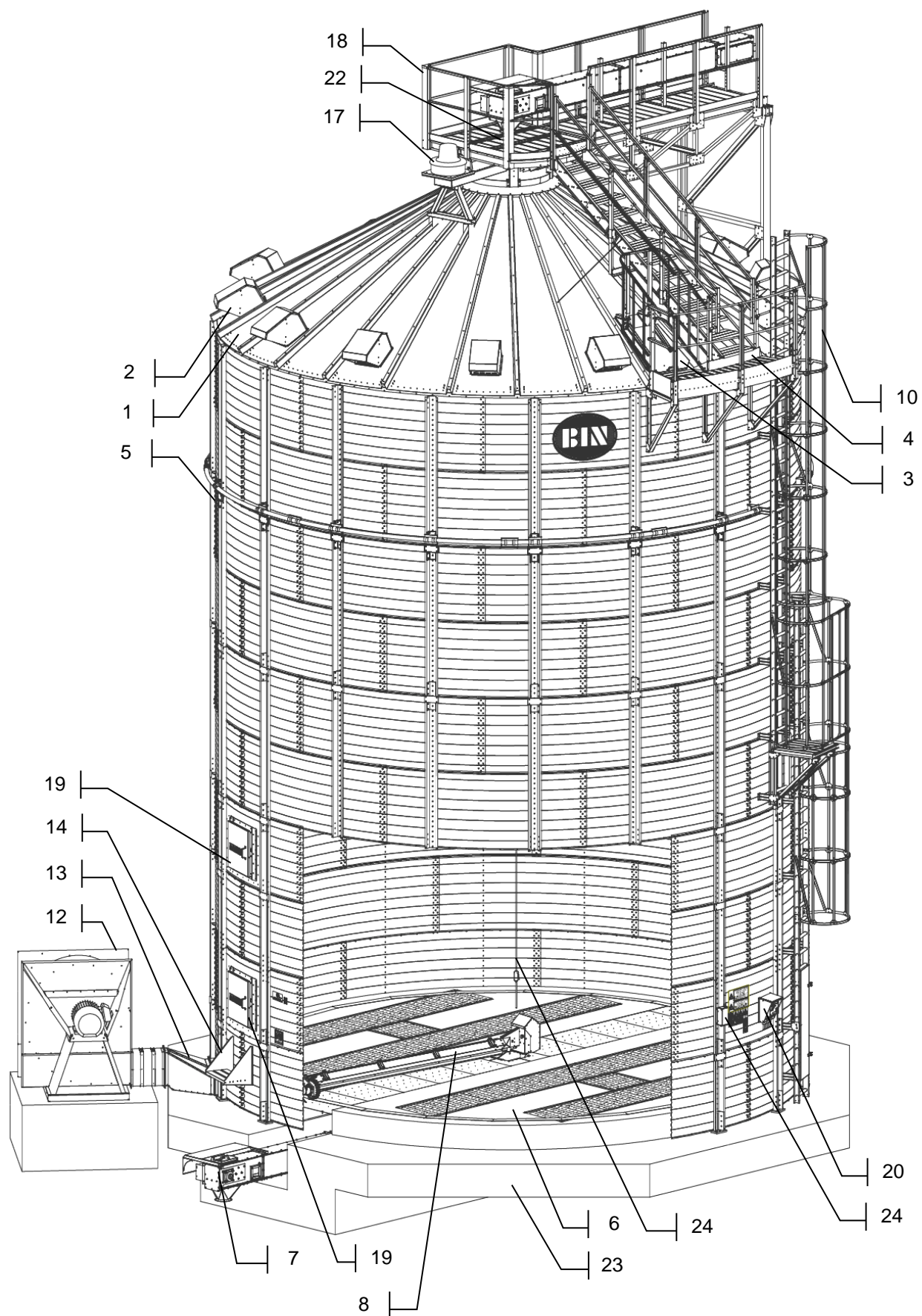


Figure 3. A diagram of a silo of the FBIN type, with a concrete floor and ventilation ducts, and with standard and optional equipment.

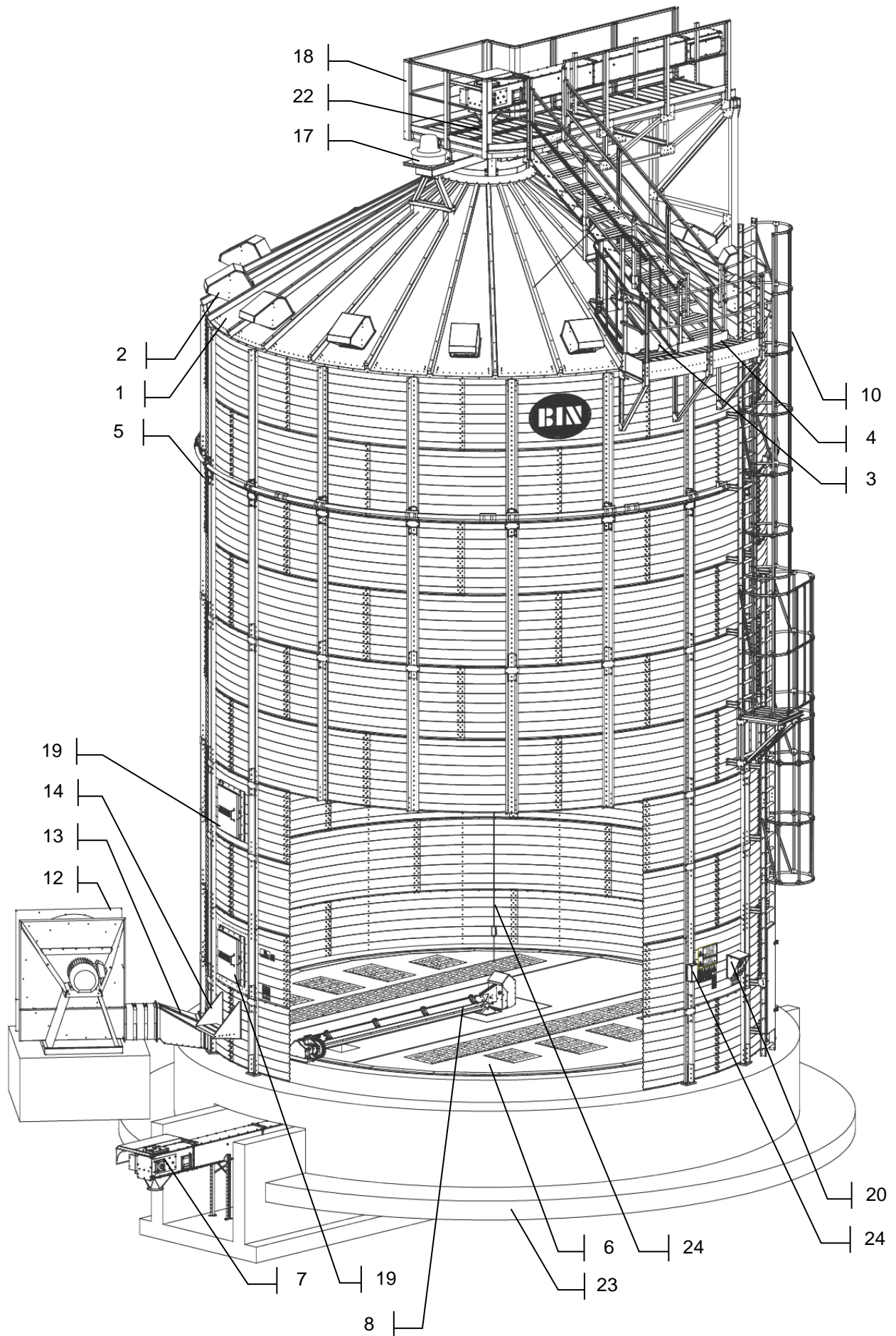


Figure 4. A diagram of a silo of the FBIN type, with a concrete floor, ventilation ducts and a man-accessible maintenance channel, and with standard and optional equipment.



Figure 1, Figure 2, Figure 3 and Figure 4 present a silo in form of a cylindrical tank with a flat bottom formed by a concrete floor with ventilation ducts or a perforated steel floor. The concrete floor with ventilation ducts is executed during construction of foundations. The perforated steel floor is installed on concrete supports or steel trusses during installation of the silo. The shell was constructed of corrugated galvanised steel and reinforced with external pillars and with horizontal rings in its top part. Multi-row screw joints of the shell are sealed with self-adhesive seals. The roof is conical, and its decking is made of flat galvanised steel sheets. A collar is installed in the top part of the roof, with a centrally located loading inlet.

During installation the whole structure is bound with the foundation slab with anchors. A brief characteristics of the most important units and devices installed in FBIN silos is presented below. Views and basic silo dimensions are presented in Figures - Figure 20, Figure 21, Figure 22, Figure 23, Figure 24, Figure 25.

#### Item 1 SILO ROOF

Roofs in all FBIN silos are conical and made of hot-dip galvanised steel sheets. Individual roof components (sections) are joined with steel screws with anti-corrosion coating and with galvanised self-drilling screws. At the joints, roof sections are appropriately shaped, additionally strengthening the roof structure and ensuring its tightness. All prefabricated openings (exhauster openings, roof hatch, and similar) are provided with special external embossing preventing precipitation (rain, snow, etc.) penetration into the silo.

#### Item 2 EXHAUSTER

A roof exhauster is a device installed on the silo roof. It is constructed of hot-dip galvanised metal sheets and ensures an appropriate level of grain ventilation. The exhauster design prevents penetration into the silo of precipitation or wind during strong winds. Additional sealing is installed at a connection between the exhauster and the roof. Exhausters are installed as standard equipment in all FBIN silos.

#### Item 3 ROOF HATCH

A roof hatch with an access platform and a safety cage are an optional equipment of the silo and provides access to the internal ladder through an opening in the silo roof, thus giving access to the silo interior. The access is possible using a special harness protecting from a fall from height, and when special precautions are observed. The roof hatch can be used this way only in silos equipped with an internal ladder: FBIN9/10, FBIN9/11, FBIN9/12, FBIN11/10, FBIN11/11, FBIN11/12, FBIN14/10, FBIN14/11, FBIN14/12 and all silo models of FBIN7 type. In all silos not equipped with the internal ladder, the roof hatch can be used to access an inspection opening in the silo roof. The inspection opening is located under a cover of the roof hatch and is equipped with safety grating protecting against a fall into the silo. It is designated for inspections of material stored in the silo. In particular, it can be used for sampling, monitoring of moisture content, etc. When the roof hatch is installed in the silo, it must be provided with an external access. This access can be ensured through an external ladder, or indirectly through a service catwalk and roof stairs. All components of the roof hatch and the silo cover are hot-dip galvanised.

#### Item 4 ROOF STAIRS

Roof stairs are used to provide access from outside to devices and units in the top part of the silo roof. If access to these locations is ensured in other way, e.g., through a service catwalk or appropriate lifting equipment, installation of roof stairs is not necessary. Roof stairs can be installed in all FBIN silos. Stairs are constructed of hot-dip galvanised metal sheets and are an optional equipment of FBIN silos.

#### Item 5 SILO SHELL

The silo shell means its cylindrical side walls made of hot-dip galvanised corrugated steel sheets. The shell consists of components (sheets) joined with steel screws with anti-corrosion coating. The shell sheets are joined with an overlap, and additional seals are installed on joints, to ensure the highest possible tightness of the structure. In all FBIN silos, a special system of external shell reinforcements is installed, consisting of vertical pillars and of rings in the top part of the shell. In the bottom part the shell pillars are supported on the foundation, to which they are attached with chemical anchors. The shell is connected to the silo roof with a roof connector in its upper part. The silo shell should be sealed on the side of the foundation slab. The sealing is constructed from the outside, by filling a gap between the shell and the concrete floor with concrete. More information is provided in this Operating Manual, section 3.4.4. Shell sealing at the base edge.

#### Item 6 SILO FLOOR

The floor is a horizontal surface of the silo, on which the material (grain) is stored. The following types of floor are used in FBIN silos:

- a) A steel floor on concrete blocks is the floor wholly made of hot-dip galvanised metal sheets, installed on concrete blocks. The entire surface of the floor is perforated (with openings ensuring air flow). This type of the floor can only be used in silos of FBIN7, FBIN9/10, FBIN9/11, FBIN9/12, FBIN11/10, FBIN11/11, FBIN11/12, FBIN14/10, FBIN14/11, and FBIN14/12 type. With the floor installed on concrete blocks, an underfloor unloading conveyor of PS220 type (manufactured by BIN) can be installed without a need for an additional hollow in the silo foundation. Unloading conveyors from other manufacturers can be installed, without an additional hollow in the silo foundation, when the dimensions are maintained - Figure 5.

Installation of larger conveyors must be taken into account during designing and construction of the silo foundations. Floor of this type is constructed during silo installation.

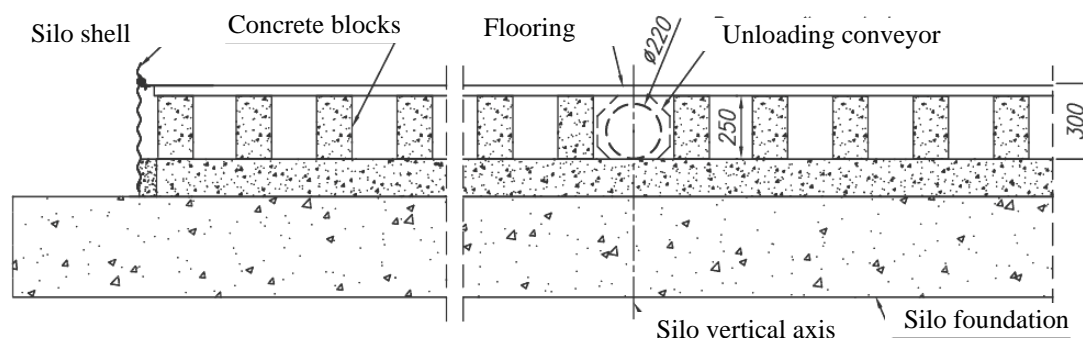


Figure 5 A steel floor on concrete blocks - conditions for installation of an underfloor unloading conveyor.

- b) A steel floor on trusses is a floor installed in special steel trusses and, similarly as the steel floor on blocks, it is wholly made of hot-dip galvanised metal sheets. The entire surface of the floor is perforated (with openings ensuring air flow). Floor of this type can be used in all FBIN silos (except for silos of the FBIN7 type), and it enables installation of underfloor unloading conveyors of RED250 and PS220 type (manufactured by BIN) without a need for an additional hollow in the silo foundation. Unloading conveyors from other manufacturers can be installed, without an additional hollow in the silo foundation, when the dimensions are maintained - Figure 6. Installation of larger conveyors must be taken into account during designing and construction of the silo foundations. Floor of this type is constructed during silo installation.

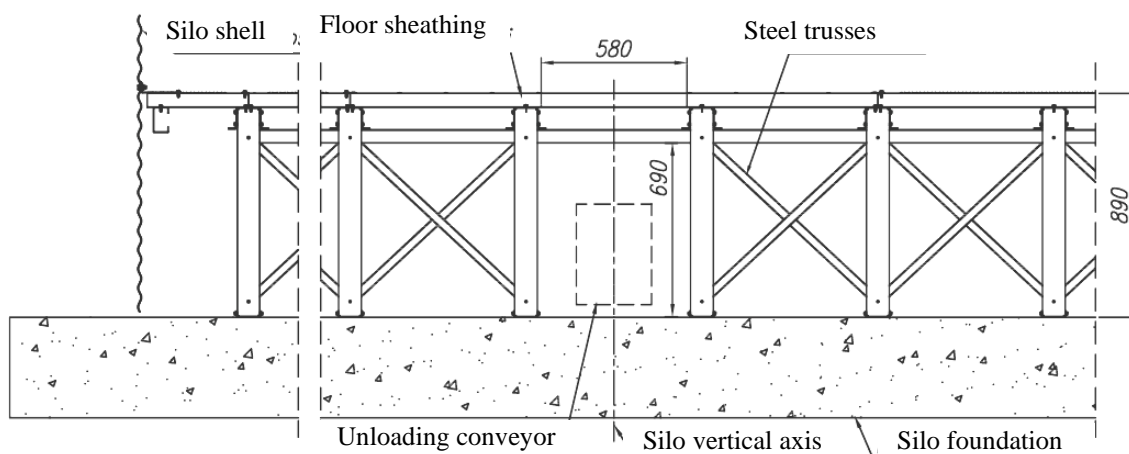
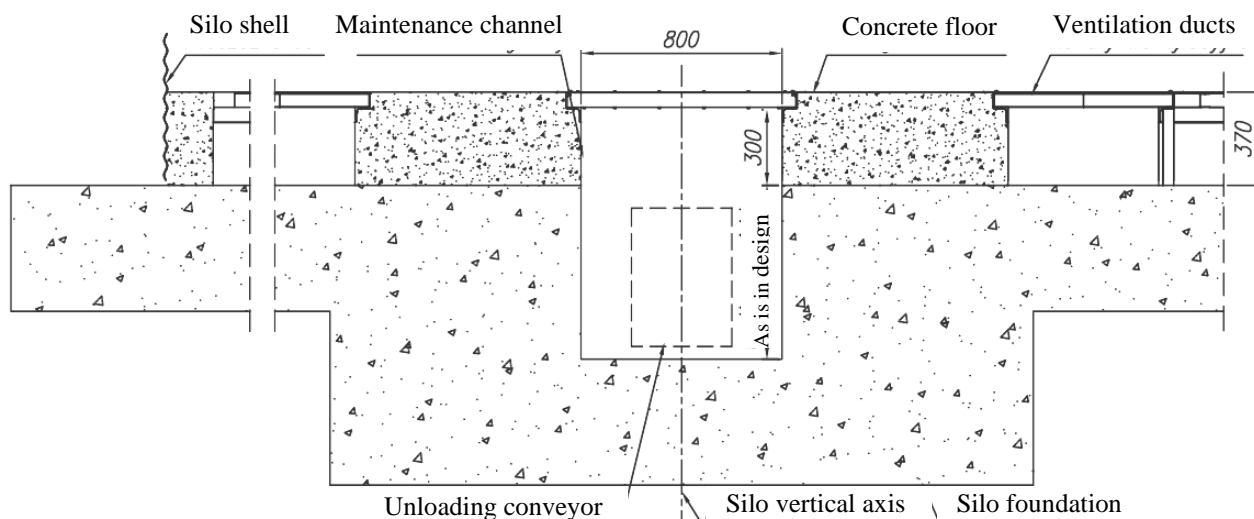


Figure 6 A steel floor on steel trusses - conditions for installation of an underfloor unloading conveyor.

- c) A concrete floor with ventilation ducts is constructed together with silo foundations. It can be used in all silos of the FBIN type except silos of the FBIN7 type. The top part of the foundation forms the silo floor, in which a system of ventilation ducts and a maintenance channel for installation of an underfloor unloading conveyor are constructed. Ventilation ducts are covered with perforated steel panels enabling the flow of air. The perforated surface enabling grain ventilation may therefore correspond to ca. 30% of the entire silo floor surface. The maintenance channel for installation of an unloading conveyor is covered by non-perforated steel panels. It can be used for installation of underfloor unloading conveyors of RED250 or PS220 (manufactured by BIN) type, or unloading conveyors from other manufacturers, of dimensions adopted to the dimensions of the maintenance channel - Figure 7. A man-accessible maintenance channel can be constructed, with a concrete ceiling, for an unloading conveyor with its equipment, and enabling men to access the pit under the silo floor. At the stage of designing silo foundations, the shape and dimensions of the maintenance channel designated for installation of a specific unloading conveyor must be specified.



*Figure 7 A concrete floor with ventilation ducts - conditions for installation of an underfloor unloading conveyor.*

#### Item 7 UNDERFLOOR UNLOADING CONVEYOR

FBIN silos are prepared for installation of various underfloor unloading machines and equipment, such as screw, scraper or belt conveyors, and other. Furthermore, an on-floor screw conveyor (PSW) is required for a complete unloading of the silo.

BIN manufactures universal screw conveyors of PS220 type, of a nominal diameter of 220 mm, and scraper conveyors (Redler) of the RED250 type of a nominal width of 250 mm, which can be used for underfloor unloading of silos. The unloading conveyors are installed in the concrete maintenance channel constructed during construction of foundations or directly under the silo steel floor. The conveyors transport the unloaded material (grain) outside the silo, and they can also be connected to other transport equipment, including a bucket elevator and scrapping, screw or belt conveyors, using special connectors. Installation of the underfloor conveyor in FBIN silos requires construction of a grain discharge inlet in the silo floor. A single grain inlet should be located centrally in the silo floor.



**It is strictly forbidden to use non-central grain inlets to unload FBIN silos. The use of non-central and incorrect grain inlets may result in deformation or even bursting of the silo shell during unloading.**

Detailed information on BIN conveyors and possibilities to use them in silos is provided in the operating manual "SCREW CONVEYORS" and "SCRAPER CONVEYORS". Underfloor unloading conveyors are an optional equipment of FBIN silos.

#### Item 8 INTERNAL SCREW CONVEYOR (PSW)

The internal screw conveyor, PSW, is a device installed in the silo that supports unloading. It enables unloading of that part of grain (Table 12), that did not get gravitationally into the unloading underfloor conveyor. Cooperating underfloor and internal conveyors allow to unload the silo practically completely. The internal screw conveyor transports the grain along the silo radius to the centrally located inlet, at the same time travelling clockwise around the silo axis (when looking down towards the silo floor). The grain is gradually unloaded, until nearly full circle is made.

The internal sweep auger conveyor cannot be installed alone in the silo - it always works together with the unloading underfloor screw-conveyor.

Our range includes the following internal screw conveyors:

- PSW220-BIN200 designated for all silos of the FBIN7 type provided with a steel floor on concrete blocks.
- PSW500 designated for all FBIN9 silos, regardless of the floor type constructed. In the silos with a steel floor on trusses and with a concrete floor with ventilation ducts, the PSW500 conveyor must be additionally equipped with a central support.
- PSW1000 designated for FBIN11/10, FBIN11/11, and FBIN11/12 silos, regardless of the floor type constructed. In the silos with a steel floor on trusses and with a concrete floor with ventilation ducts, the PSW1000 conveyor must be additionally equipped with a central support. When PSW1000 is installed in silos with a steel floor on steel trusses, additional four floor sections must be installed.
- PSW1500 designated for FBIN14/10, FBIN14/11, and FBIN14/12 silos, regardless of the floor type constructed. In the silos with a steel floor on trusses and with a concrete floor with ventilation ducts, the PSW1500 conveyor must be additionally equipped with a central support. When PSW1500 is installed in silos with a steel floor on steel trusses, additional four floor sections must be installed.
- PSW-F11-7.5/PSW-F11-11.0 designated for all FBIN11 silos, excluding those with a steel floor on concrete blocks. When PSW-F11 is installed in silos with a steel floor on steel trusses, one additional floor section must be installed for grain inlets.
- PSW-F14-7.5/PSW-F14-11.0 designated for all FBIN14 silos, excluding those with a steel floor on concrete blocks. When PSW-F14 is installed in silos with a steel floor on steel trusses, one additional floor section must be installed for grain inlets.
- PSW-F17-7.5/PSW-F17-11.0 designated for all FBIN17 silos. When PSW-F17 is installed in silos with a steel floor on steel trusses, one additional floor section must be installed for grain inlets.
- PSW-F19-7.5/PSW-F19-11.0 designated for all FBIN19 silos. When PSW-F19 is installed in silos with a steel floor on steel trusses, additional two floor sections must be installed for grain inlets.

PSW-F conveyors should be equipped with PSW-FAKC-PDS (for a steel floor on steel trusses), PSW-FAKC-PDB1 (for a concrete floor with an inaccessible maintenance channel), and PSW-FAKC-PDB2 (for a concrete floor with an man-accessible maintenance channel) accessories.

Detailed information on conveyors and possibilities to use them in silos is provided in the operating manual "SCREW CONVEYORS" and "INNER SCREW CONVEYORS PSW-F". The internal screw conveyors are an optional equipment of FBIN silos.

#### Item 9 INTERNAL LADDER TO THE BOTTOM ACCESS MANHOLE

The internal ladder to the bottom access manhole is a short leaning ladder for easy entering in the silo through the bottom access manhole. It should not be left in the silo during its loading and unloading. For the duration of loading and unloading the ladder should be hung on the shell near the bottom access manhole. The ladder is constructed of hot-dip galvanised metal sheets and is a standard equipment of all FBIN silos.

#### Item 10 EXTERNAL LADDER

Access to places of use and operation in upper parts of BIN silos is provided by installation of an external ladder. The external ladder is a vertical ladder with a fixed safety cage, and provided with landings and a door preventing an accidental access to the ladder by unauthorised persons. Doors securing ladders are adopted to installation of a limiting switch to stop devices during their unforeseen opening. All ladder components are hot-dip galvanised. External ladders are an optional equipment of FBIN silos.

#### Item 11 INTERNAL LADDER

The internal ladder is an optional accessory of the following silos: FBIN9/10, FBIN9/11, FBIN9/12, FBIN11/10, FBIN11/11, FBIN11/12, FBIN14/10, FBIN14/11, FBIN14/12 and all silos of FBIN7 type. Installation of the internal ladder is not provided for in other FBIN silos. The internal silo ladder is a vertical ladder with a fixed safety cage. It is fixed to the silo shell with special supports. All silos equipped with the internal vertical ladder must also have a roof hatch. The internal ladder provides access to the material (grain) in the silo through the roof hatch. The access is possible using a special harness protecting from a fall from height, and when special precautions are observed.

#### Item 12 ACTIVE VENTILATION EQUIPMENT - FANS

BIN provides for the use of fans to ventilate grain stored in the silo. The air passes through perforated steel floor or special ventilation ducts and then through the material (grain) in the silo, and this way the material is ventilated. Issues related to correct ventilation and correct storage of material kept in the silo are described in further sections of this Operating Manual. The fans are an optional equipment of FBIN silos.

#### Item 13 ACTIVE VENTILATION EQUIPMENT - AIR INLETS

Air inlets can be used for connecting an appropriate fan to the silo. BIN manufactures and optionally equips FBIN silos in air inlets for WPR type fans manufactured by Tywent Sp. z o.o. and for WPS fans manufactured by Nyborg-Mawent S.A. All air inlets are made of hot-dip galvanised metal sheet. The main units of air inlets are:

- a) An air inlet frame is a unit connecting the silo shell with a confusor. It is intended for silos equipped with steel floor on concrete blocks or on steel trusses. Different types of frames are used here, depending on the silo type and the floor type used in the silo.
- b) The air inlet to silos equipped with the concrete floor is a unit connecting one of ventilation ducts of the silo floor with the fan confusor. Usually, two inlets are used in the silo with the concrete floor.
- c) A confusor for the fan connection is a unit designated to connect the frame of the air inlet to the fan. The confusor can be connected to the fan directly or through a splitter and flexible connectors.
- d) With the air inlet splitter one fan can be connected to two neighbouring silos. The splitter is connected to the fan and to the confusor directly or through flexible air inlet connectors.
- e) The flexible connector is used to connect the confusor to the air inlet splitter. Furthermore, it can also be used to connect the confusor directly to the fan. Several flexible connectors can be connected with each other to increase their installation length.

The air inlets and all their components are an optional equipment of FBIN silos.

#### Item 14 PLATFORM OF THE BOTTOM ACCESS MANHOLE

The bottom manhole platform is a component facilitating access to the silo through the bottom access manhole. The platform can be installed in those silos in which the bottom access manhole is installed in the second section of the shell (ca. 140 cm from the foundation surface). It is made of hot-dip galvanised steel sheets, with an anti-slip surface to ensure safety of its use. The platform fixed to the silo shell below the bottom access manhole is a standard equipment for all silos with the bottom access manhole.

#### Item 15 ACCESS PLATFORM

The access platform to the bottom access manhole facilitates entrance to a silo in which the bottom access manhole is installed in the third section of the shell (ca. 250 cm from the foundation surface). The platform is made of hot-dip galvanised steel sheets, with an anti-slip surface to ensure safety of its use. The platform fixed to the silo shell is an optional equipment for all silos with the bottom access manhole on the third section of the shell.

#### Item 16 EMERGENCY DUCT

In FBIN silos an option for the emergency unloading is foreseen, through a special emergency unloading duct. The emergency duct is intended for safe unloading of grain from the silo when the discharge opening is blocked. The opening can be blocked by aggregated or contaminated grain or possible damage of an underfloor unloading device. The duct can be used to introduce a conveyor into the silo to transport stored material outside. The emergency duct should be installed on a surface of the silo floor as close as possible to the PSW conveyor and behind its body. The on-floor emergency duct is not required in silos with the concrete floor with the man-accessible maintenance channel, as it enables repair or replacement of the damaged unloading device or an emergency unloading of the silo. The emergency duct is constructed of hot-dip galvanised metal sheets and is an optional equipment of the silo. The emergency duct is not designed for normal unloading of the silo.

#### Item 17 ROOF EXHAUST FAN

A radial suction fan with a side outlet is a standard equipment in the FBIN silos. It is designated for ventilation of a space above grain stored in the silo. During the technological process of storage of corn and maize grain, and oilseeds, contaminations are formed in the air being in a direct contact with stored material. Usually, the air is contaminated with excessive water, various dust, and similar. The roof exhaust fan prevents condensation of water on the inner surface of the silo roof. Condensation of water on the silo roof is dangerous for grain stored in it, as it may cause its moistening and in consequence, sprouting, spontaneous heating and other processes destructive to the grain. These processes destroy material stored in the silo and can prevent its unloading due to grain aggregation and/or blocking of openings for grain unloading. To improve safe storage conditions in the silos the contaminated air must be removed. Silo ventilation is also recommended during loading and unloading, and cleaning of the silo. The fan should be installed using a special duct in the upper part of the silo. It is recommended to construct an electrical system in such way that the exhaust fan is switched on each time when loading and/or unloading equipment, as well as active grain ventilation is switched on. Ventilation should be maintained as long as loading, unloading or active grain ventilation activities are conducted. When the exhaust fan is used this way, accumulation of large quantities of dust in the silo is limited.

Basic technical characteristics of the suction fan: type WVPKH-250, power supply 3~, engine power 0.55 kW, engine rotations 1380 rpm, engine current 1.5 A, max. capacity 4040 m<sup>3</sup>/h, weight 25 kg.

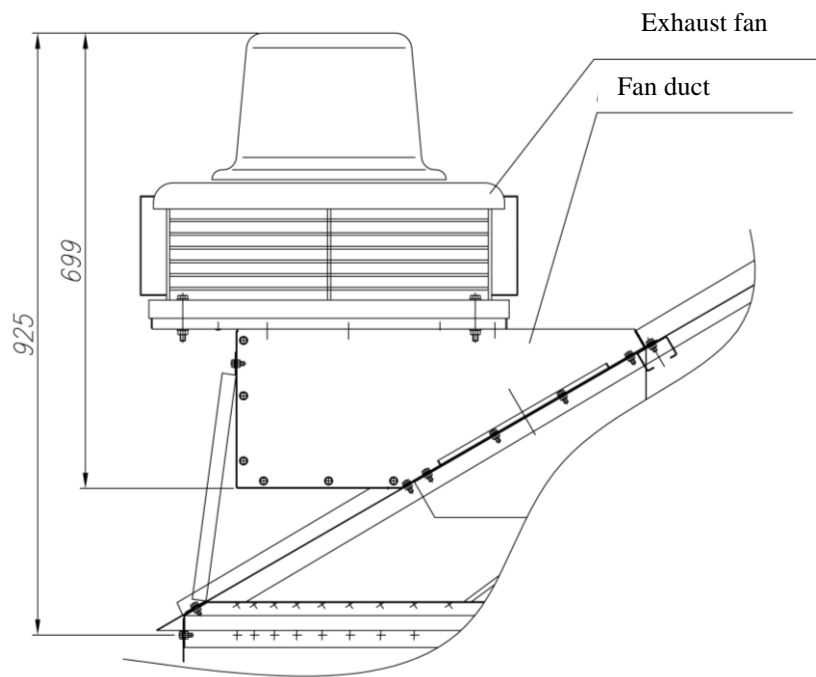


Figure 8. Suction fan installed on a silo of the FBIN7 type

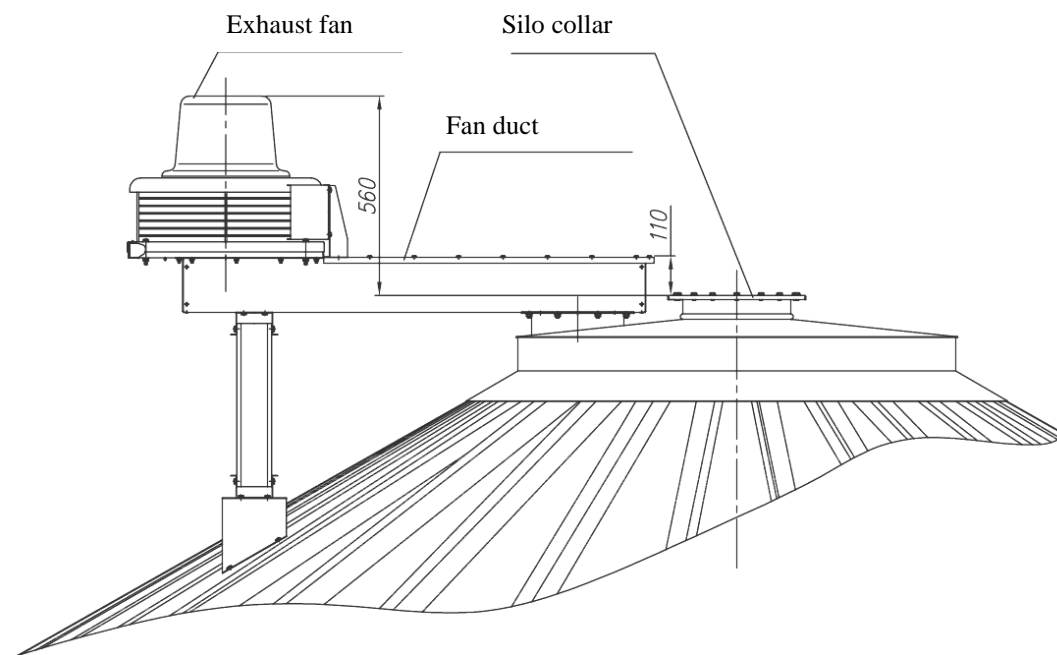
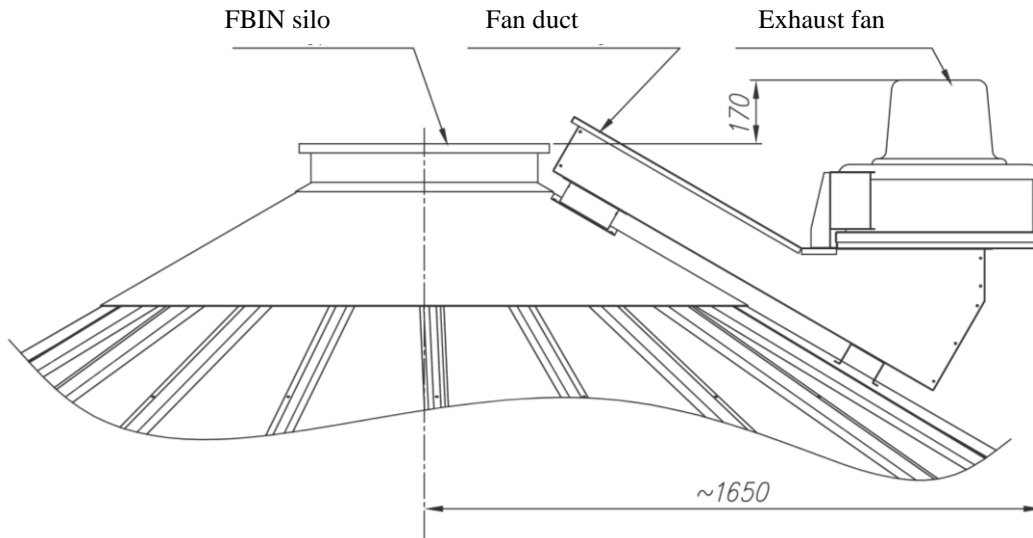


Figure 9. Suction fan installed on a silo of the FBIN9, FBIN11 or FBIN14 type



*Figure 10. Suction fan installed on a silo of the FBIN17 or FBIN19 type*

#### Item 18 SERVICE CATWALK/COLLAR PLATFORM/CENTRAL PLATFORM WITH AN ENTRANCE

Service catwalks enable correct use and maintenance of FBIN silos, particularly when several silos are arranged in a row. They are optional silo equipment. They ensure safe and convenient installation and operation of various devices for grain transport. The catwalk structure is based on a system of profiles made of hot-dip galvanised metal sheets. Silos of the FBIN7, FBIN9, FBIN11 and FBIN14 type can be equipped with the collar platform, while silos of the FBIN17 and FBIN19 type can be provided with a central platform with an entrance. When installation of the service catwalk is not necessary then the collar platform or a central platform with an entrance can be used as a unit ensuring access to equipment located in the top part of the roof. The collar platforms and the central platforms with an entrance, similarly as the service catwalks, are an optional equipment for the FBIN silos.



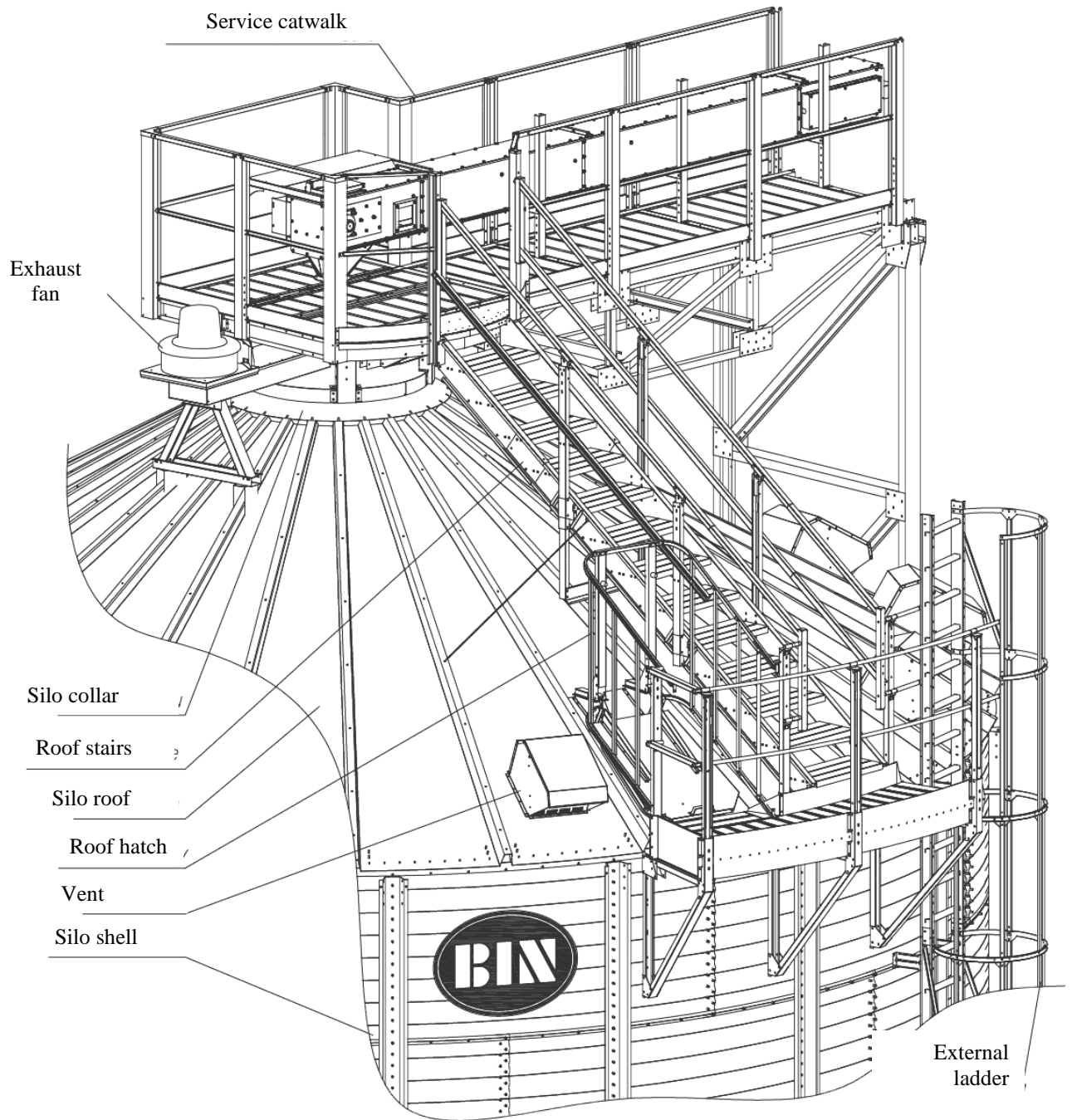


Figure 11. Sios of the FBIN9, FBIN11 and FBIN14 type with a service catwalk.

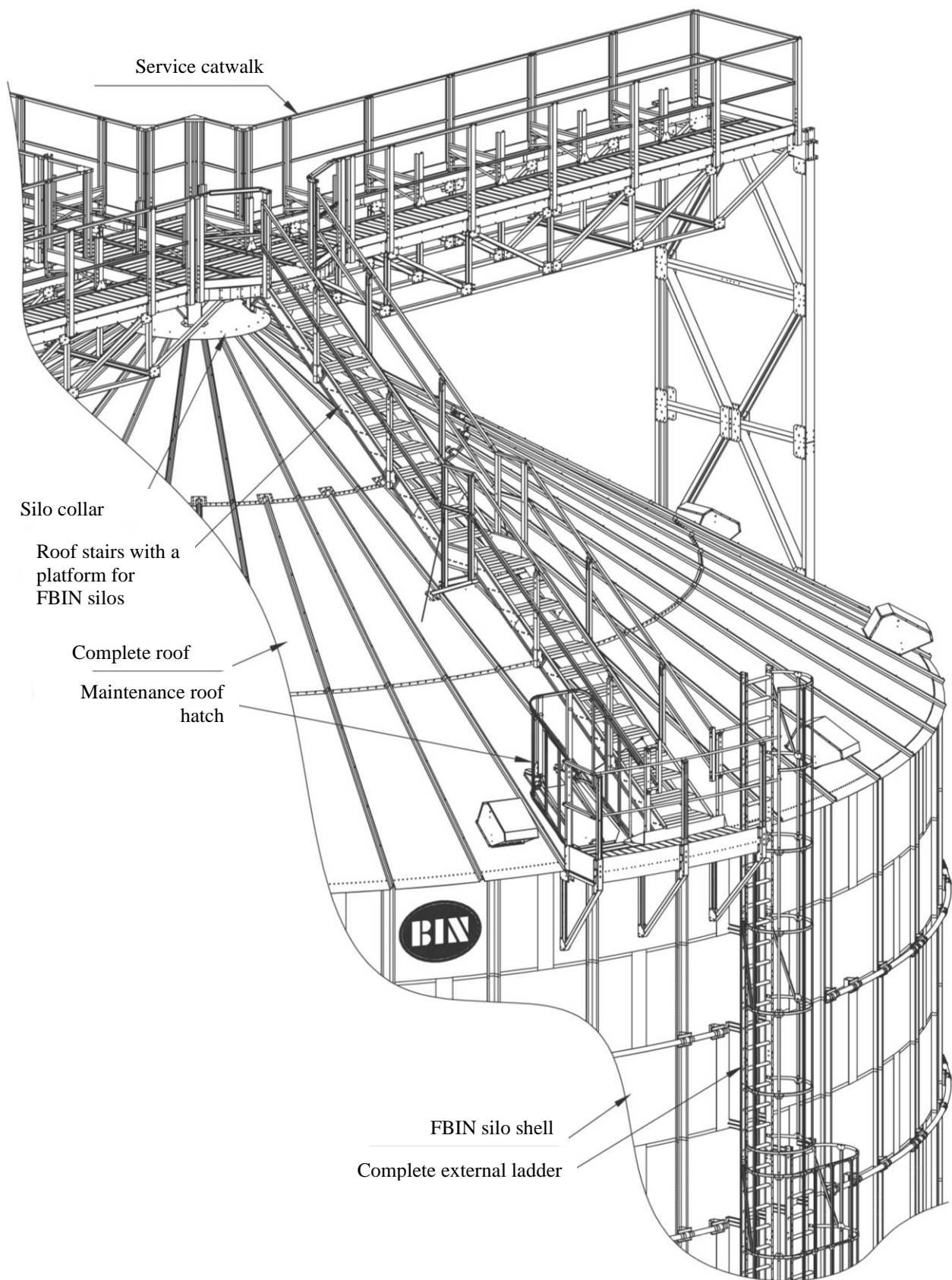


Figure 12. Silos of the FBIN17 and FBIN19 type with a service catwalk.

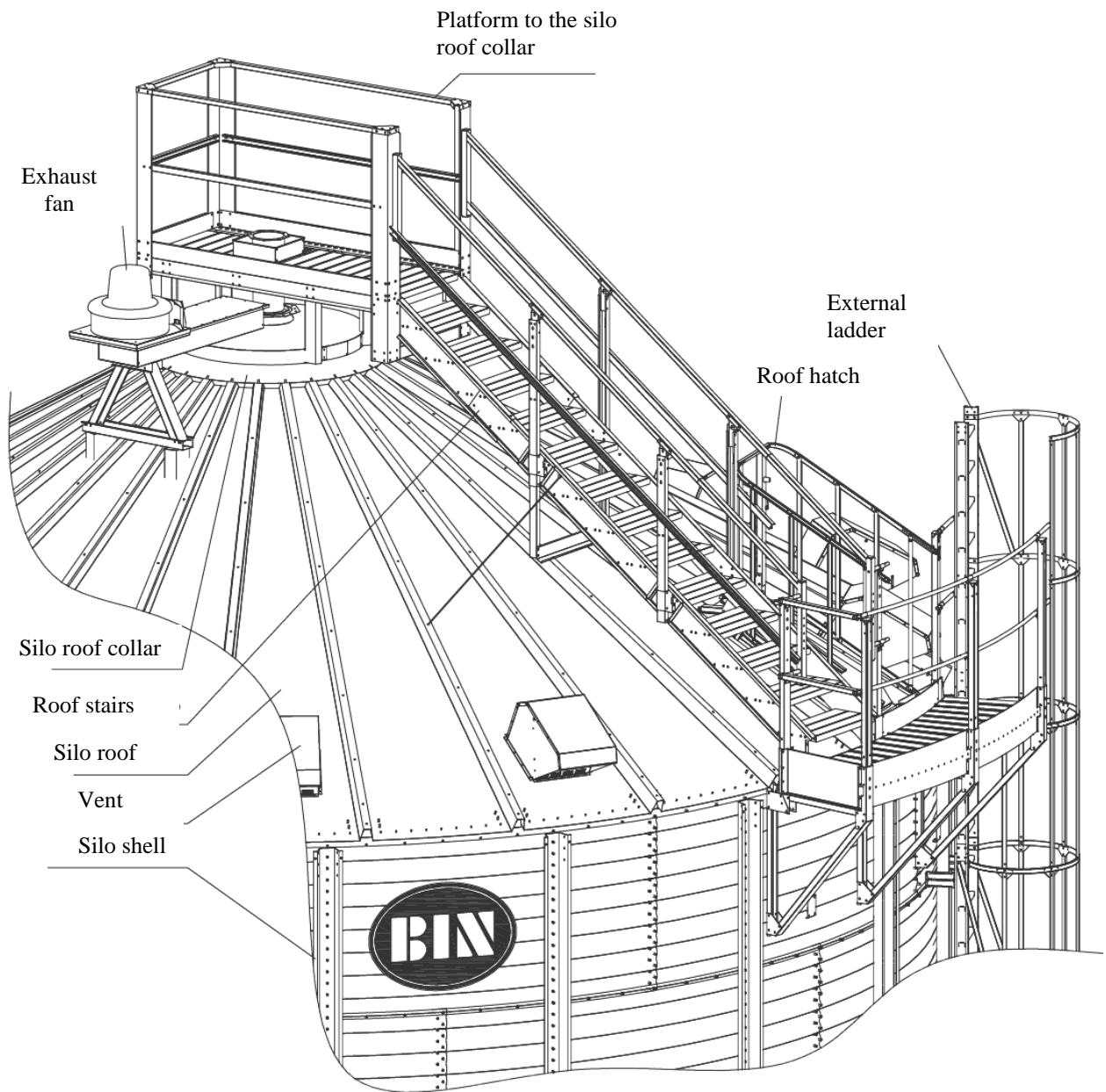


Figure 13. A silo of the FBIN type with a collar platform.

#### Item 19 BOTTOM ACCESS MANHOLE

The bottom access manhole provides access into the silo and equipment installed inside. The inner door with a lock opens into the silo. The outer door functions as a cover and opens to the outside of the silo. The design of the bottom access manhole enables free exit from the silo interior without a need to use keys or other tools. However, a key is needed to enter the silo through the bottom access manhole. This way, the FBIN silos meet essential safety requirements provided for in the European standards. The manhole is installed ca. 140 cm above the foundation surface (the second section of the shell) in the FBIN silos equipped with the steel floor on blocks or with the concrete floor with ventilation ducts. In the silos equipped with the steel floor on steel trusses, the bottom access manhole is installed ca. 250 cm above the foundation surface (the third section of the shell). When the bottom access manhole is installed on the second section of the shell, then the bottom access manhole platform should be installed, while when it is installed on the third section of the shell, the access platform to the bottom access manhole, with an external ladder should be provided. In the manhole body, a special connection was made for installation of the limit switch stopping the equipment in the event the manhole is opened accidentally. The bottom access manhole is a standard equipment of all FBIN silos. The bottom access manhole can also be used as an emergency manhole. When the silo is equipped with an additional bottom access manhole used as an emergency manhole, it should be installed at the height of:

##### a) in silos of the FBIN7 type:

- ca. 250 cm above the foundation surface (the third section of the shell) in the silos equipped with the steel floor on blocks.

##### b) in silos of the FBIN9 type:

- ca. 250 cm above the foundation surface (the third section of the shell) in the silos equipped with the steel floor on blocks or with the concrete floor with ventilation ducts;

- ca. 370 cm above the foundation surface (the fourth section of the shell) in the silos equipped with the steel floor on steel trusses.
- c) in silos of the FBIN11 type:
  - ca. 370 cm above the foundation surface (the fourth section of the shell) in the silos equipped with the steel floor on blocks or with the concrete floor with ventilation ducts;
  - ca. 480 cm above the foundation surface (the fifth section of the shell) in the silos equipped with the steel floor on steel trusses.
- d) in silos of the FBIN14 type:
  - ca. 480 cm above the foundation surface (the fifth section of the shell) in the silos equipped with the steel floor on blocks, with the concrete floor with ventilation ducts, with the steel floor on steel trusses.
- e) in silos of the FBIN17 type:
  - ca. 600 cm above the foundation surface (the sixth section of the shell) in the silos equipped with the steel floor on steel trusses or with the concrete floor with ventilation ducts.
- f) in silos of the FBIN19 type:
  - ca. 710 cm above the foundation surface (the seventh section of the shell) in the silos equipped with the steel floor on steel trusses or with the concrete floor with ventilation ducts.

The bottom access - emergency manhole is an optional equipment of FBIN silos, and should be installed in all silos that are not provided with an internal ladder. Installation of a bottom access - emergency manhole is not necessary in silos without an internal ladder, which are equipped with an underfloor conveyor installed in the man-accessible maintenance channel and a PSW conveyor.

#### Item 20 SILO CONTROL MODULE (MKS-100/2)

The Silo Control Module is a device designated for FBIN silos, and having a control and protective function. MKS-100/2 may control and inform a user about a maximum acceptable filling of the silo with stored material and whether access manholes to the silo are closed. The silo control module can be used to connect machines, unloading/loading equipment or active ventilation, with a function for their control and switch off to:

- secure against access to the silo interior during loading, unloading or active ventilation;
- prevent silo overfilling by switching the loading devices off at an appropriate time.

Stopping of the loading equipment after loading the silo does not prevent starting the silo unloading equipment. MKS-100/2 is an optional equipment of FBIN silos.

#### Item 21 STEEL SUPPORTS OF THE PERFORATED FLOOR

Installation of FBIN silos equipped with a standard steel floor requires concrete floor supports (concrete blocks) in quantities specified below (Table 8). They have a form of cuboids of 14cm x 12cm x 25cm. Supports must be made of concrete of a minimum class C16/20.



**It is forbidden to use supports other than concrete, including lime and sand ones. It is forbidden to use supports of other dimensions.**

*Table 8. Concrete blocks - technological quantity (quantity of blocks in the construction design, required for the silo assembling) Commercial quantity includes an additional reserve.*

<i>Silo type</i>	<i>Silo model</i>	<i>Technological quantity of concrete blocks [pcs.]</i>	<i>Commercial quantity of concrete blocks [pcs.]</i>
FBIN7	FBIN7/5, FBIN7/6, FBIN7/7, FBIN7/8, FBIN7/9, FBIN7/10, FBIN7/11	378	400
FBIN9	FBIN9/10, FBIN9/11, FBIN9/12	752	800
	FBIN9/13, FBIN9/14	Perforated steel floor only on trusses	
FBIN11	FBIN11/10, FBIN11/11, FBIN11/12	1536	1600
	FBIN11/13, FBIN11/14, FBIN11/15, FBIN11/16, FBIN11/17	Perforated steel floor only on trusses	
FBIN14	FBIN14/10, FBIN14/11, FBIN14/12	2144	2200
	FBIN14/13, FBIN14/14, FBIN14/15, FBIN14/16, FBIN14/17	Perforated steel floor only on trusses	

#### Item 22 CENTRAL LOADING INLET

All FBIN silos are adapted to loading through special loading inlets. Loading is conducted through a central loading connection installed in the silo collar, of a diameter of ca:

- Ø 200 mm for silos of the FBIN7 type
- Ø 300 mm for silos of the FBIN9, FBIN11, and FBIN14 type
- Ø 600 mm for silos of the FBIN17 and FBIN19 type

The loading inlet is a standard equipment of FBIN silos.

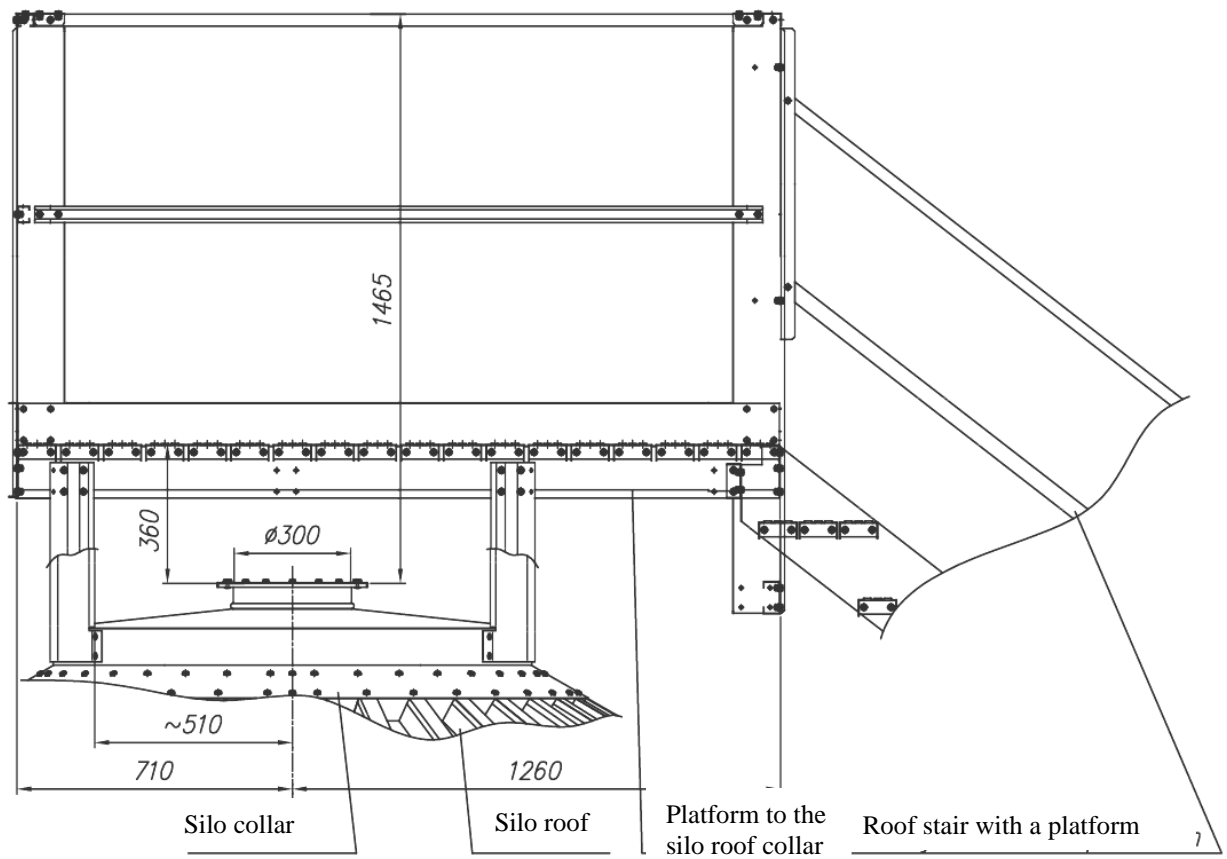


Figure 14. Silos of the FBIN9, FBIN11 and FBIN14 type with a collar platform.

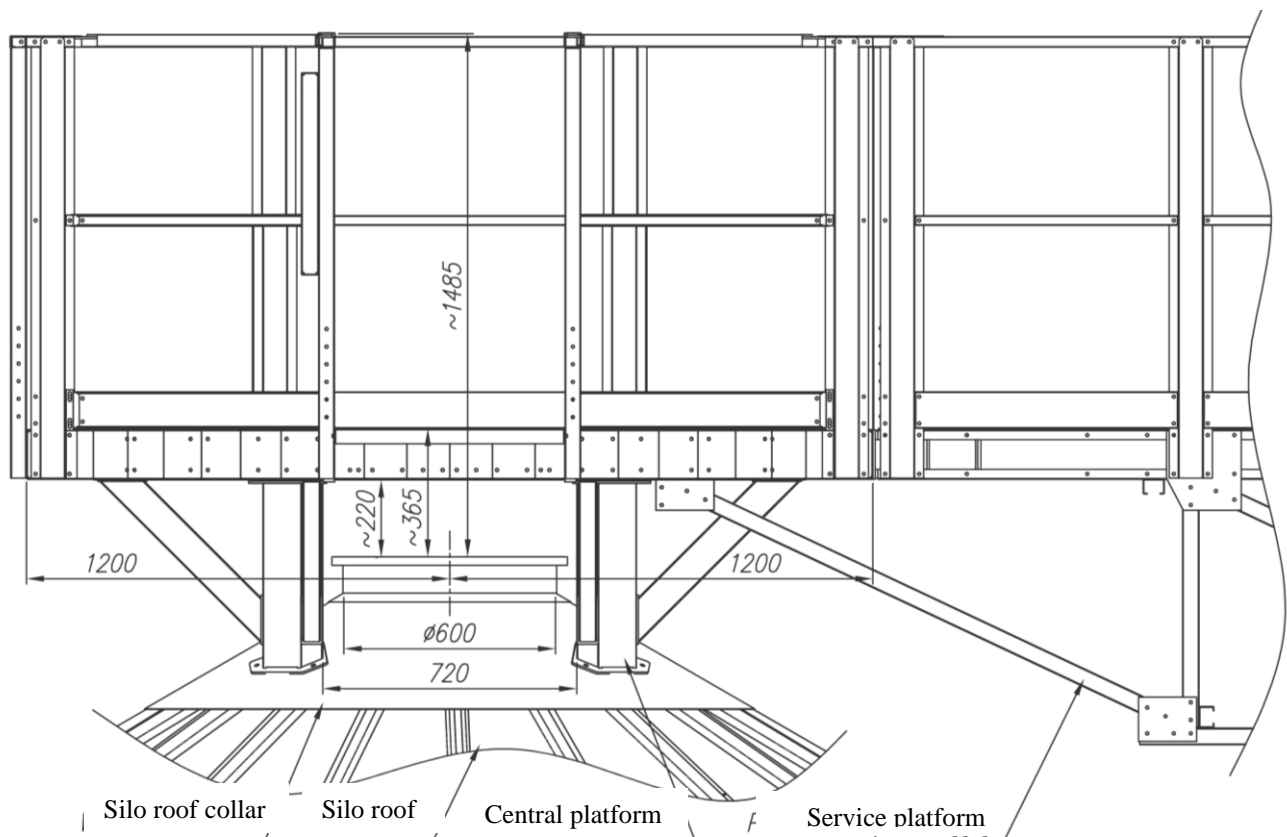


Figure 15. Silos of the FBIN17 and FBIN19 type with a service catwalk.



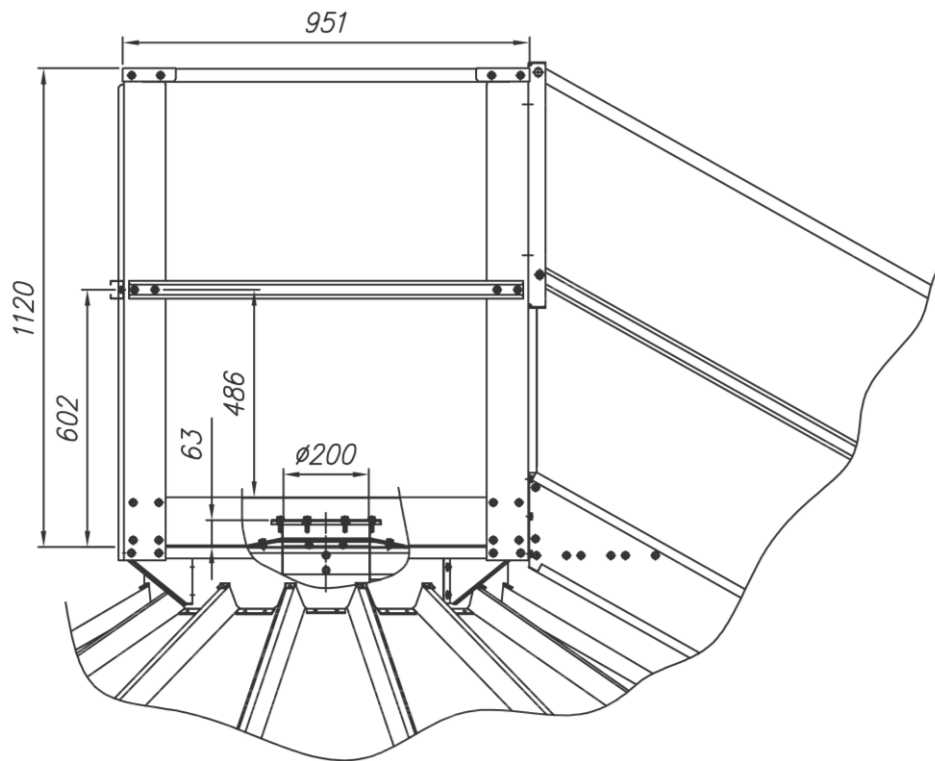


Figure 16.A silo of the FBIN7 type with a platform.

#### Item 23 FOUNDATION

A correctly designed and constructed foundation is one of preconditions for correct installation, and safe and failure-free operation of the silo.

Solutions for foundations presented in this document are only geometric guidelines enabling installation of the silo. Calculations for the silo seating, taking into account the load bearing capacity of the substrate, should be performed for ground conditions determined at the target construction site.

##### **Guidelines for designing foundations:**

- the investor is responsible for development of the construction design;
- the construction design must be prepared by a designer holding relevant licences;
- when designing the foundations, local geotechnical conditions must be taken into account.



**When the load bearing capacity of the ground substrate is insufficient, it may be necessary to reinforce the ground or install the foundations on piles.**

- minimum concrete class– C20/25 (B25);
- the designer of the construction structure is responsible for selecting necessary reinforcement for the foundation.

##### **Conditions for foundation slab construction and acceptance:**

- a topsoil layer and non-load bearing layers under the foundation must be removed;
- replace soil subject to frost-heave at least to the ground freezing level;
- construct a 10-cm-thick layer of blinding concrete under a peripheral ring or a foundation slab;
- for silos installed in a row, foundations of individual silos must maintain a common axis;
- a difference in levels between the lowest and the highest point of the top surface of the sealing screed or the foundation slab (when the sealing screed is not constructed) cannot exceed 10 mm;
- appropriate reinforcement must be constructed, in accordance with the construction design of the structure;
- the concrete must be vibrated;
- during the silo installation, a difference in the top surface of the shell anchoring and the ground surrounding the foundation cannot exceed 20 cm for the foundation without a peripheral ring, and 80 cm for the foundation with a peripheral ring - failure to meet this requirement is a basis to cancel installation of the silo;
- when the foundations are not constructed correctly, installation of the silo may be cancelled.
- the foundation must be constructed in such way that a difference between the top shell anchoring surface and the ground surrounding the foundation does not exceed 10 cm. When the difference between the top shell anchoring surface and the surrounding ground exceeds 10 cm, the investor is obliged to ensure an appropriate access level for a side manhole, an external ladder, stairs, and other equipment installed on the silo. An appropriate access level must be constructed in accordance with current legislation.
- BIN Sp. z o.o. shall not be held responsible for any silo damage and other damage resulting from incorrect design and construction of the foundation.

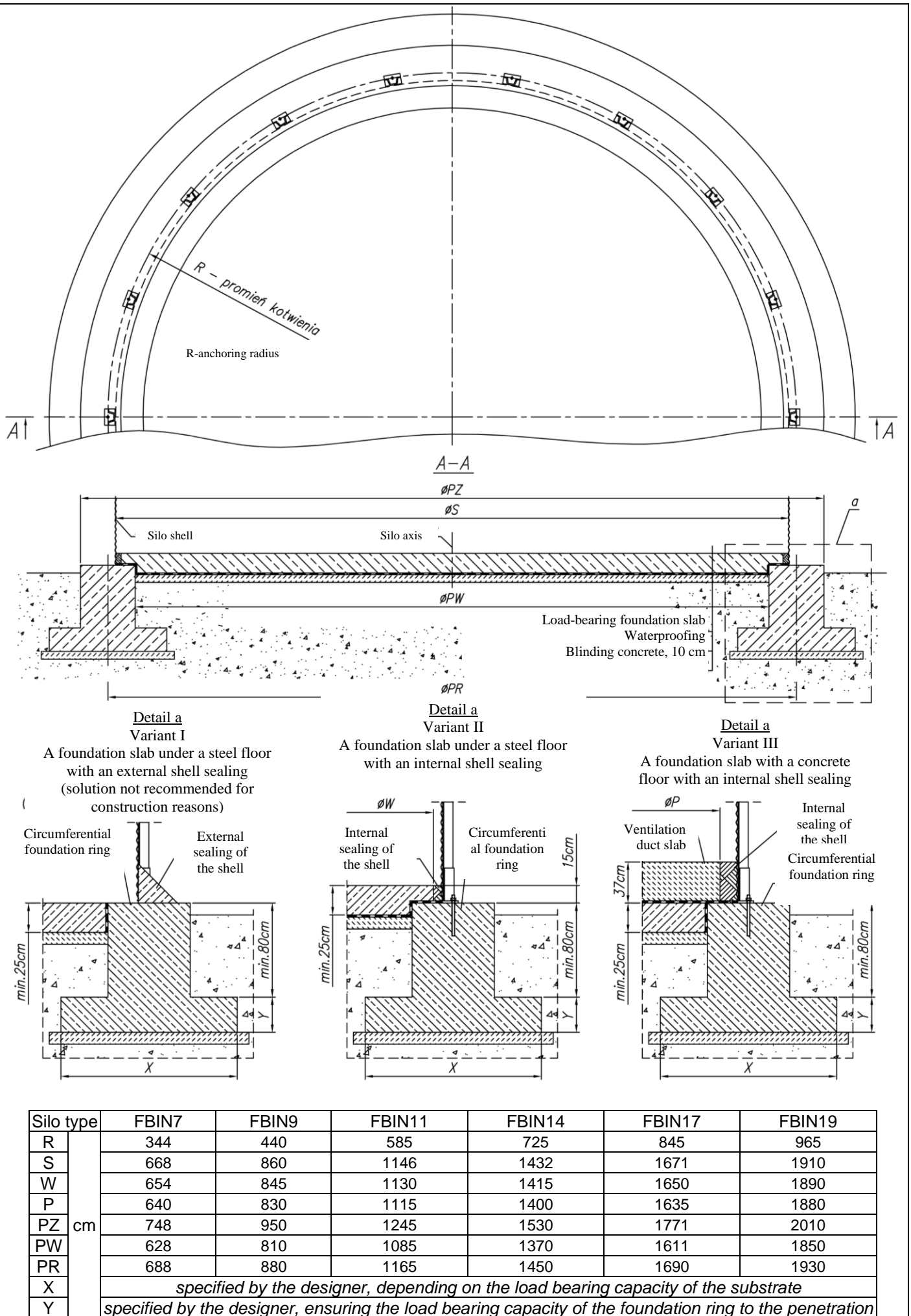
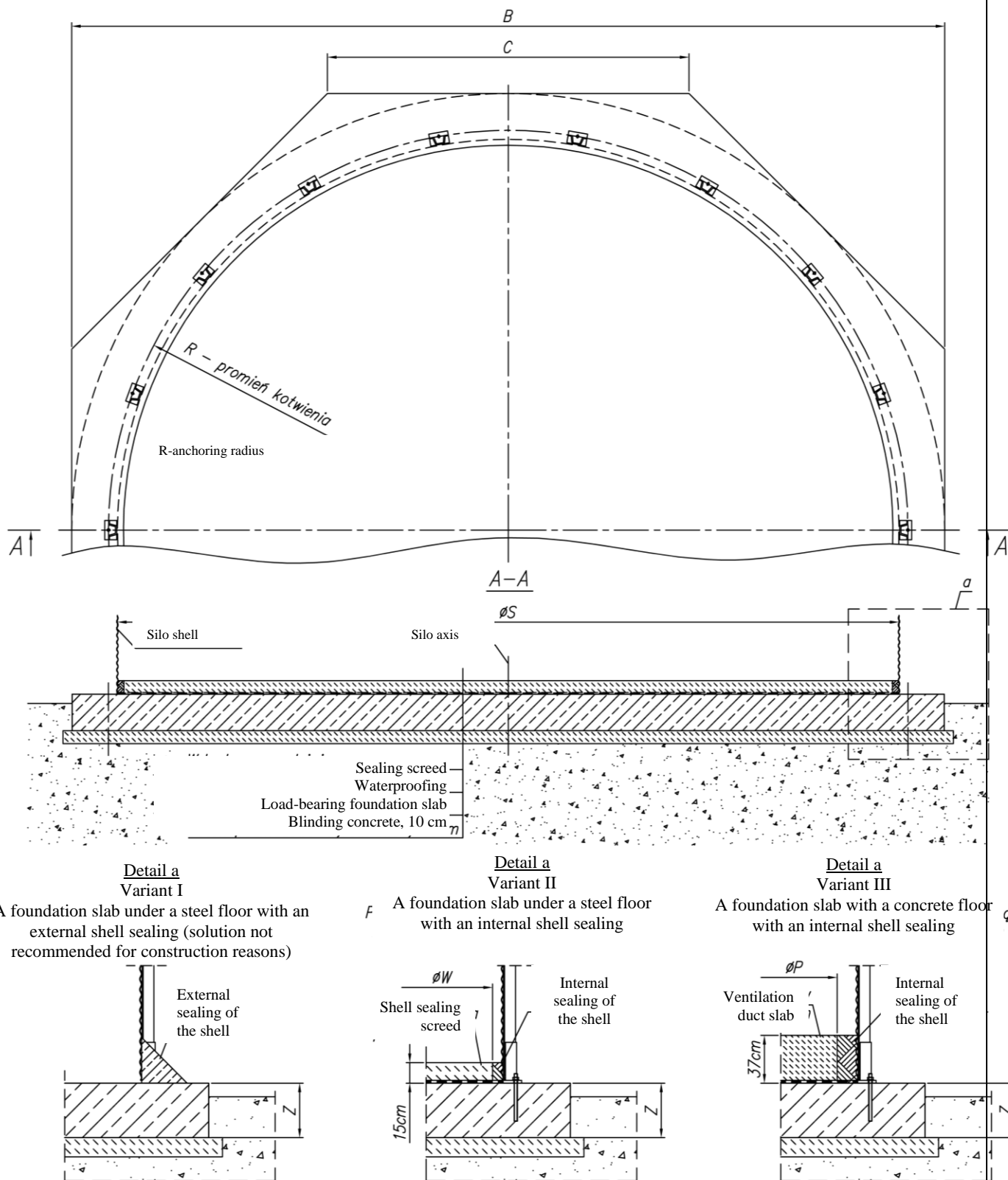


Figure 17. Characteristics of foundations with a peripheral ring for silos of the FBIN type.



Model weight		FBIN7/					FBIN9/					FBIN11/							FBIN14/							FBIN17/							FBIN19/			
		5 6 7 8 9 10 11	10 11 12 13 14	10 11 12 13 14	10 11 12 13 14 15 16 17	10 11 12 13 14 15 16 17	14 15 16 17 18 19	15 16 17 18																												
Z	cm	30	35	30	35	40	30	35	40	45	50	30	35	40	45	50	55	60	65	70	80	85	90	100	80	85	90	100								
R		345		440			585					725					845				965															
S		668		860			1146					1432					1671				1910															
W		654		845			1130					1415					1650				1890															
P		640		830			1115					1400					1635				1880															
B		740		960			1280					1580					1840				2050															
C		307		398			530					656					760				849															

Figure 18. Characteristics of foundations without a peripheral ring for silos of the FBIN type.  
A round slab can be constructed, when the above dimensions are observed.



#### Item 24 MEASUREMENTS OF GRAIN TEMPERATURE IN THE SILO

The temperature of grain in the silo is one of the most important parameters informing about the grain condition. The increase in the grain temperature indicates a significant intensity of biological processes, usually caused by too high moisture content in the grain.

The temperature should be measured using the temperature reader TEMP\_CZYT/1 with the multipoint probe MULTICORE-S for grain temperature measurements (in its entire volume) - Figure 19.

Regardless of a number and types of measuring probes, one reader is sufficient to operate all of them in all cases. A reader is a device with a display, on which the user reads out the temperature on individual sensors of the measuring probe. The measuring probe consists of temperature sensors spaced along it every 1 m. All sensors are connected with an electrical cable routed outside the silo and ending with a connecting plug for connection of the temperature reader.

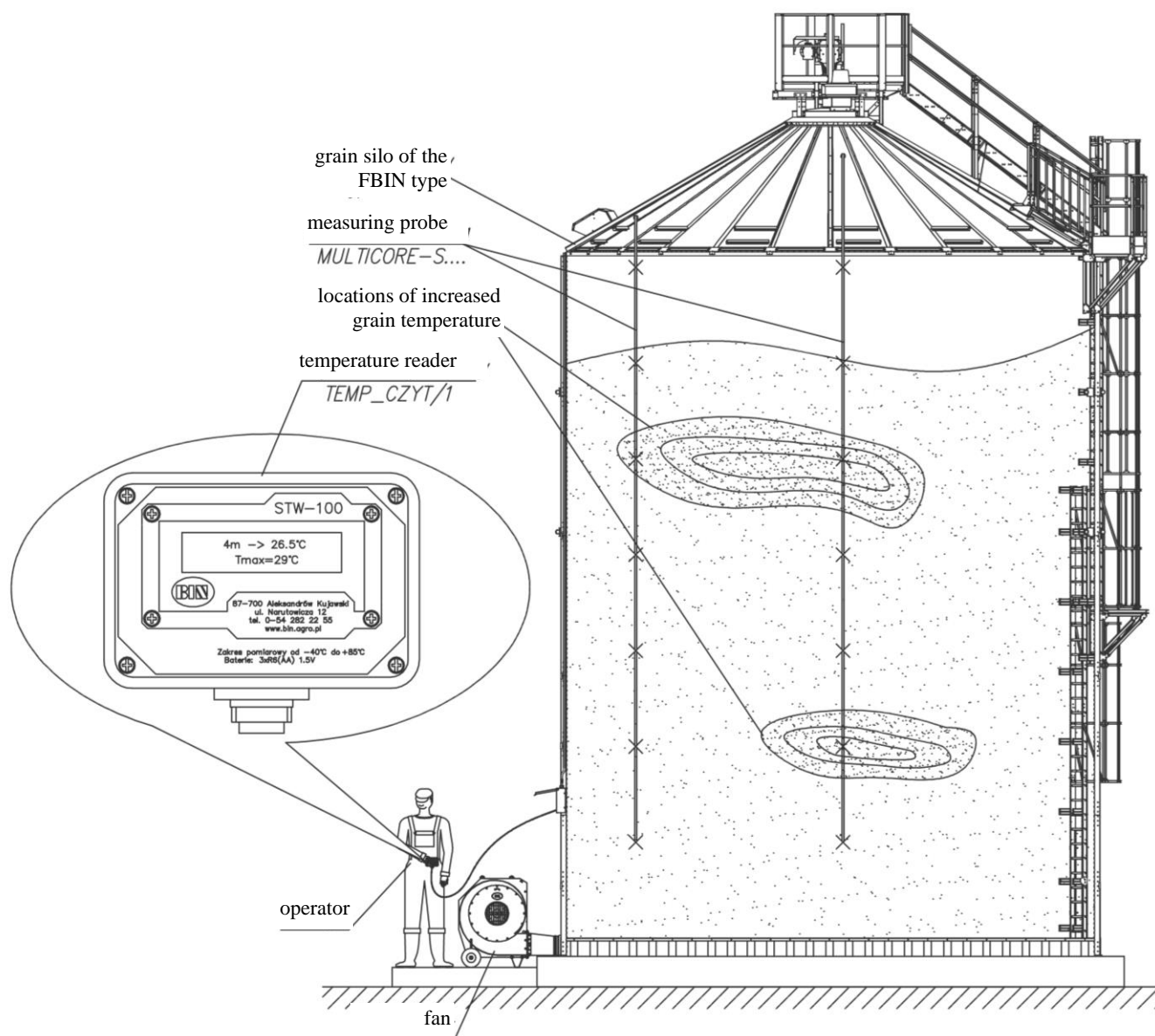


Figure 19. Temperature measurements using the reader TEMP\_CZYT/1 and the probe MULTICORE-S.



**Regardless of the measuring method, when the temperature of grain in the silo is found to be too high, immediately start airing grain to reduce its temperature.**

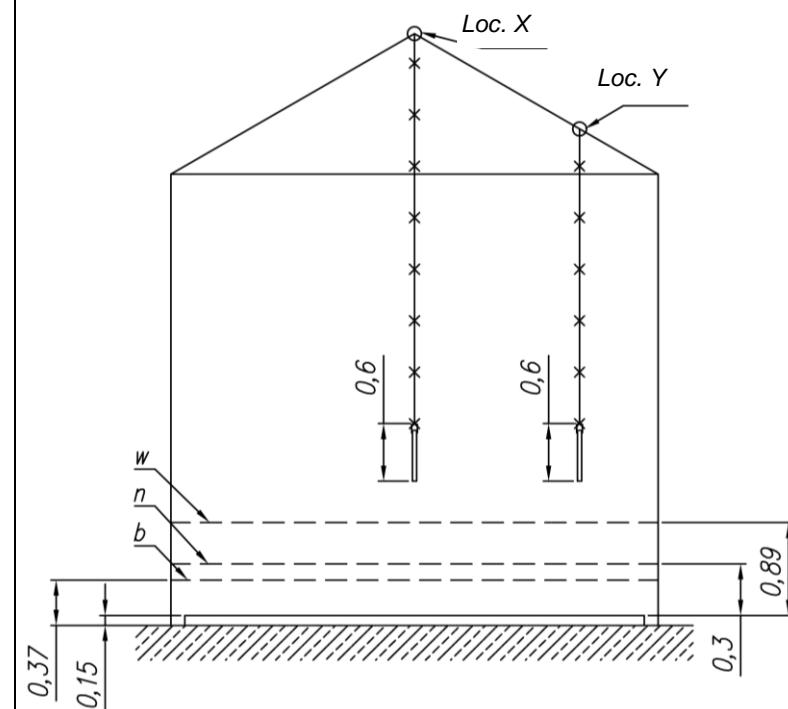
Table 9. Recommended lengths and numbers of MULTICORE measuring probes for silos of the FBIN type listed in the table below.

		FBIN silo model																																									
		FBIN7/5	FBIN7/6	FBIN7/7	FBIN7/8	FBIN7/9	FBIN7/10	FBIN7/11	FBIN9/10	FBIN9/11	FBIN9/12	FBIN9/13	FBIN9/14	FBIN11/10	FBIN11/11	FBIN11/12	FBIN11/13	FBIN11/14	FBIN11/15	FBIN11/16	FBIN11/17	FBIN14/10	FBIN14/11	FBIN14/12	FBIN14/13	FBIN14/14	FBIN14/15	FBIN14/16	FBIN14/17	FBIN17/14	FBIN17/15	FBIN17/16	FBIN17/17	FBIN17/18	FBIN17/19	FBIN19/15	FBIN19/16	FBIN19/17	FBIN19/18				
MULTICORE probe	MULTICORE-S4	Xw																																									
	MULTICORE-S5	Xbn	Xw																																								
	MULTICORE-S6		Xbn	Xw																																							
	MULTICORE-S7			Xbn	Xw																																						
	MULTICORE-S8				Xbn	Xw																																					
	MULTICORE-S9					Xbn	Xw							Yw																													
	MULTICORE-S10						Xbn		Xw					Ybn	Yw																												
	MULTICORE-S11							Xbnw	Xbn	Xw				Xw	Ybn																												
	MULTICORE-S12									Xbn	Xw			Xbn	Xw	Ybnw							Xbnw																				
	MULTICORE-S13										Xbn				Xbn	Xw	Yw							Xw																			
	MULTICORE-S14											Xbnw			Xbn	Xw	Ybn	Yw					Xbn	Xw						Ybnw													
	MULTICORE-S15												Xbnw					Xw	Ybn	Yw					Xbn	Xw						Yw				Yw							
	MULTICORE-S16																	Xbn	Ybn	Yw						Xbn	Xw					Ybn	Yw				Ybn	Yw					
	MULTICORE-S17																		Xbnw	Ybn	Yw						Xbn	Xw			Xbnw		Ybn	Yw					Ybn	Yw			
	MULTICORE-S18																			Xbnw	Ybn						Xbn					Xw		Ybn	Yw					Ybn			
	MULTICORE-S19																				Xnw								Xbnw			Xbn	Xw		Ybn			Xbnw			Ybnw		
	MULTICORE-S20																					Xb								Xbnw			Xbn	Xw		Ybnw			Xw				
	MULTICORE-S21																																	Xbn					Xbn	Xw			
	MULTICORE-S22																																		Xbnw					Xbn	Xw		
	MULTICORE-S23																																			Xbnw						Xbn	
The MULTICORE probes listed above should be equipped with the following subunits:																																											
TEMP-M/ZESMONT	X	X	X	X	X	X	X	X	X	X	X	X	XY	XY	XY	XY	XY	XY	XY	XY	X	X	X	X	X	X	X	X	XY	XY	XY	XY	XY	XY	XY	XY	XY	XY	XY	XY	XY		
TEMP-M/UCHWYT <sup>5)</sup>	X	X	X	X	X	X	X																						X	X	X	X	X	X	X	X	X	X	X	X	X	X	
TEMP-M/MOCDACH <sup>6)</sup>																														Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
TEMP-MOC/F11 <sup>7)</sup>													Y	Y	Y	Y	Y	Y	Y	Y																							
TEMP_CZYT/1 <sup>8)</sup>	X	X	X	X	X	X	X	X	X	X	X	X	XY	XY	XY	XY	XY	XY	XY	XY	X	X	X	X	X	X	X	X	XY	XY	XY	XY	XY	XY	XY	XY	XY	XY	XY	XY	XY		

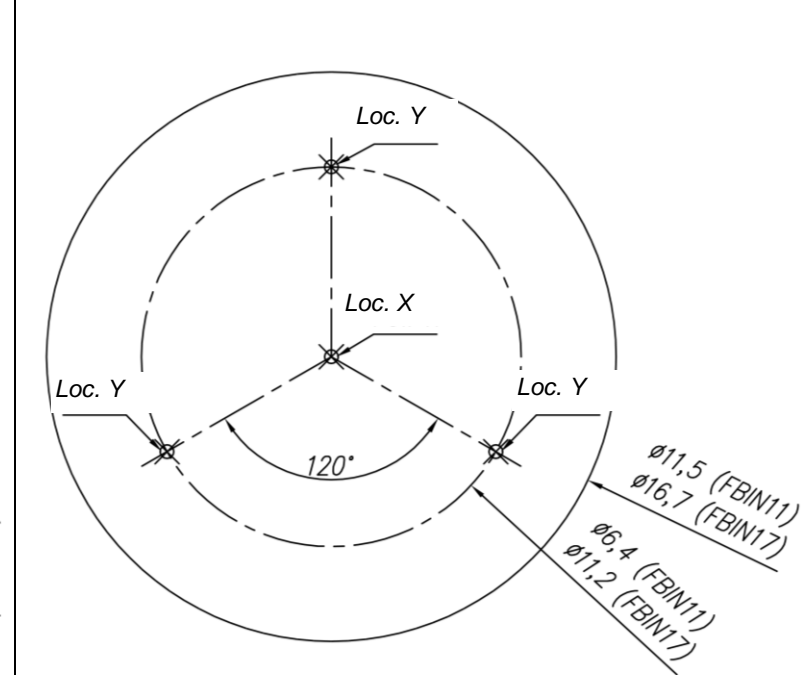
The MULTICORE probes listed above should be equipped with the following subunits:

TEMP-M/ZESMONT	X	X	X	X	X	X	X	X	X	X	X	X	XY	XY	XY	XY	XY	XY	XY	XY	X	X	X	X	X	X	X	XY	XY	XY	XY	XY	XY	XY	XY	XY	XY	XY	XY
TEMP-M/UCHWYT <sup>5)</sup>	X	X	X	X	X	X																					X	X	X	X	X	X	X	X	X	X	X	X	
TEMP-M/MOCDACH <sup>6)</sup>																												Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
TEMP-MOC/F11 <sup>7)</sup>													Y	Y	Y	Y	Y	Y	Y	Y																			
TEMP_CZYT/1 <sup>8)</sup>	X	X	X	X	X	X	X	X	X	X	X	X	XY	XY	XY	XY	XY	XY	XY	XY	X	X	X	X	X	X	X	XY	XY	XY	XY	XY	XY	XY	XY	XY	XY	XY	XY

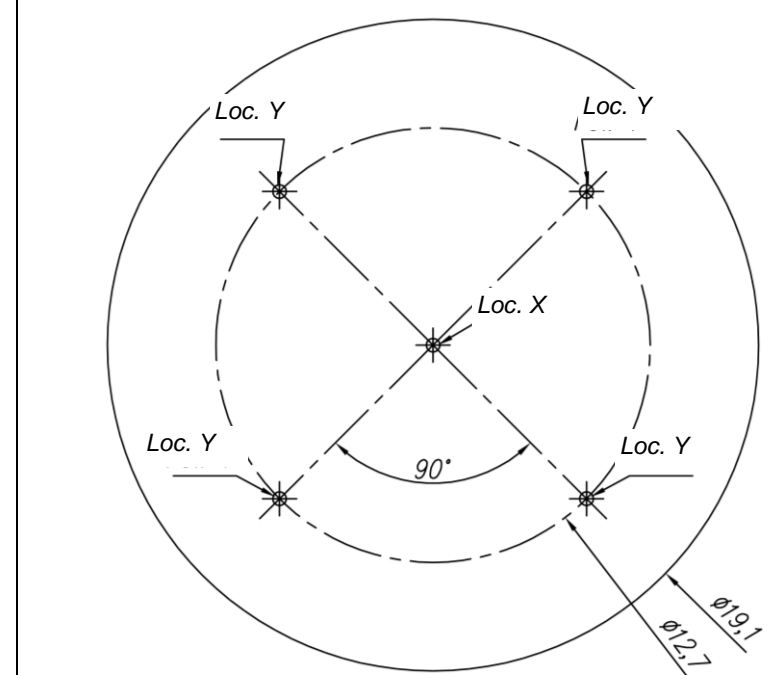
Silos of the FBIN type



Silos of the FBIN11 and FBIN17 type



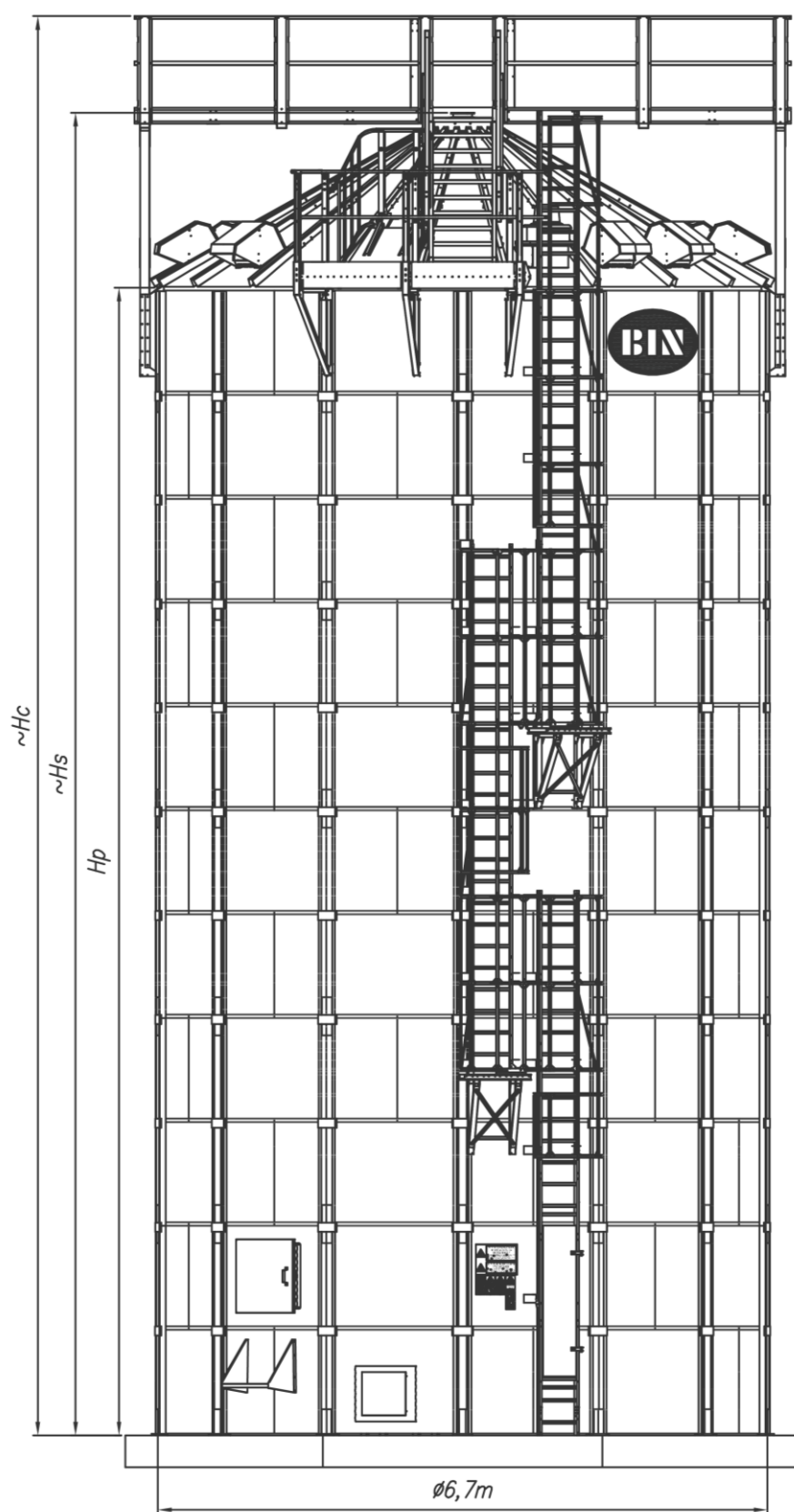
Silos of the FBIN19 type



Notes:

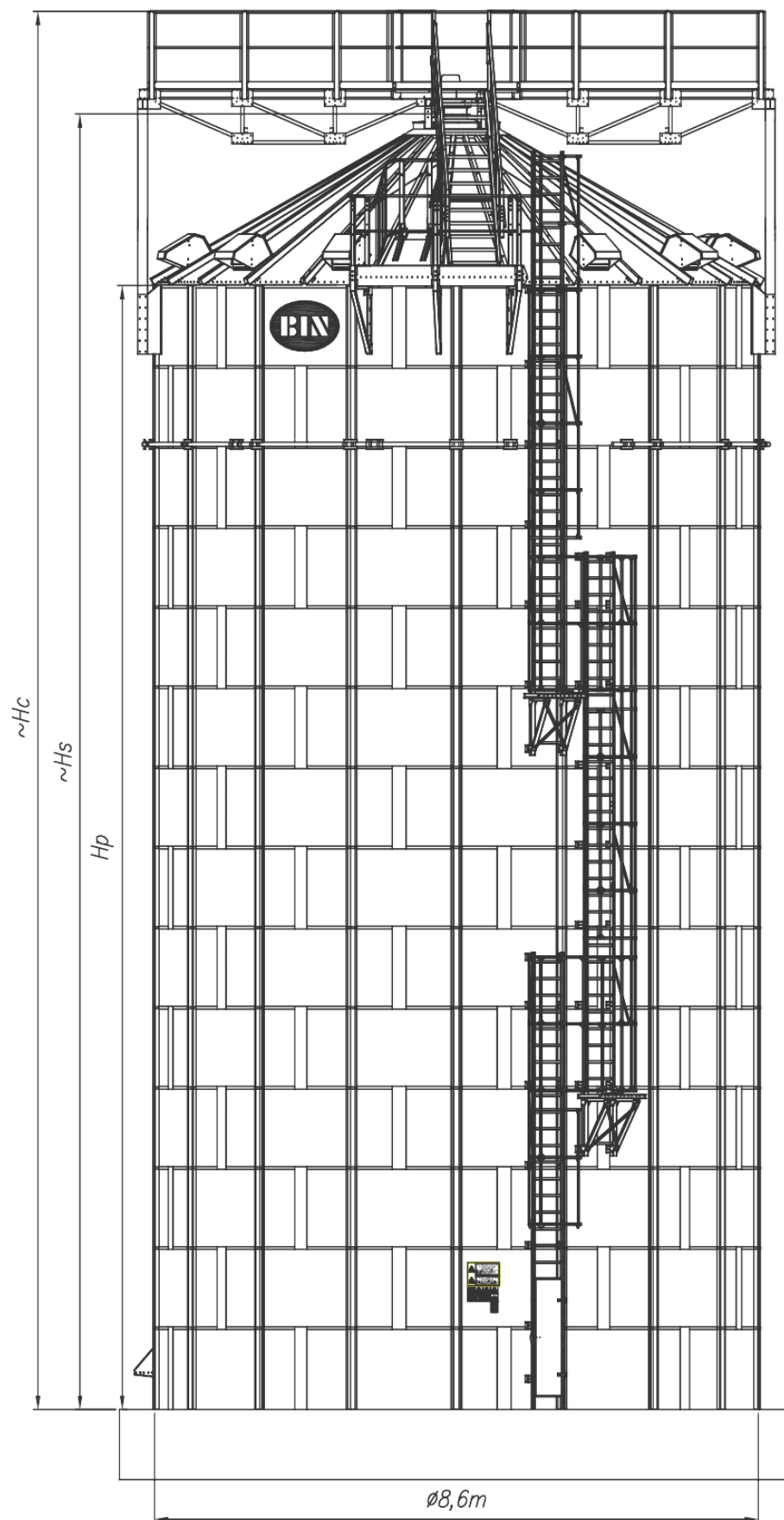
- The following designations are used in the table:  
X - location X (Loc. X), centrally installed measuring probe in the silo.  
Y - location Y (Loc. Y), peripherally installed measuring probe in the silo.
- Installation of five measuring probes is recommended in silos of the FBIN19 type. One measuring probe in location X (Loc. X) and four measuring probes in location Y (Loc. Y).
- Installation of four measuring probes is recommended in silos of the FBIN11 and FBIN17 type. One measuring probe in location X (Loc. X) and three measuring probes in location Y (Loc. Y).
- In the remaining silos listed in the table above, installation of one measuring probe in location X (Loc. X) is recommended.
- The TEMP-M/UCHWYT bracket is required only for probes installed in location X (Loc. X) in silos of the FBIN7, FBIN17 and FBIN19 type.
- The TEMP-M/MOCDACH bracket is required only for probes installed in location Y (Loc. Y) in silos of the FBIN17 and FBIN19 type.
- The TEMP-MOC/F11 bracket is required only for probes installed in location Y (Loc. Y) in silos of the FBIN11 type.
- The TEMP\_CZYT/1 reader is a portable device. One reader can be used to read the temperature on all probes.

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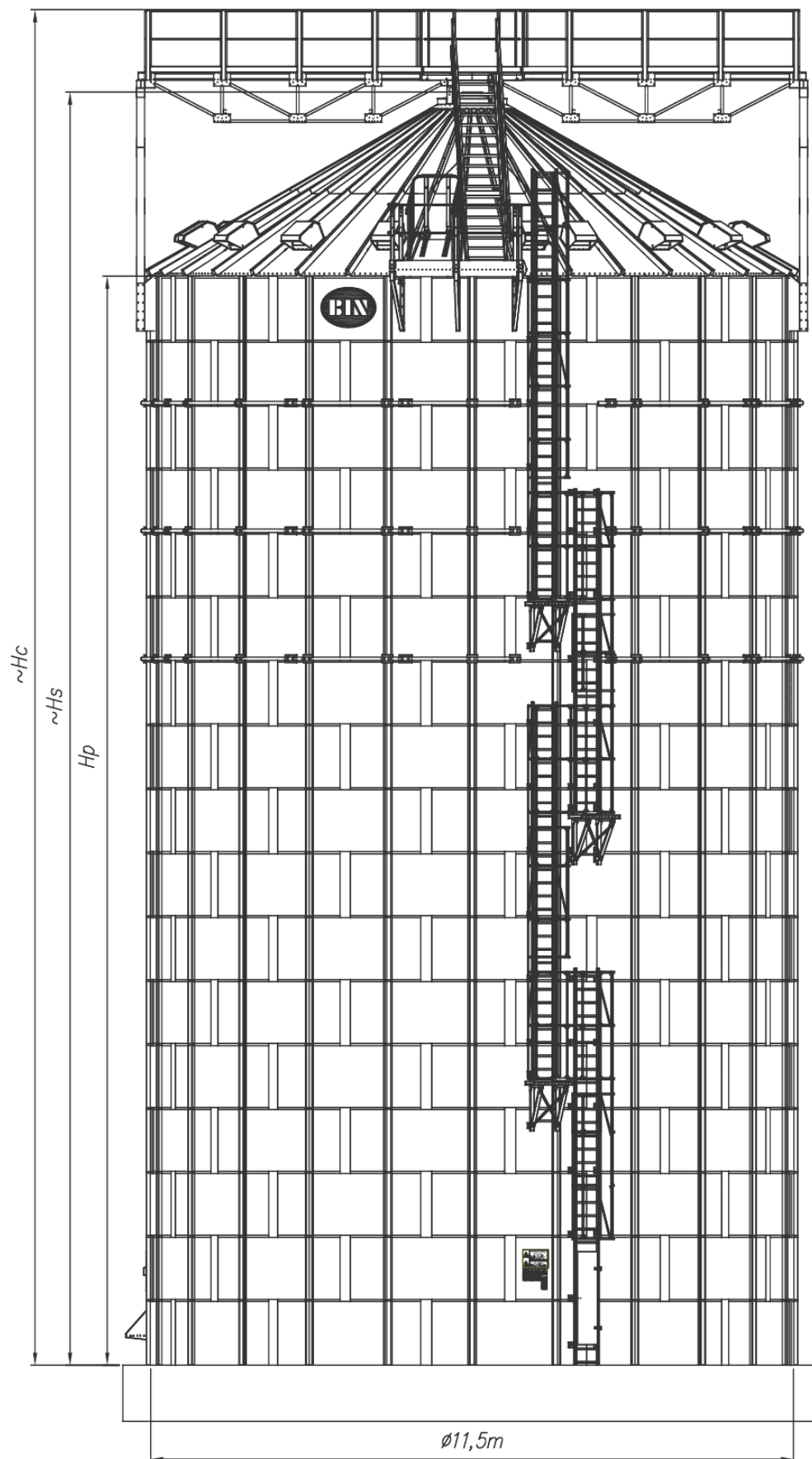
Silo model		FBIN7/5	FBIN7/6	FBIN7/7	FBIN7/8	FBIN7/9	FBIN7/10	FBIN7/11
H <sub>p</sub>	m	5.74	6.88	8.02	9.16	10.30	11.44	12.58
H <sub>s</sub>		7.68	8.82	9.96	11.10	12.24	13.38	14.52
H <sub>c</sub>		8.74	9.88	11.02	12.16	13.30	14.44	15.58

Figure 20. Basic dimensions of silos of the FBIN7 type.



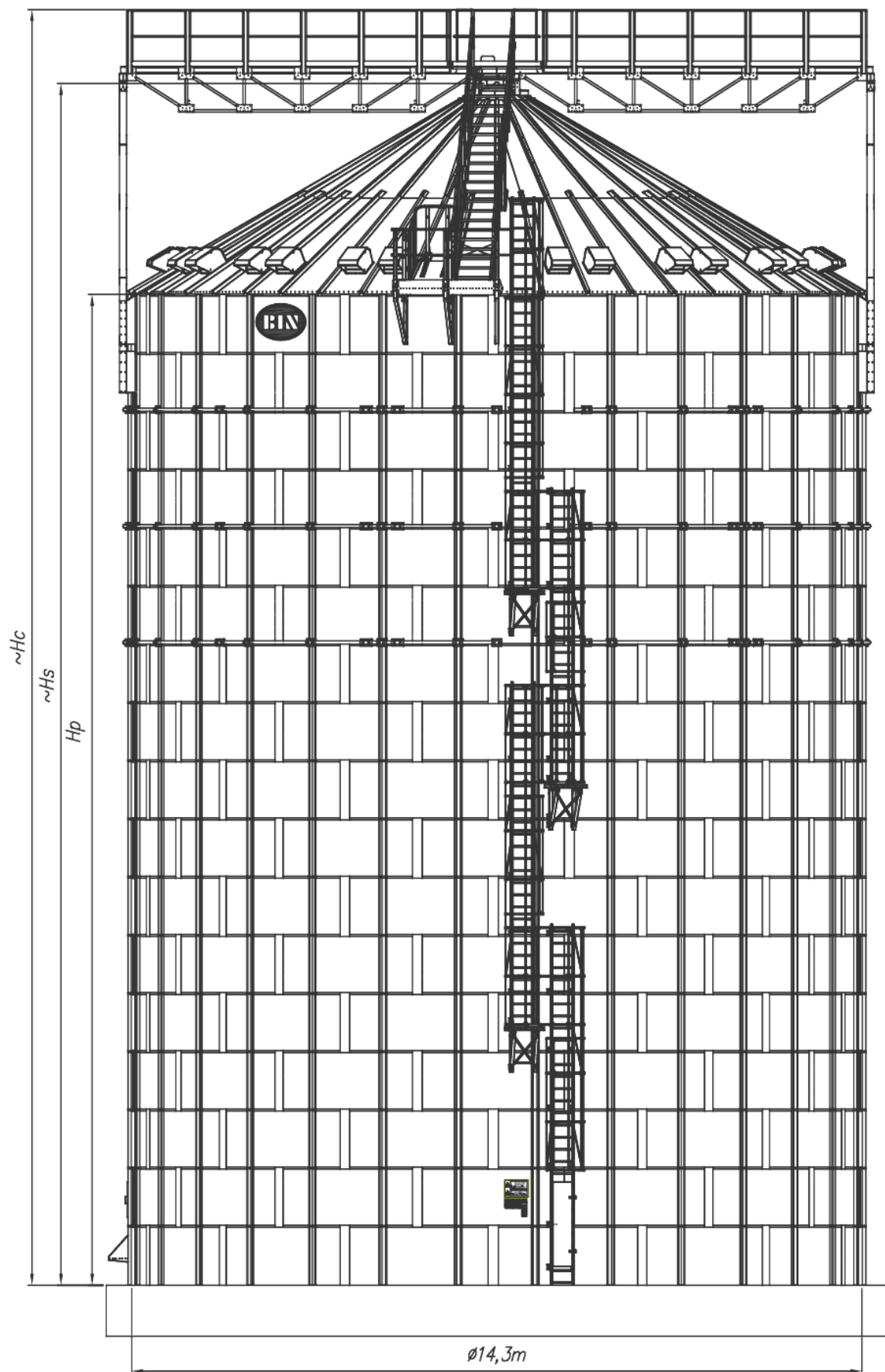
Silo model		FBIN9/10	FBIN9/11	FBIN9/12	FBIN9/13	FBIN9/14
H <sub>p</sub>	m	11.44	12.58	13.72	14.86	16.00
H <sub>s</sub>		13.88	15.00	16.15	17.30	18.44
H <sub>c</sub>		15.37	16.51	17.65	18.79	19.93

Figure 21. Basic dimensions of silos of the FBIN9 type.



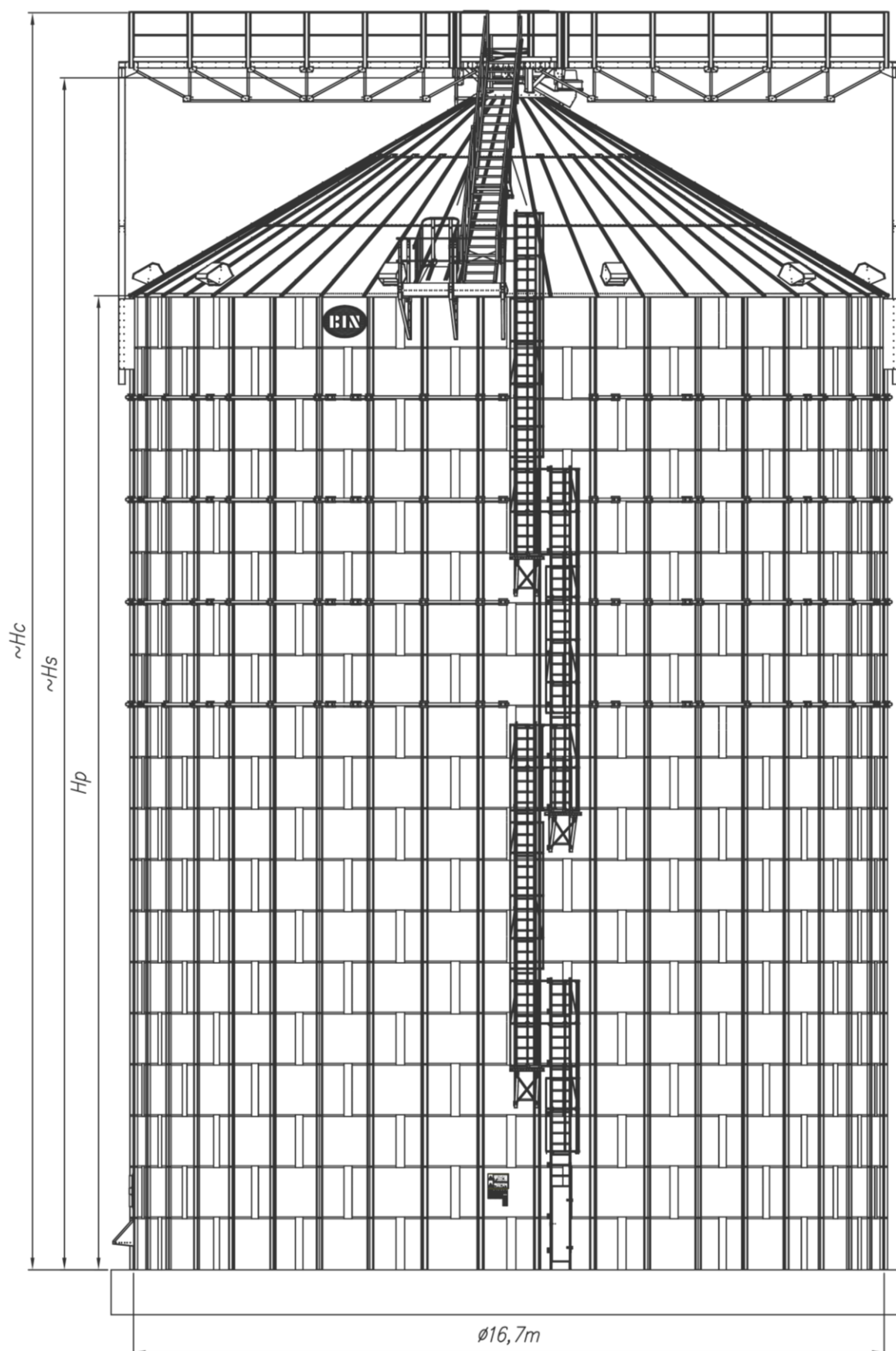
Silo model		FBIN11/10	FBIN11/11	FBIN11/12	FBIN11/13	FBIN11/14	FBIN11/15	FBIN11/16	FBIN11/17
$H_p$	$m$	11.44	12.58	13.72	14.86	16.00	17.14	18.28	19.42
$H_s$		14.74	15.88	17.02	18.16	19.30	20.44	21.58	22.70
$H_c$		16.21	17.35	18.49	19.63	20.77	21.91	23.05	24.19

Figure 22. Basic dimensions of silos of the FBIN11 type.



Silo model		FBIN14/10	FBIN14/11	FBIN14/12	FBIN14/13	FBIN14/14	FBIN14/15	FBIN14/16	FBIN14/17
Hp	m	11.44	12.58	13.72	14.86	16.00	17.14	18.28	19.42
Hs		15.57	16.71	17.85	18.99	20.13	21.27	22.41	23.55
Hc		17.04	18.18	19.32	20.46	21.60	22.74	23.88	25.02

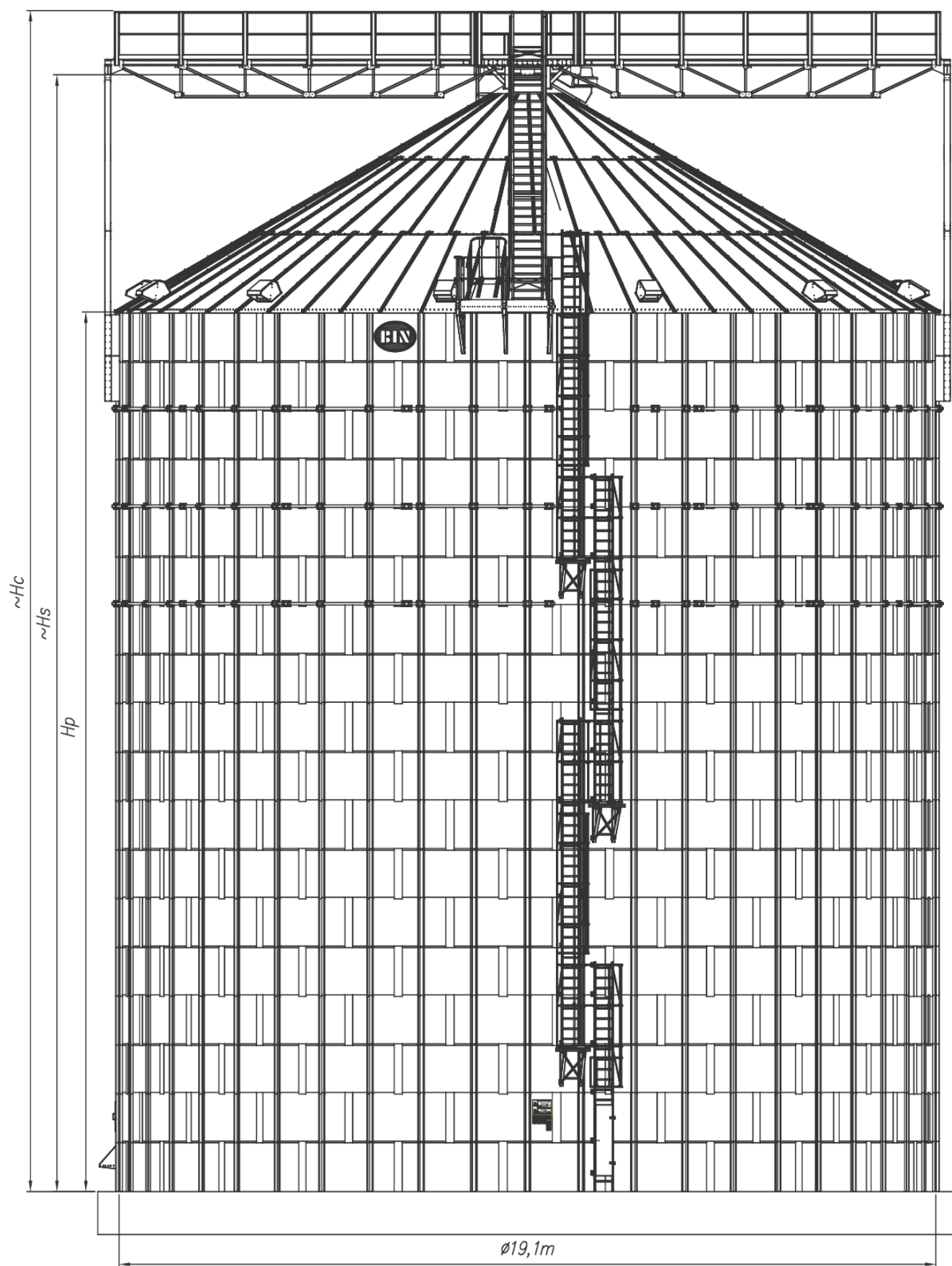
Figure 23. Basic dimensions of silos of the FBIN14 type.



Silo model		FBIN17/14	FBIN17/15	FBIN17/16	FBIN17/17	FBIN17/18	FBIN17/19
$H_p$	m	16.00	17.14	18.28	19.42	20.56	21.70
$H_s$		20.87	22.01	23.15	24.29	25.43	26.57
$H_c$		22.34	23.48	24.62	25.76	26.90	28.04

Figure 24. Basic dimensions of silos of the FBIN17 type





Silo model		FBIN19/15	FBIN19/16	FBIN19/17	FBIN19/18
$H_p$	m	17.14	18.28	19.42	20.56
$H_s$		22.70	23.84	24.98	26.12
$H_c$		24.17	25.31	26.45	27.59

Figure 25. Basic dimensions of silos of the FBIN19 type.

### 3. Initial operations and preparing the conveyor for operation

#### 3.1. Investor initial activities

##### 3.1.1. Formal and legal arrangements for the investment

Silos should be erected in accordance with the current Construction Law:

- the Construction Law of 7 July 1994 (Journal of Laws No. 89, item 414, as amended)
- Minister of Agriculture and Food Economy Regulation of 07/10/1997 concerning technical requirements that should be met by agricultural construction and their location (Journal of Laws No. 132, item 877, as amended)

The investor is obliged to provide the user with necessary information concerning rules of operation (starting, stopping, controlling, signalisation, etc.) for all equipment used together with the silo, including emergency procedures in the event of a fire, trapping, blocking of material in the equipment, and similar situations.

In accordance with provisions of the Construction Law of 07/07/1994, Article 29.1.29 (C) (Journal of Laws 1994, No 89, item 414), in the territory of Poland, construction of silos requires a building permit. The sole exclusion are FBIN7/6 silos with a steel floor on trusses and with concrete floor with ventilation ducts, and FBIN7/5 silos, regardless of the type of floor installed. In the case of those silos, the construction needs to be notified to a relevant body, because their height is below 15 m and their capacity is below 250 m<sup>3</sup> – this information is valid as of the end of 2023 (the time of developing this study).

The investor is responsible for meeting all formal and legal issues, together with a design. The designer is responsible for designing the foundations for silos and other equipment (when used) and for drawing up a land development plan. Guidelines for design of foundations and silo dimensions are specified in this Operating Manual. The whole silo design documentation was drawn up at BIN spółka z o.o.

The silos were designed in accordance with current standards and legislation, and are intended to be used in climate conditions of Poland for:

##### a) wind load

The II terrain category was selected, defined in the standard PN-EN 1991-1-4 as terrains with low vegetation and with low isolated obstacles with separations of at least 20 obstacle heights. The design does not provide for construction of silos at the sea and shore terrains, lakes and terrains without terrain obstacles, belonging to more stringent terrain categories.

For silos of the FBIN7, FBIN9, FBIN11, FBIN14 and FBIN17 type, the basic wind speed of  $v_{b,o} = 26$  m/s was assumed. In Poland, that value corresponds to wind zones 1 and 3 to the height A of  $\leq 600$  m amsl and wind zone 2 regardless of the height.

For FBIN9 silos, the basic wind speed of  $v_{b,o} = 28$  m/s was assumed. In Poland, that value corresponds to wind zones 1 and 3 to the height A of  $\leq 755$  m amsl and wind zone 2 regardless of the height.

##### b) Snow load

The acceptable value of the specific snow load on the ground of  $s_k = 2.0$  kN/m<sup>2</sup> was assumed. In Poland, the value of  $s_k = 2.0$  kN/m<sup>2</sup> corresponds to 2 and 4 zones regardless of the height, zone 1 to the height of 486 m amsl, zone 3 to the height of 433 m amsl, and zone 5 to the height of 572 m amsl.

Furthermore, the exposure index for the roof and the platform,  $C_e = 0.8$  was assumed, corresponding to areas exposed to the wind. The acceptable value of the specific snow load on the ground of  $s_k = 2.0$  kN/m<sup>2</sup> should be reduced for silos constructed on lands inappropriate for  $C_e = 0.8$  (according to PN-EN 1991-1-3).

On a special request, an alternate design of the FBIN11 silos is possible, adopted to the specific snow load on the ground of up to  $s_k = 2.5$  kN/m<sup>2</sup>. The information about using the silo in the zone with the specific snow load on the ground,  $s_k$ , above 2.0 kN/m<sup>2</sup> should be provided before the silo is ordered at BIN Sp. z o.o. or authorised BIN sales representatives.

##### 3.1.2. Silo location

The silos are designated to be installed outdoors. The silo can be installed in a building, provided a sufficient space is ensured. It was recommended to install the silo on a slope of a maximum incline not exceeding 5%.

Due to the installation technology and future operational and maintenance activities, it is required for all structures and machines to be located at least 1.0 m away from the silo shell. It is forbidden to install a silo near or under power lines.

Silos can be erected at a minimum distance of 15 m away from storage of silage and organic fertilisers: manure, liquid manure, and similar.

### 3.1.3. Silo ordering

Orders for silos and spare parts can be placed with BIN Sp. z o.o. or with authorised BIN sales representatives.

Each time, before purchasing any components, a customer should consult the manufacturer or a sales representative in detail about planned investment.

The manufacturer prepares the silo before shipment in accordance with the specification. The specification is attached to the shipped components.

### 3.2. Transport of silo components

FBIN silos are delivered as components packed on pallets:

- the weight of the heaviest pallet does not exceed 3500kg;
- the dimensions of the largest pallet do not exceed 4 m in length and 1.2 m in width,
- concrete supports of the steel floor are delivered on pallets of the weight not exceeding 2000 kg.



#### **SILO COMPONENTS MUST BE SECURED AGAINST MOISTURE DURING THEIR TRANSPORT AND STORAGE.**

**When the components get wet, they must be thoroughly dried. This applies, in particular, to the silo shell and roof components. Storage of wet components may result in development of impossible to remove white spots on a surface of metal sheets of which the silo is constructed. The manufacturer shall not be held responsible for the above-mentioned defects resulting from a failure to observe the above recommendations.**

Transport of the components is arranged by a seller or the customer, under additional arrangements. A vehicle of capacity and dimensions adapted to the above-mentioned pallet weights and lengths is required for transport of the components. The cargo body of the vehicle must be provided with a tight tarpaulin. In transport, all equipment must be secured against sudden movement.

A forklift truck of capacity adapted to the above-mentioned pallet weights should be used for loading and unloading. During a delivery acceptance, a silo buyer is obliged to check the delivery completeness against the specification attached to the components.



#### **IT IS FORBIDDEN TO TRANSPORT THE SILO PARTS ABOVE PEOPLE AND ANIMALS**

### 3.3. Information on installation

Installation of the silo requires use of special equipment, and relevant know-how. Therefore, the silo can only be installed by an installation company authorised by BIN. The installation company should cooperate with an entity ordering installation, in terms of works organisation, financial settlements, and acceptance of installation works. Due to risks related to the installation works, it is forbidden for the investor or other companies not authorised by BIN to perform these works. The installation works can be started when a correct foundation is constructed and all silo components, including concrete floor supports and machines working with the silo (such as loading and unloading conveyors) are gathered on site.

Furthermore, during installation, the installation company authorised by BIN should install the specified silo equipment, excluding construction of and connection to the power supply grid. The investor is responsible for construction of the required electrical system. The investor should order a licensed electrician to perform these works in accordance with current legislation and an individual facility plan.

### 3.4. Investor final activities

#### 3.4.1. Silo anchoring



#### **FAILURE TO ANCHOR THE SILO CORRECTLY POSES A THREAT OF ITS DESTRUCTION AND OF A SITUATION THAT IS HAZARDOUS TO HUMAN HEALTH AND LIFE.**

Silo anchoring consists of fixing the silo to the foundation with steel anchors using chemical anchors. The silo should be anchored taking into account rules and conditions for installation of glued anchors, specified by their manufacturer in a relevant installation instruction. The silo is installed by an installation

company under a direct order of the investor. During installation works, the investor is obliged to verify and personally ensure correct performance of the above activities.

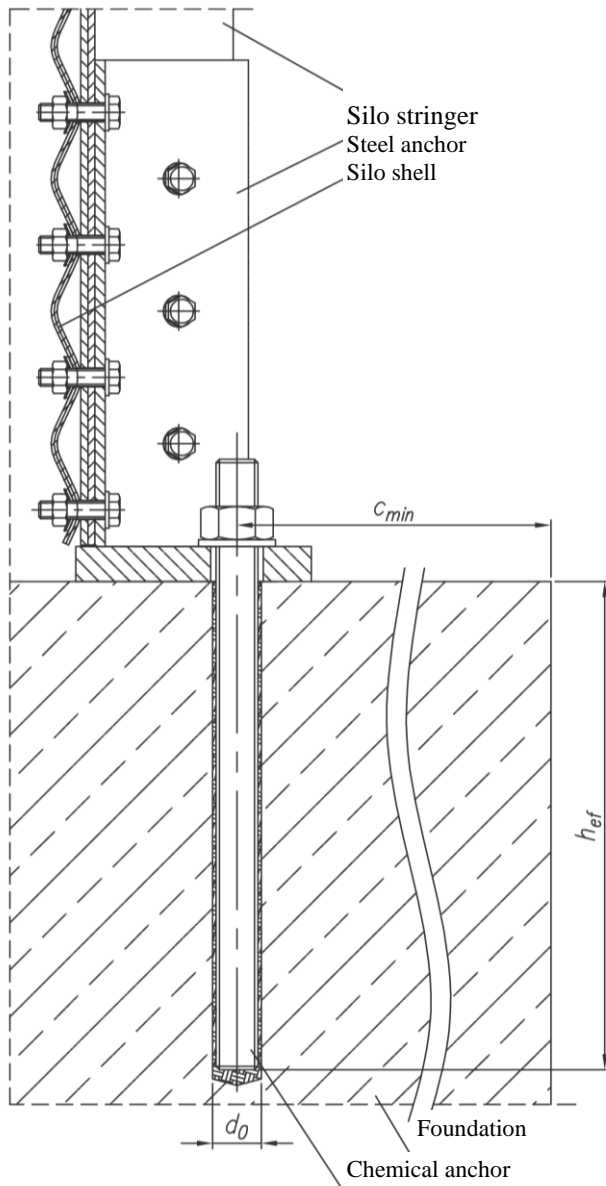


Table 10 Basic installation conditions for FISCHER chemical anchors.

	FBIN7/5 FBIN7/6 FBIN7/7 FBIN7/8 FBIN7/9	FBIN7/10 FBIN7/11	FBIN9	FBIN11	FBIN14	FBIN17	FBIN19
Anchoring type	Chemical anchor (M20x195 rod with a resin ampoule RM II)	Chemical anchor (M24x300 rod with a resin ampoule RM II)	Chemical anchor (M24x350 rod with injection mortar FIS SB)				
Number of anchors	14	14	18	24	30	42	48
Efficient anchoring depth $h_{ef}$ [mm]	170	210	290				
Maximum torque $T_{inst}$ [Nm]	120	150	150				
Drilled hole diameter $d_0$ [mm]	25	28	28				
Minimum anchor distance from the foundation edge $c_{min}$ [mm]	170	270	400				

Figure 26. Diagram of silo anchoring

### 3.4.2. Electric shock protection - lightning arrestor system

The silos should be protected against consequences of a lightning. A system must be provided, protecting people and animals against the electric shock related to devices and machines installed in the silo. The investor is obliged to provide the electric shock protection for people and animals, and to construct the lightning arrestor system and the protective earthing of the silo. Construction and performance verification of the lightning arrestor system and the protective earthing of the silo should be ordered at a person with required qualifications.

### 3.4.3. Fire prevention

The investor is obliged to fulfil all obligations related to fire prevention, including ensuring access and evacuation routes, access to sources of extinguishing water, and distribution of extinguishing equipment and fire safety instructions. Fire prevention aspects are governed by the Regulation of the Minister of Interior and Administration of 7 June 2010 concerning fire prevention in buildings, other structures, and terrains (Journal of Laws, 2010, No. 109, item 719) and the Minister of Interior and Administration Regulation of 24 July 2009 concerning supplies of water for extinguishing purposes and fire department access roads (Journal of Laws 2009, No. 124, Item 1030).

#### 3.4.4. Shell sealing at the base edge

The shell is sealed at the base edge with a concrete overlay along the whole circumference of the base, on the internal side of the silo shell.

For silos equipped with the concrete floor with ventilation ducts, sealing should be constructed after the silo is anchored by the installing company, before the first loading of the silo. For silos equipped with the perforated steel floor, sealing should be constructed after the silo is anchored and before the steel floor is installed by the installing company.

The sealing is constructed by the investor himself or by the installing company, following additional arrangements with the investor. The concrete for sealing is provided by the investor, in a sufficient quantity and at its cost.

Sealing is used to:

- level the foundation, when necessary, so the silo shell rests on the foundations along its entire circumference,
- secure the internal space of the silo against penetration of precipitation waters flowing down the silo shell,
- prevent air losses during grain ventilation with a fan.



**The overlay dimensions must conform to a description - Figure 17 and Figure 18.  
Failure to construct the overlay will void the warranty.**

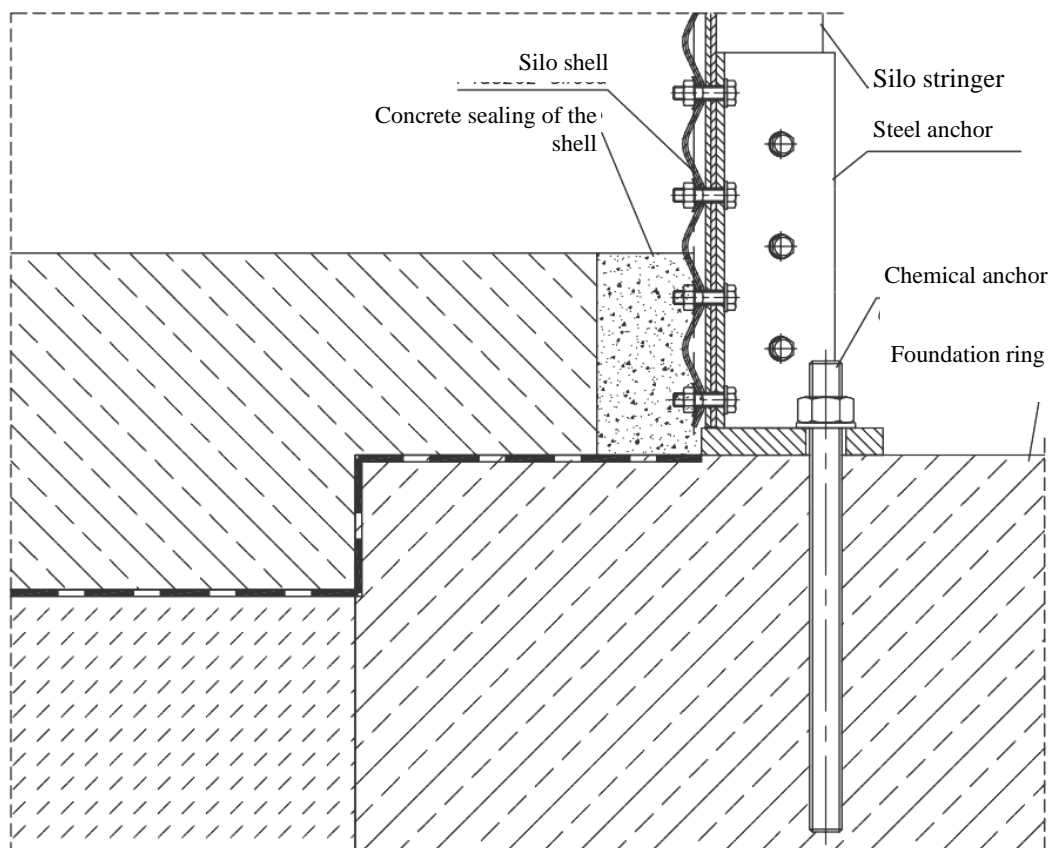


Figure 27. Diagram of shell sealing at the base edge.

#### 3.4.5. Installation of power delivery points

Installation of power delivery points and supplying of auxiliary devices should be performed by a licensed electricians according to the current law and an individual facility plan.

## 4. Operation

### 4.1. Silo operation

**A sequence of operations during silo loading (Figure 28) - Example:**

- 1) close the unloading shutter Z2;
- 2) open the loading shutter Z1;
- 3) set the two-way separator, R2, in a position to the loading conveyor PZ;

- 4) start the loading conveyor, PZ;
- 5) start the bucket elevator, PK;
- 6) start the inlet hopper, KP;
- 7) unload the transport vehicle, PT.

When the silo loading is completed, stop the individual devices in a sequence reverse to the described above.

**A sequence of operations during silo unloading (Figure 29) - Example:**

- 1) set the two-way separator, R2, in a position to a transport vehicle, PT;
- 2) check, and when necessary, close the unloading shutter, Z2,
- 3) start the bucket elevator, PK;
- 4) start the underfloor conveyor, PP;
- 5) gradually and slowly open the unloading shutter Z2 (open the shutter Z2 so the PP, PK or other conveyors are not blocked); the silo unloading process can be stopped by performing in reverse the actions described above.

When the transported material stops to gravitationally feed the shutter Z2, stop the unloading (in accordance with guidelines in section 5). Check whether the opening of the shutter Z2 and the internal conveyor PW (in the silo axis) are not covered by the material stored in the silo.

When the above conditions are met, further unloading can be performed as follows:

- 6) check and, whenever necessary, set the R2 separator in a position to a transport vehicle, PT;
- 7) start the bucket elevator, PK;
- 8) start the underfloor conveyor, PP;
- 9) start the internal conveyor, PW;

When the transported material stops to feed the shutter Z2, stop the unloading (in accordance with guidelines in section 5). The internal conveyor PW should be removed from a special support, open covers, etc. (depending on the silo model and the internal conveyor).

When the above conditions are met, further unloading can be performed as follows:

- 10) check and, whenever necessary, set the R2 separator in a position to a transport vehicle, PT;
- 11) start the bucket elevator, PK;
- 12) start the underfloor conveyor, PP;
- 13) start the internal conveyor, PW;

The unloading can be continued until the transported material stops to feed the shutter Z2, then stop the unloading (in accordance with guidelines in section 5).

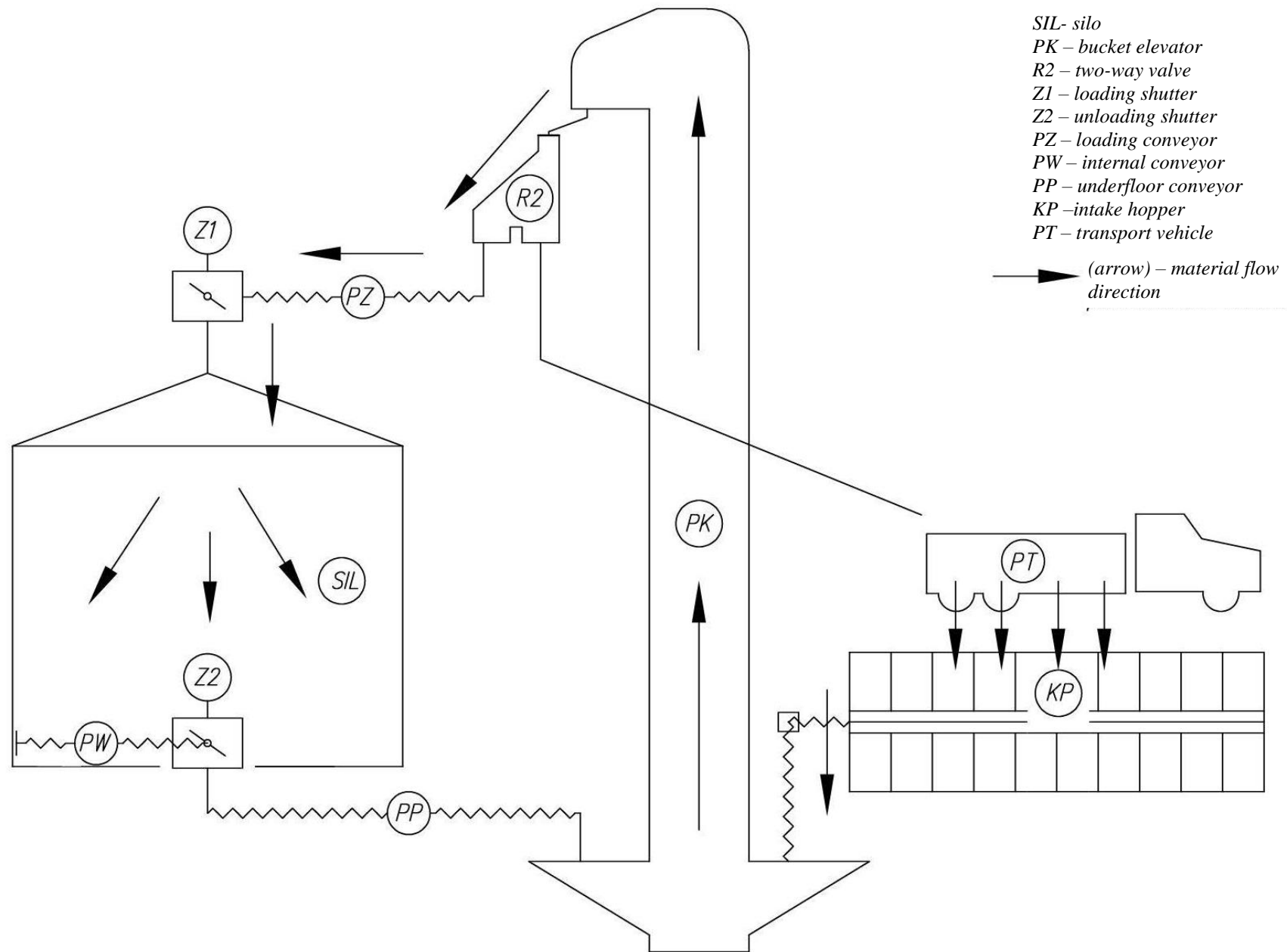


Figure 28. A diagram for loading of a silo of the FBIN type with most common sets of equipment.

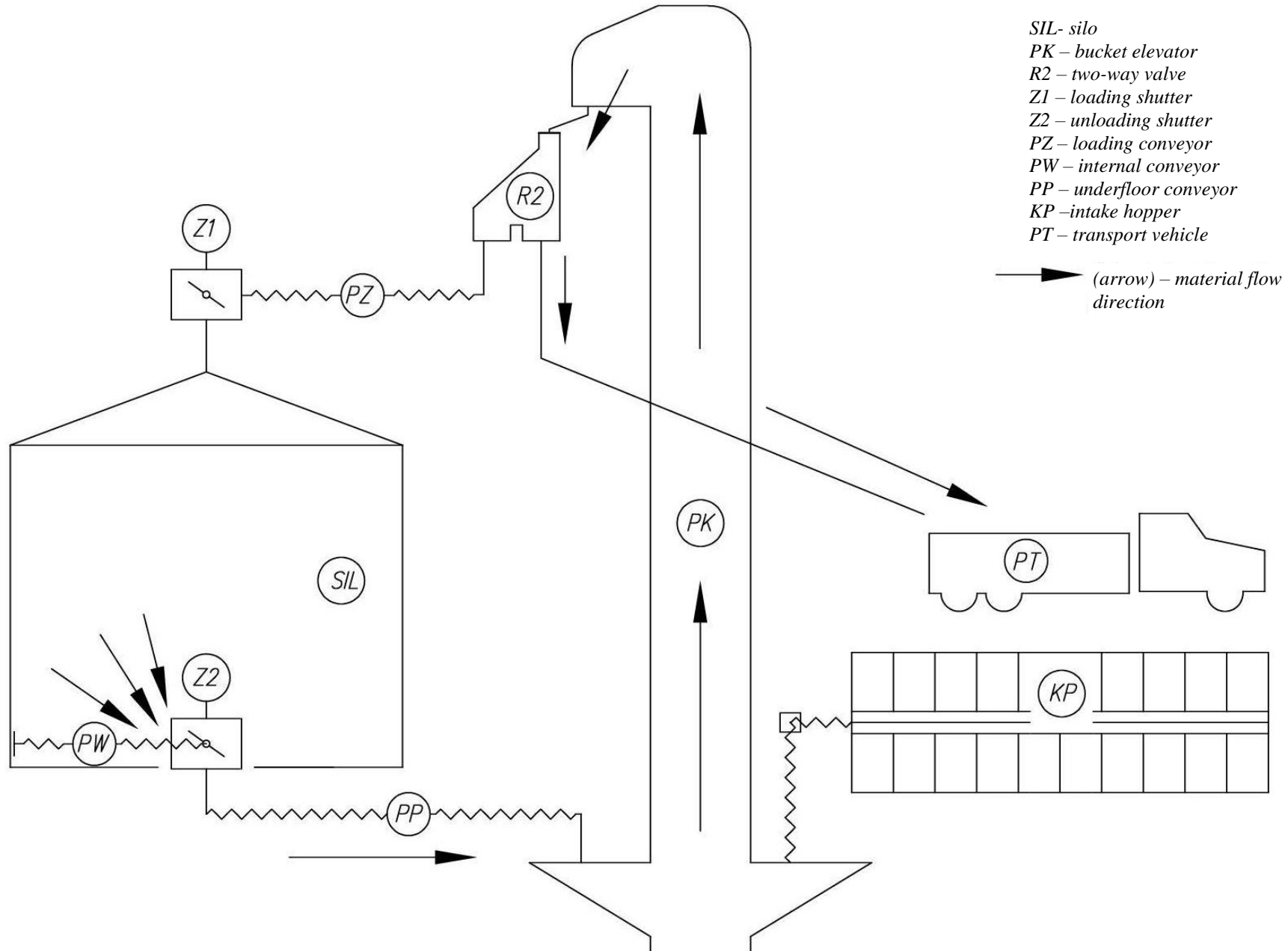


Figure 29. A diagram for unloading of a silo of the FBIN type with most common sets of equipment.



#### 4.1.1. Loading grain into the silo

Each silo should be equipped with devices for loading of grain. Loading can be performed with a bucket elevator. Recommended loading methods, depending on needs and silo equipment - Table 1.

All silos have the grain inlet installed in the silo axis (centrally). This location of the inlet guarantees even loading of the silo walls (even grain pressure on the walls on the entire circumference).

All loading equipment attached to the silo should be installed in a way not damaging the silo (Figure 30, Figure 31, Figure 32). This applies, in particular, to scrapper and screw conveyors, and to loading pipes of bucket elevators supported on the silo roof. These conveyors and pipes should only be connected to special spigots in the silo collar. A conveyor or a downpipe must be connected to an inlet connector in a way preventing load transfer onto the silo roof.

The producer shall not be held responsible for any silo defects resulting from a failure to observe the above recommendations.

During the silo loading, the speed of 150 tonnes per hour should not be exceeded; higher speeds may result in the permanent deformation of the silo.

Before starting loading:

- 1) check the operational condition of the silo and its accessories;
- 2) make sure there are no people in the silo.
- 3) close the bottom access manhole of the silo (if installed);
- 4) close openings for grain unloading.

During loading continuously monitor the level of silo filling.

For loading equipment, strictly adhere to rules of their operation as described in the relevant Operating Manual.

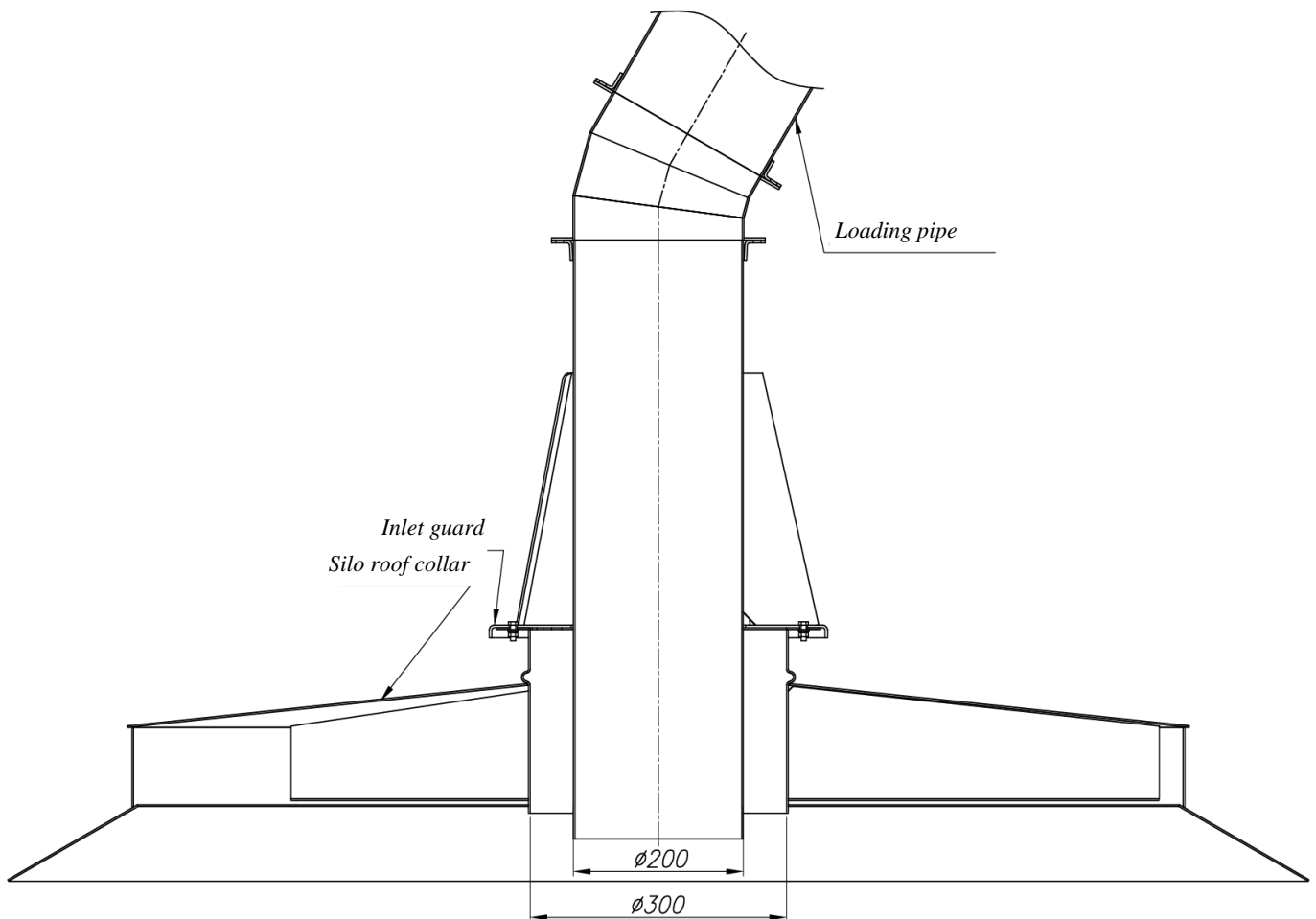


Figure 30. Correct installation of loading pipes in the roof collar of the silo of the FBIN9, FBIN11 and FBIN14 type.

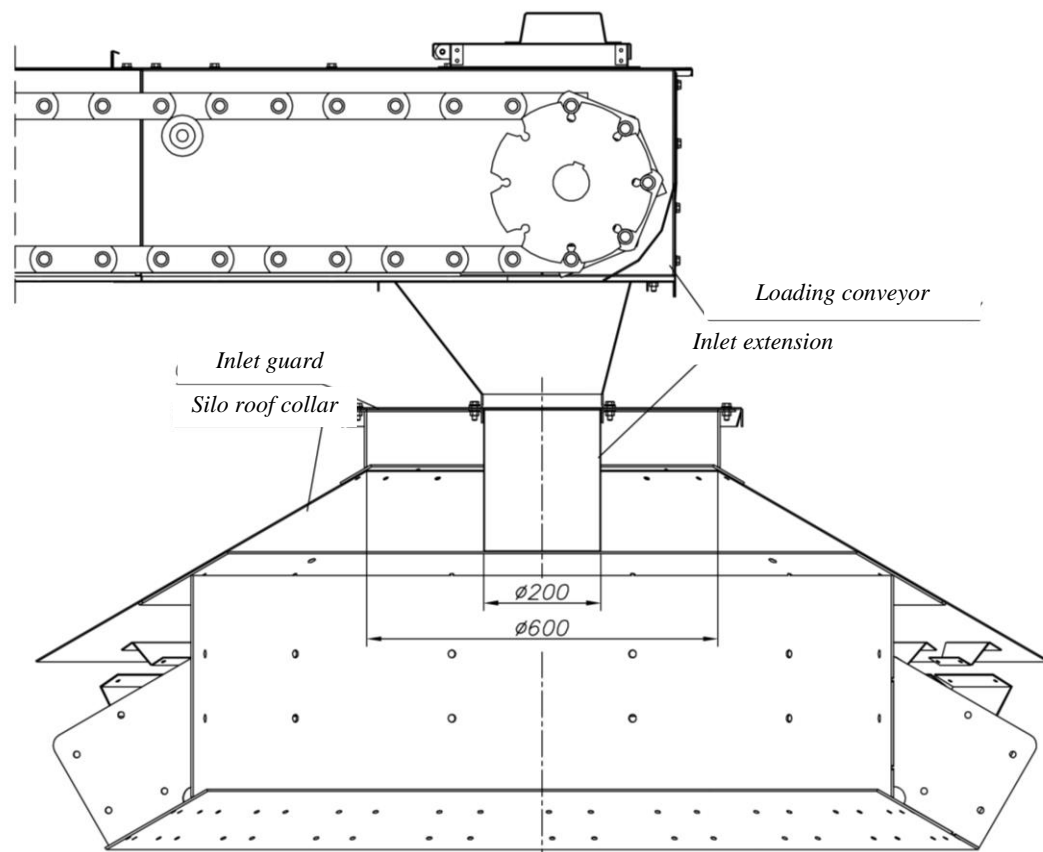


Figure 31. Correct installation of loading conveyors in the roof collar of silos of the FBIN17 and FBIN19 type.

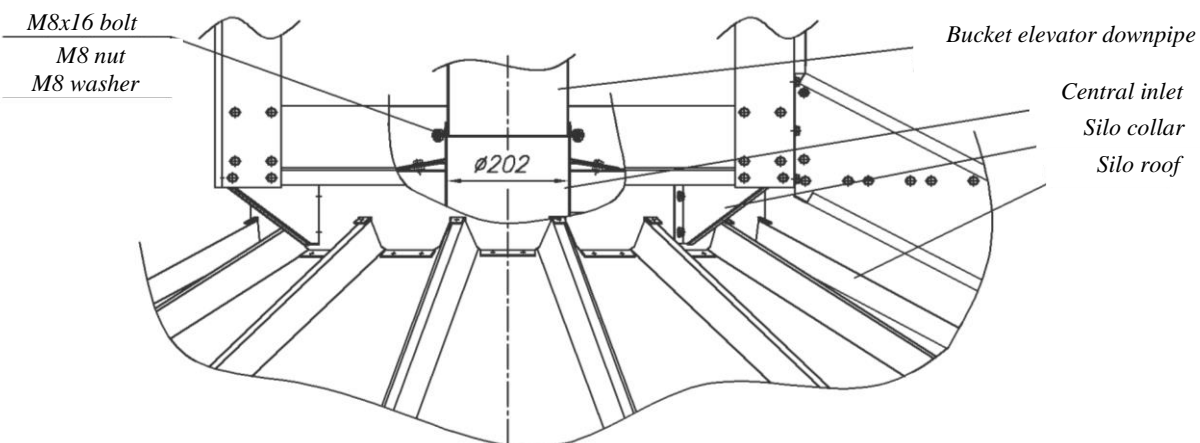


Figure 32. Correct installation of loading pipes in the roof collar of silos of the FBIN7 type.

#### 4.1.2. Grain storage

Grain in the silo can be stored for a long time without losing its quality, provided the following rules are observed:

1. grain cannot be contaminated;
2. it should have a correct moisture content (Table 11);
3. the user should monitor the temperature of the stored grain on a regular basis;
4. freshly poured grain must be well cooled;
5. regardless of its moisture content, the grain should be regularly aired using an appropriate fan.
6. when the grain is infested with pests, perform fumigation activities;
7. always remember to secure the silo against penetration of precipitation water;
8. when grain becomes wet, remove it from the silo immediately and dry.

Grain stored in the silo should be inspected at least once a week.

The rules for correct storage of grain are discussed in more detail in a textbook by A. Ryniecki "Dobrze przechowane zboże". This textbook can be purchased from BIN.

**Note:** Failure to follow rules for grain storage may result in significant deterioration in its quality or destruction of the whole silo load, as well as in numerous situations that can affect safety of the silo and its operators.

The worst hazard is so-called grain bridging. This situation can:

- completely prevent silo unloading;
- result in the silo destruction due to "bump" of the bridged mass after the silo is partly emptied;
- result in formation of empty cavities in the mass of grain during its unloading.



**Due to the above-mentioned hazards it is strictly forbidden to climb onto a layer of grain.**

Table 11. Safe moisture content for grain (for the Polish climate, Data prepared on a basis of the study "Dobrze przechowane zboże" by A. Ryniecki)

Grain type and storage duration	Safe grain moisture content [%]
Wheat, rye, triticale, barley, and oats:	
storage for up to 6 months	14
storage for more than 6 months	13
Rapeseed:	
storage for up to 6 months	8
storage for more than 6 months	7
Maize:	
feed, used before spring	15.5
storage for 6 to 12 months	14
storage for more than 12 months	13

Cereal and maize grain, and oilseeds are nearly always stored in the silo with some contaminations, pests and microorganisms, therefore, they are a very difficult material for storage. Their physical and biological parameters may change within a relatively extensive range, and during various periods of storage. Basic parameters decisive for the condition of the stored material, which are relatively easy to control in the storage conditions include the temperature and the moisture content of the stored material. The temperature and moisture content have a crucial influence on a length of a period for which grain or seed can be (safely) stored, as shown in diagrams in Figure 33 and Figure 34. FBIN silos and other machines and devices working with them do not have any design limitations concerning temperature and moisture content of materials stored in them within the scopes presented in Figure 33 and Figure 34. However, acceptable periods for safe storage must be strictly adhered to due to a risk of deterioration in the material quality which may lead to bridging of grain or seeds, and in consequence, prevent the silo unloading or loading, create empty spaces in the material, etc. Bridging or forming of empty spaces (cavities) in the stored material may result in complete deformation of the silo and thus its irreversible damage requiring its withdrawal from operation.

For example: the chart shows that cereal grain of 5°C and moisture content of ca. 14% can be stored safely for ca. 2.5 years, while cereal grain of 15°C and moisture content of ca. 16% can be stored safely for only ca. 3 months.

Maintaining the required temperature and moisture content throughout the material storage is equally important as achieving these parameters. For this purpose FBIN silos were equipped with active ventilation devices that must be used regularly to ventilate grain and seeds. When the temperature or moisture content increase despite ventilation, then:

- shorten the storage period accordingly;
- when technically feasible, use unloading/loading equipment for grain circulation in a closed flow circuit, that is, unload the silo directly into its loading equipment (simultaneous unloading and loading of the same silo);
- unload the silo and dry grain in a continuous, batch, or other dryer.

The examples presented above are most common methods for bringing the stored material to required storage parameters.

Grain stored in the silo should be periodically inspected by collecting samples and testing them for moisture content. When necessary and possible, also test other parameters important for storage conditions in the silo.

The sampling frequency should depend on the condition of the stored material. The grain temperature is a parameter equally important as its moisture content. Measurements can be performed, for example, with the temperature reader TEMP\_CZYT/1 with the multipoint MULTICORE-S probe described in this operating manual

- sections 2.4. Design description.

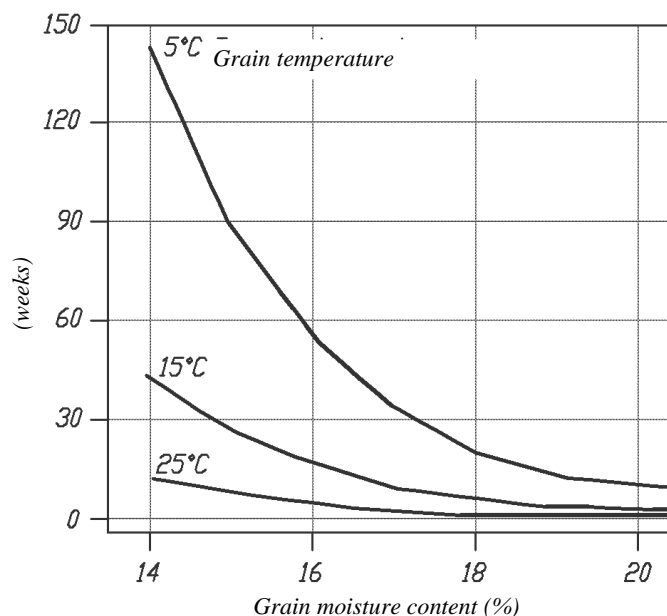


Figure 33. A time of safe grain storage depending on visible mould development (sometimes called an acceptable storage time); this time strongly depends on grain moisture content and temperature [after "Dobrze Przechowywane Zboże" A.Ryniecki and P.Szymański].

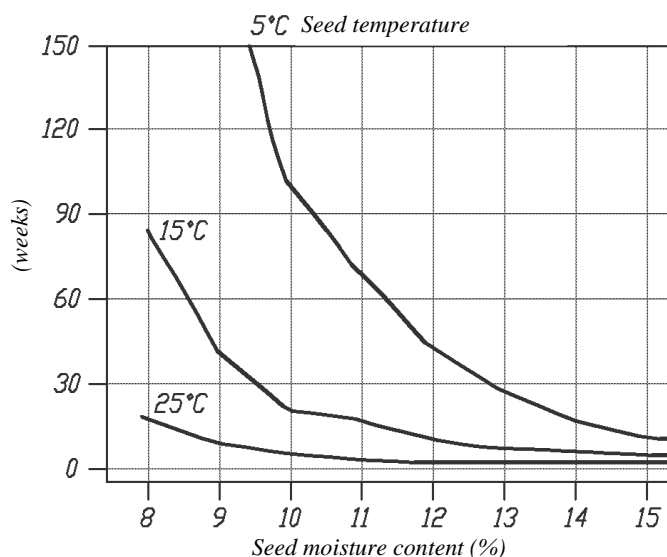


Figure 34. A time of safe rapeseed storage depending on visible mould development (sometimes called an acceptable storage time); this time strongly depends on seed moisture content and temperature [after "Dobrze Przechowywane Zboże" A.Ryniecki and P.Szymański].

#### 4.1.3. Fan selection

Each FBIN silo is equipped with a concrete floor with ventilation ducts or a perforated steel floor facilitating even flow of air through a whole layer of grain stored in the silo when using an appropriate fan.

A correctly selected fan ensures an appropriate dose of air to flow through the grain layer. The dose here means the quantity of air flowing through one tonne of grain during one hour. E.g., when a capacity of the fan connected to the silo containing 60 tonnes of grain is 6000 m<sup>3</sup>/h then the hourly dose is 100 m<sup>3</sup>/tonne. When planning to purchase a new fan the user should consult the silo manufacturer about its usefulness, or can itself establish the required fan capacity and fan pressure.

Examples of the use of commonly available WPR fans manufactured by Tywent Sp. z o.o. and WPS fans from Nyborg-Mawent S.A. with specific FBIN silo types are shown in Table 2, Table 3 Table 4, Table 5, Table 6 and Table 7. Depending on the design of the air inlets, one or two fans can be connected to one silo, or one fan can be connected to two silos (then the splitter must be connected to the air inlets).



**The WPR and WPS fans require construction of a special connection at the silo installation stage, so the fan can be used in one or in two adjoining silos. Therefore, installation of the fan should be provided for at the stages of the silo foundation design and the construction. Guidelines for construction of appropriate foundations should be obtained from BIN Sp. z o.o.**

#### 4.1.4. Grain sampling for moisture content measurements

To measure the moisture content of grain, its samples must be collected. Samples can either be collected from a top layer through the roof hatch with the access platform, or by starting the unloading equipment and unloading certain amount of grain from the silo. This second method is considered to be more reliable because grain from various layers is mixed.

#### 4.1.5. Grain unloading

Each silo should be equipped with devices for unloading of grain.

It is acceptable to unload the silo with a system of screw conveyors or scrapper conveyors of Redler type, including internal auger sweep conveyors. Recommended unloading methods, depending on a silo type, needs, and silo equipment, are provided in Table 1.

Because the silo bottom is flat, some grain (Table 12) cannot be get into the outlet automatically. Therefore, regardless of the unloading method, it is performed in two stages:

- stage 1 - when grain spontaneously (gravitationally) moves into an unloading device;
- stage 2 - at the end of unloading, when grain remaining in the silo (Table 12) must be shovelled (mechanically) to the inlet of the unloading device.

For FBIN silos it is recommended to use a system of PS220/PSW or RED250/PSW screw conveyors manufactured by BIN and screw and scrapper conveyors of other manufacturers, for fully mechanical unloading of grain from the silo.

Before starting the unloading equipment:

- check the operational condition of the unloading equipment.
- make sure there are no people in the silo.

The following rules should be observed during unloading:

- Silo unloading requires permanent supervision.
- For unloading equipment, strictly adhere to rules of their operation as described in the relevant Operating Manual.
- In the event of the unloading equipment failure, when it cannot be repaired due to large quantities of grain stored in the silo, unload the grain through the emergency duct in the silo, at the speed not exceeding 20 tonnes per hour. Higher speed may cause permanent silo deformation and, in consequence, its damage.
- It is forbidden to cut any holes in the silo shell or bottom for an emergency silo unloading.
- During the silo unloading the speed of 150 tonnes per hour should not be exceeded; higher speeds may result in the permanent deformation and, eventually damage, of the silo.

In FBIN silos an option for the emergency unloading is foreseen, through a special emergency unloading duct. The duct can be used to introduce a conveyor into the silo to transport stored material outside. The emergency unloading ducts and unloading conveyors are not standard silo equipment.

Basic parameters for a conveyor for emergency unloading of FBIN silos:

- conveyor type - screw (recommended);
- external diameter - Ø 250 mm (maximum external diameter);
- flow rate - 20 tonnes/h (maximum)
- length (minimum) – FBIN7 – ca. 3 m, FBIN9 – ca. 4 m, FBIN11 – ca. 5 m, FBIN14 – ca. 6 m, FBIN17 – ca. 7 m, and FBIN19 – ca. 9 m.

*Table 12. An indicative quantity of stored material (grain) that will remain in the silo after gravitational unloading through a central inlet is completed.*

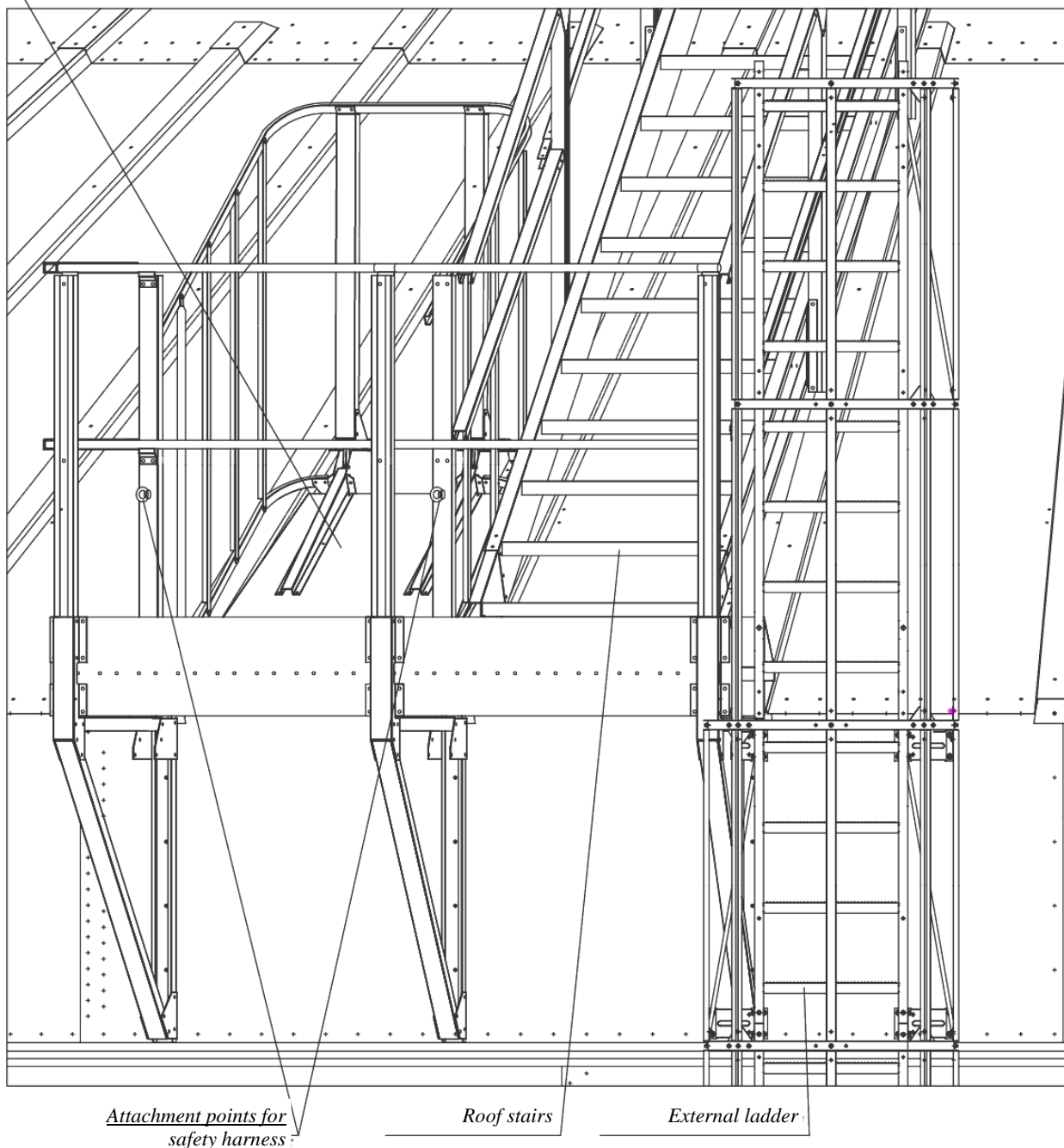
<i>Silo type</i>	<i>Silo model</i>	<i>Remaining quantity of grain [t]</i>
FBIN7	FBIN7/5, FBIN7/6, FBIN7/7, FBIN7/8, FBIN7/9, FBIN7/10, FBIN7/11	29
FBIN9	FBIN9/10, FBIN9/11, FBIN9/12, FBIN9/13, FBIN9/14	61
FBIN11	FBIN11/10, FBIN11/11, FBIN11/12, FBIN11/13, FBIN11/14, FBIN11/15, FBIN11/16, FBIN11/17	144
FBIN14	FBIN14/10, FBIN14/11, FBIN14/12, FBIN14/13, FBIN14/14, FBIN14/15, FBIN14/16, FBIN14/17	281
FBIN17	FBIN17/14, FBIN17/15, FBIN17/16, FBIN17/17, FBIN17/18, FBIN17/19	445
FBIN19	FBIN19/15, FBIN19/16, FBIN19/17, FBIN19/18	663

\*) - for wheat grain of density of 780 kg/m<sup>3</sup> and a natural grain slope of 25°.

## 4.2. Silo maintenance

Correct and punctual maintenance inspections, maintenance and possible repairs guarantee availability of the full storage capacity of the silo and prevent its premature and excessive wear.

*Roof hatch with an access platform*



*Figure 35. An entry to the silo through a roof hatch with an access platform.*

When the silo is not equipped with an internal ladder, then the entrance is secured with a grate and intended solely for workers from the servicing company authorised by BIN Sp. z o.o. When the silo is equipped with the internal ladder, the hatch provides access to the silo also for its user. A person entering the silo through a roof hatch should be assisted by two people and provided with equipment protecting against falling from heights, including an automatic fall arrest system. It is strictly forbidden to disconnect a lifeline protecting against a fall from height while working in the silo.

While workers are present in the silo, the roof hatch and a bottom access manhole should be kept open, with a shutter of the underfloor conveyor closed.

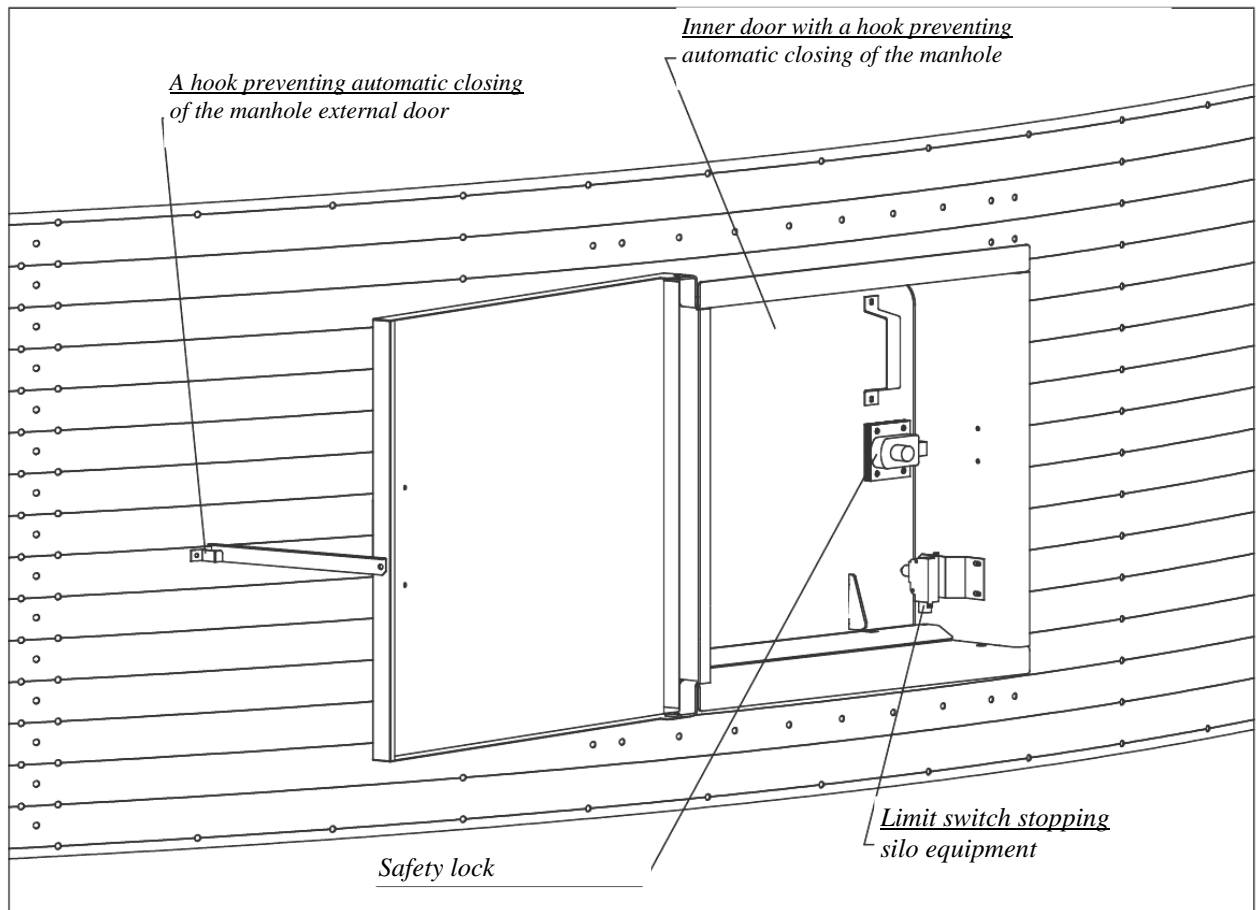


Figure 36. Access to a silo through a bottom access manhole.

#### 4.2.1. Periodic maintenance and regular overhauls

Periodic maintenance covers:

- inspection of ladders and safety devices (secure fixing);
- inspection of a technical condition of a silo shell and bolted joints;
- inspection of fixing of covers, manholes and hatches, hinges, locks and devices securing against their automatic closure, as well as handles for their opening;
- inspection of closing of unloading openings;
- inspection of anti-corrosion coatings.

The technical condition of the bottom access manhole must be checked after each unloading of the silo and before its each loading.

Before each loading of the silo, check the technical condition of the loading and unloading equipment, i.e., the conveyors installed in the silo (internal, underfloor, and other).

All safety devices, i.e., ladder covers, ladder safety equipment, safety railings, ladder fixing, and covers fixing must be inspected at least once a month.

The inspection of other silo components should be performed at least once every 12 months.

The regular repairs include small repairs, applying solid lubricant onto hinges and possible repairs of anti-corrosion coats.

When the silo is equipped with a perforated steel floor, anti-corrosion coating of the shell below the floor level should be checked at least once every two years. When any corrosion foci are found, they should be removed, and anti-corrosion coating should be applied.

When the silo is equipped with a concrete floor with ventilation ducts, anti-corrosion coating of panels covering the ventilation ducts should be checked at least once every two years. When any corrosion foci are found, they should be removed, and anti-corrosion coating should be applied.

**NOTE!** Anti-corrosion coating of screws can be damaged during installation (tightening). In such case, regular repairs include applying anti-corrosion coatings on damaged surfaces.

The annual maintenance of the silo should be performed with a person authorised to perform maintenance of construction structures. The person performing the maintenance should draw up a report on inspection of the silo operating condition.

The silo user should maintain a silo maintenance logbook.

#### 4.2.2. General overhaul

The general overhaul is performed at least once every 8 years. It covers the scope of regular maintenance and:

- painting of steel components;
- inspection of the lightning arrestor system by a licensed electrician, and drawing up of a report;
- tests of fixing and security measures, with their possible strengthening;
- other relevant repairs.



**All damages must be repaired immediately, and parts that are damaged or worn must be repaired or replaced with new ones.**

#### 4.2.3. Spare parts

When any silo components are worn, damaged or lost, they can be purchased from BIN. The manufacturer does not provide for the use of spare parts from manufacturers other than BIN. To purchase spare parts, contact BIN in writing, specifying the following details:

- Device name
- Proof of purchase
- Device model
- Year of production
- Serial No.

Before the order is placed, the type of ordered spare parts must be precisely specified (on phone). A need for BIN representative's visit to correctly identify a part cannot be excluded.

The manufacturer does not provide the silo with spare parts.

#### 4.2.4. Pest control

Pest control activities should be performed each time any grain pests are found. A general principle should be applied that no fresh grain is poured into the silo after grain affected by pests was unloaded before conducting pest control activities. Pest control should be ordered at specialist companies, as there is a high risk of poisoning with chemical agents.

#### 4.2.5. Disassembling and disposal

Silos are devices made of materials not harmful to the environment and can be scrapped, and all their components can be recycled. During disassembling, particular attention should be paid to safety, due to components large dimensions and the height. Disassembling should be ordered at a specialist company.

As of 20/12/2023 I approve for use the Operating Manual:

title - "Flat bottom FBIN silos"

revision - 10

issued on - 08/12/2023.

Chief Constructor  
Mieczysław Laskowski

.....  
(signature)



## 5. Warranty

**BIN Spółka z o.o. guarantees a correct operation of the purchased product in normal conditions and during the normal use of the silo. The guarantee shall cover 12 months from a date of the end of the installation (but no longer than 15 months of a date of the product purchase by the Buyer from BIN Sp. z o.o.). This guarantee shall be valid solely with a proof of purchase issued to the user by BIN Sp. z o.o. or by the BIN Sp. z o.o. distributor. The guarantee covers free of charge removal of defects significantly compromising functions of the product. Therefore, application of warranty provisions of Article 558.1 of the Civil Code, in force in the territory of the Republic of Poland, shall be explicitly excluded. BIN Sp. z o.o. guarantees that the new FBIN silo under the BIN brand (hereinafter referred to as the Product), manufactured by BIN Sp. z o.o., is free of manufacturing defects in terms of material and workmanship. When BIN Sp. z o.o. confirms that the defect exists, then BIN Sp. z o.o. undertakes, at its own discretion, to repair or to replace the Product free of charge. This limited guarantee is not transferable and applies solely to the Buyer who purchased a new Product directly from BIN Sp. z o.o. or from the BIN Sp. z o.o. distributor.**

### Guarantee terms and conditions

1. This Guarantee shall cover the territory of the Republic of Poland. The warrantor shall cover costs of transport related to an accepted warranty complaint for a distance of up to 250 kilometres covered, according to standard rates.
2. The warranty does not apply to defects resulting from incorrect or excessive operation, natural wear of parts, or other reasons outside the manufacturer's control.
3. The warranty shall not cover any other costs, especially costs being a consequence of the equipment stoppage.
4. This warranty shall not apply when:
  - the Product is used contrary to its intended use or the operating manual;
  - installation was incorrect or any unapproved changes were made;
  - the Product is modified in a way not explicitly specified in the Product operating manual or described in detail and approved in writing by BIN Sp. z o.o.;
  - works requiring specialist licences are performed by unauthorised persons;
  - when all parts of the products are not original equipment supplied by BIN Sp. z o.o.;
  - when the Product or its components have not been installed by an authorised fitter, to the order of the BIN Sp. z o.o. or the BIN Sp. z o.o. distributor;
  - when the incorrect operation or a failure of the Product result from the incorrect use of the product, a failure to perform periodic maintenance, excessive use of the Product, poor management, changes made, accident, or failure to ensure proper maintenance, the use for grain which does not flow smoothly and/or is in a poor condition, lightnings, natural catastrophes, electric shock, or power outages;
  - corrosion, deteriorated material condition, and/or incorrect operation of equipment caused by chemicals, minerals, deposits, or other foreign bodies;
  - installation of the Product at locations or in a way not permitted by legal regulations;
  - incorrect design of the foundation, or construction of the silo foundation contrary to assumptions of a construction design and legal regulations, and technical standards.
5. The Buyer shall be responsible for the Product location conforming to the legal regulations, the Product installation conforming to the legal regulations, and the Product operation conforming to the legal regulations. BIN Sp. z o.o. shall not be held responsible for any damages that may result from a failure to observe those regulations.
6. In the case of Products delivered as components - a customer will verify condition of these components on delivery, and then will store them on its own responsibility until they are assembled. Components of galvanised sheets require a special attention. They should be stored in a way ensuring a free flow of air around each component. When wet galvanised metal sheets are in contact with each other, permanent spots form, even during a short-term storage.
7. BIN Sp. z o.o. guarantees correct anti-corrosion protection for manufactured hot-dip galvanised products; provided they are operated in the corrosion environment of the category no worse than C3, as specified in PN-EN ISO 12944-2:2018-02.
8. The Product can have parameters of no importance from an anti-corrosion protection point of view, and thus not covered by a warranty. In particular, this concerns:
  - different colour or shade of the zinc coating on individual elements of the Product (depending on a material supplier);visible cracks and scratches created in the metal sheet production process with a minimum zinc coating weight maintained.
  - corrosion that may occur at cut edges of galvanised metal sheet is a natural phenomenon that does not reduce the Product durability, and cannot form a basis for any complaints.
9. When arrangements made during placement of an order or included in the Operating Manual include obligations for a buyer, then the warranty does not cover consequences of failure to perform or incorrect performance of these obligations.

10. Outdated financial liabilities of a buyer towards the warrantor or the seller result in a loss of the warranty rights until the outstanding liabilities are covered.
11. These guarantee terms and conditions can only be modified in writing.

**Mode for exercising guarantee rights**

Any defects found a customer notifies to the seller in writing. The seller shall notify the customer about a way of handling its complaint, a place and a time of warranty repair no later than within 14 days.

Manufacturer:

BIN Sp. z o.o.  
87-700 Aleksandrów Kujawski  
at Narutowicza 12

.....  
Seller

*(seller's signature is not required when an invoice  
includes a note of granting the warranty)*