JEFFERSON COUNTY PURCHASING DEPARTMENT

Deborah L. Clark, Purchasing Agent

1149 Pearl Street, 1st Floor, Beaumont, TX 77701 409-835-8593 Fax 409-835-8456

LEGAL NOTICE
Advertisement for Invitation for Bids

April 25, 2016

Notice is hereby given that sealed bids will be accepted by the Jefferson County Purchasing Department for IFB 16-009/JW, Sale of Used Low-Level Passenger Boarding Bridges. **Specifications for this project may be obtained from the Jefferson County website, http://www.co.jefferson.tx.us/Purchasing/main.htm or by calling 409-835-8593.**

Bids are to be sealed and addressed to the Purchasing Agent with the bid number and name marked on the outside of the envelope. Bidders shall forward an original and two (2) copies of their bid to the address shown below. Jefferson County does not accept bids submitted electronically. Late bids will be rejected as non-responsive. Bids will be publicly opened and read aloud in the Jefferson County Engineering Conference Room, 1149 Pearl Street, 5th Floor, Beaumont, Texas 77701 at the time and date below. Bidders are invited to attend the sealed bid opening.

BID NAME: **Sale of Used Low-Level Passenger Boarding Bridges**

BID NO: **IFB 16-009/JW**

DUE DATE/TIME: **11:00 AM CDT, Tuesday, May 24, 2016**

MAIL OR DELIVER TO: **Jefferson County Purchasing Department**
1149 Pearl Street, 1st Floor
Beaumont, Texas 77701

Prior to bid submission, Bidders may contact the Jack Brooks Regional Airport at 409-719-4900 to schedule a viewing of the Passenger Boarding Bridges for sale via this IFB.

Any questions relating to these requirements should be directed to Jamey West, Assistant Purchasing Agent, at 409-835-8593 or jwest@co.jefferson.tx.us

Jefferson County encourages Disadvantaged Business Enterprises to participate in the bidding process. Jefferson County does not discriminate on the basis of race, color, national origin, sex, religion, age or disability in employment or the provisions of services. Individuals requiring special accommodations are requested to contact our office at 409-835-8593 to make arrangements no later than seven (7) calendar days prior to the submittal deadline. Jefferson County reserves the right to accept or reject any or all proposals, to waive technicalities and to take whatever action is in the best interest of Jefferson County.

All interested firms are invited to submit a bid in accordance with the terms and conditions stated in this bid.

RESPONDENTS ARE STRONGLY ENCOURAGED TO CAREFULLY READ THE ENTIRE INVITATION.

Deborah L. Clark, Purchasing Agent
Jefferson County, Texas
Publish: Beaumont Enterprise & Port Arthur News – April 27th & May 4th, 2016

IFB 16-009/JW
Sale of Used Low-Level Passenger Boarding Bridges
Bids due: 11:00 AM CDT, Tuesday, May 24, 2016

Table of Contents

Instructions to Bidders

1. Bid Submission

Bids must be submitted in complete original form by mail or messenger to the following address:

Jefferson County Purchasing Department
1149 Pearl Street, 3rd Floor
Beaumont, TX 77701

Bids will be accepted at the above address until the time and date specified herein, and immediately after will be publicly opened and read aloud.

All bids shall be tightly sealed in an opaque envelope and plainly marked with the Bid Number, Bid Name, Bid Due Date, and the Bidder's Name and Address; and shall be addressed to the Purchasing Agent.

Late bids will not be accepted and will be returned unopened to the bidder.

All bids submitted in response to this invitation shall become the property of Jefferson County and will be a matter of public record available for review.

2. Bid Submissions During Time of Inclement Weather, Disaster, or Emergency

In case of inclement weather or any other unforeseen event causing the County to close for business on the date of a bid/proposal/statement of qualifications submission deadline, the bid closing will automatically be postponed until the next business day that County offices are open to the public. Should inclement weather conditions or any other unforeseen event cause delays in courier service operations, the County may issue an addendum to all known vendors interested in the project to extend the deadline. It will be the responsibility of the vendor to notify the county of their interest in the project should these conditions impact their ability to submit a bid/proposal/statement of qualifications submission before the stated deadline. The County reserves the right to make the final judgement call to extend any deadline.

Should an emergency or unanticipated event interrupt normal County processes, and bid/proposal/statement of qualifications submissions cannot be received by the Jefferson County Purchasing Department's office by the exact time specified in the IFB and urgent County requirements preclude amendment to the IFB, the time specified for receipt of bids will be deemed to be extended to the same time of day specified in the solicitation on the first business day on which normal County processes resume.

3. Courthouse Security

Bidders are advised that all visitors to the Courthouse must pass through Security. **Bidders planning to hand deliver bids must allow time to get through Security, as a delay in entering the Courthouse will not be accepted as an excuse for late submittal.** Mondays and Tuesdays are particularly heavy days. Bidders are strongly urged to plan accordingly.

4. Preparation of Bids

The bid shall be legibly printed in ink or typed.

If a unit price or extension already entered is to be altered, it shall be crossed out and initialed in ink by the bidder.

The bid shall be legally signed and shall include the complete address of the bidder.

Jefferson County is exempt from Federal and State Sales Taxes, and such taxes shall not be included in bid prices.

5. Signatures

All bids, notifications, claims, and statements must be signed by an individual authorized to bind the bidder. The individual signing certifies, under penalty of perjury, that he or she has the legal authorization to bind the bidder.

6. County Holidays – 2016:

January 1	Friday	New Year's Day
January 18	Monday	Martin Luther King, Jr. Day
February 15	Monday	President's Day
March 25	Friday	Good Friday
May 30	Monday	Memorial Day
July 4	Monday	Independence Day
September 5	Monday	Labor Day
November 11	Friday	Veterans Day
November 24 & 25	Thursday & Friday	Thanksgiving
December 26-27	Monday & Tuesday	Christmas

7. Rejection or Withdrawal

Submission of additional terms, conditions or agreements with the bid document are grounds for deeming a bid non-responsive and may result in bid rejection. Jefferson County reserves the right to reject any and all bids and to waive any informalities and minor irregularities or defects in bids. Bids may be withdrawn in person by a bidder or authorized representative, provided their identity is made known and a receipt is signed for the bid, but only if the withdrawal is made prior to the time set for receipt of bids. Bids are an irrevocable offer and may not be withdrawn within 90 days after opening date.

8. Insurance

The contractor (including any and all subcontractors as defined in Section 9.1.3 below) shall, at all times during the term of this contract, maintain insurance coverages with not less than the type and requirements shown below. Such insurance is to be provided at the sole cost of the contractor. These requirements do not establish limits of the contractor's liability.

All policies of insurance shall waive all rights of subrogation against the County, its officers, employees and agents.

Contractor shall furnish Jefferson County with Certificate of Insurance naming Jefferson County as additional insured.

All insurance must be written by an insurer licensed to conduct business in the State of Texas.

Minimum Insurance Requirements

Public Liability	$1,000,000.00
Excess Liability	$1,000,000.00
Workers' Compensation	Statutory Coverage (see attached)

9. Workers' Compensation Insurance

9.1 Definitions:

9.1.1 **Certificate of coverage ("Certificate")** – A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement, DWC-81, DWC-82, DWC-83, or DWC-84 showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a project, for the duration of the project.

9.1.2 **Duration of the project** – Includes the time from the beginning of the work on the project until the contractor's/person's work on the project has been completed and accepted by the governmental entity.

9.1.3 **Persons providing services on the project ("subcontractor") in article 406.096** – Includes all persons or entities performing all or part of the services under the contractor has undertaken to perform on the project, regardless of whether that person contracted directly with the contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractor, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the project. "Services" includes, without limitation, providing, hauling or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

9.2 The Contractor shall provide coverage, based on proper reporting of classification code and payroll amounts and filing any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the contractor providing services on the project, for the duration of the project.

9.3 The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the contract – refer to Section 6 above.

9.4 If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the project, the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.

9.5 The Contractor shall obtain from each person providing services on a project, and provide to the governmental entity:

9.5.1 A certificate of coverage, prior to that person beginning work on the project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the project; and

9.5.2 No later than seven (7) days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate ends during the duration of the project.

9.6 The Contractor shall retain all required certificates of coverage for the duration of the project and for one (1) year thereafter.

9.7 The Contractor shall notify the governmental entity in writing by certified mail or personal delivery, within ten (10) days after the contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.

9.8 The Contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Department of Workers' Compensation, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

9.9 The Contractor shall contractually require each person with whom it contracts to provide services on a project to:

9.9.1 Provide coverage, based on reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all its employees providing services on the project, for the duration of the project.

9.9.2 Provide to the Contractor, prior to that person beginning work on the project a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project.

9.9.3 Provide the Contractor, prior to the end of coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

9.9.4 Obtain from each person with whom it contracts, and provide to the Contractor:

9.9.4.1 A certificate of coverage, prior to the other person beginning work on the project; and

9.9.4.2 the coverage period, if the coverage period shown on the current certificate of a new certificate of coverage showing extension of coverage, prior to the end of coverage ends during the duration of the project.

9.9.5 Retain all required certificates of coverage on file for the duration of the project and for one (1) year thereafter.

9.9.6 Notify the governmental entity in writing by certified mail or personal delivery, within ten (10) days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and

9.9.7 Contractually require each person with whom it contracts to perform as required by paragraphs 9.1. – 9.7., with the certificates of coverage to be provided to the person for whom they are providing services.

9.10 By signing this contract or providing or causing to be provided a certificate of coverage, the Contractor is representing to the governmental entity that all employees of the contractor who will provide services of the project will be covered by workers' compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

9.11 The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor which entitles the governmental entity to declare the contract void if the Contractor does not remedy the breach within ten (10) days after receipt of notice of breach from the governmental entity.

10. Emergency/Declared Disaster Requirements

In the event of an emergency or if Jefferson County is declared a disaster area, by the County, State, or Federal Government, this Acceptance of Offer may be subjected to unusual usage. Contractor shall service the county during such an emergency or declared disaster under the same terms and conditions that apply during non-emergency/disaster conditions. The pricing as specified in this Acceptance of Offer shall apply to serving the County's needs regardless of the circumstances. If Contractor is unable to supply the services under the terms of the Acceptance of Offer, then Contractor shall provide proof of such disruption and a copy of the invoice from Contractor's supplier(s). Additional profit margin as a result of supplying services during an emergency or declared disaster shall not be permitted. In the event that additional equipment, supplies, and materials are required during the declared disaster, additional shipping, handling and drayage fees may apply.

11. Award

The bid will be awarded to the responsible, responsive bidder(s) whose bid, conforming to the solicitation, will be most advantageous to Jefferson County – price and other factors considered. Unless otherwise specified in this IFB, Jefferson County reserves the right to accept a bid in whole or in part, and to award by item or by group, whichever is deemed to be in the best interest of Jefferson County. Any bidder who is in default to Jefferson County at the time of submittal of the bid shall have that bid rejected. Jefferson County reserves the right to clarify any contractual terms with the concurrence of the Contractor; however, any substantial nonconformity in the offer, as determined by Jefferson County, shall be deemed non-responsive and the offer rejected.

In evaluating bids, Jefferson County shall consider the qualifications of the bidders, and, where applicable, operating costs, delivery time, maintenance requirements, performance data, and guarantees of materials and equipment. In addition, Jefferson County may conduct such investigation as it deems necessary to assist in the evaluation of a bid and to establish the responsibility, qualifications, and financial ability of the bidders to fulfill the contract.

Jefferson County reserves the right in accordance with the laws of the State of Texas, to waive any formality or irregularity, and/or to reject any or all bids. In the event the highest dollar offeror meeting specifications is not awarded a contract, Offeror may appear before the Commissioners' Court and present evidence concerning Offeror responsibility after officially notifying the Office of the Purchasing Agent of Offeror's intent to appear.

12. Contract

A response to an IFB is an offer to contract with Jefferson County based upon the terms, conditions, and specifications contained in the IFB. Bids do not become contracts unless and until they are executed by Jefferson County, eliminating a formal signing of a separate contract. For that reason, all of the terms and conditions of the contract are contained in the IFB, unless any of the terms and conditions is modified by an IFB Amendment, a Contract Amendment, or by mutually agreed terms and conditions in the contract documents.

13. Waiver of Subrogation

Bidder and bidder's insurance carrier waive any and all rights whatsoever with regard to subrogation against Jefferson County as an indirect party to any suit arising out of personal or property damages resulting from bidder's performance under this agreement.

14. Fiscal Funding

A multi-year contract (if requested by the specifications) continuing as a result of an extension option must include fiscal funding out. If, for any reason, funds are not appropriated to continue the contract, said contract shall become null and void.

15. Bid Results

Bid results are not provided in response to telephone inquiries. A preliminary tabulation of bids received will be posted on the Purchasing web page (http://co.jefferson.tx.us/purchasing/main.htm) as soon as possible following bid opening. A final tabulation will be posted following bid award, and will also be available for review in the Purchasing Department.

16. Changes and Addenda to Bid Documents

Each change or addendum issued in relation to this IFB document will be on file in the Office of the Purchasing Agent, and will be posted on the Purchasing web site as soon as possible. It shall be the bidder's responsibility to make inquiry as to change or addenda issued, and to monitor the web site. All

such changes or addenda shall become part of the contract and all bidders shall be bound by such addenda. Information on all changes or addenda issued will be available at the Office of the County Purchasing Agent.

17. Specifications

Any unsolicited alternate bid, or any changes, insertions, or omissions to the terms and conditions, specifications, or any other requirements of the bid, may be considered non-responsive.

18. Interpretation of Bid and/or Contract Documents

All inquiries shall be made within a reasonable time prior to the date and time fixed for the bid opening, in order that a written response in the form of an addendum, if required, can be processed before the bids are opened. Inquiries received that are not made in a timely fashion may or may not be considered.

19. Currency

Prices calculated by the bidder shall be stated in U.S. dollars.

20. Pricing

Prices shall be stated in units of quantity specified in the bid documents. In case of discrepancy in computing the amount of the bid, the unit price shall govern.

21. Certification

By signing the offer section of the Offer and Acceptance page, bidder certifies:

- The submission of the offer did not involve collusion or other anti-competitive practices.
- The bidder has not given, offered to give, nor intends to give at any time hereafter, any economic opportunity, future employment, gift, loan, gratuity, special discount, trip, favor, or service to any public servant in connection with the submitted offer.
- The bidder hereby certifies that the individual signing the bid is an authorized agent for the bidder and has the authority to bind the bidder to the contract.

22. Definitions

"County" – Jefferson County, Texas.

"Contractor" – The bidder whose proposal is accepted by Jefferson County.

23. Minority-Women Business Enterprise Participation

It is the desire of Jefferson County to increase the participation of Minority (MBE) and women-owned (WBE) businesses in its contracting and procurement programs. While the County does not have any preference or set aside programs in place, it is committed to a policy of equitable participation for these firms.

Minimum Specifications

The following requirements and specifications supersede General Requirements where applicable. Contact Jamey West, Assistant Purchasing Agent (e-mail: jwest@co.jefferson.tx.us; phone: 409-835-8593), regarding any questions or comments. Please reference bid number 16-009/JW.

1. Objective

Jefferson County seeks to sell two (2) Used Low-Level Passenger Boarding Bridges. Purchased in 2000 and refurbished by ThyssenKrupp in 2009 due to hurricane damage, these Boarding Bridges are currently located at and have been solely utilized by the Jack Brooks Regional Airport.

The Boarding Bridges will be sold only as a pair, and will not be sold separately.

2. Scope

The Jefferson County Purchasing Department will receive sealed bids for the Sale of Used Low-Level Passenger Boarding Bridges. The Boarding Bridges will be sold as is, as one unit, as listed on the Bid Form. All offers must be submitted on the official Bid Form included in this Invitation for Bid (Page 11).

The Successful Bidder must make bid payment within fourteen (14) days of receipt of award notice. Non-business days included.

The Successful Bidder shall be solely responsible for removing and transporting the Boarding Bridges from the Jack Brooks Regional Airport located at N. Hwy 69 Nederland, Texas. The Successful Bidder will also be responsible for having the first components of each Boarding Bridge detached from the exterior wall. To Jefferson County's best knowledge, these first components are connected to the exterior wall via angle iron and a connector seal.

The Successful Bidder shall coordinate the date and time of removing and transporting the Boarding Bridges with Duke Youmans, Operation /Security Chief with the Jack Brooks Regional Airport at 409-719-4950.

The Successful Bidder must thoroughly remove and transport the Boarding Bridges from the Jack Brooks Regional Airport within thirty (30) days of the date of bid payment submission.

The Successful Bidder will be solely responsible for any and all damages that may occur to person or property as a result of the removal and transporting of the Boarding Bridges.

3. Description

The Description and Specifications included in this section are applicable to both Boarding Bridges included in this Invitation for Bid.

Manufacturer: ThyssenKrupp

Type: RS 31/19.3-2 Low Rider "DUAL" Steel Apron Drive Passenger Boarding Bridge

Purchase Date: 2000

Refurbishment (Due to Hurricane Damage): 2009

Fully extended, the bridge is 101' long, fully closed it is 64'. The "inside" tunnel portion is 47', the "outside" tunnel portion is 48'.

4 main components:
1. From building to pivot point.
2. Inside tunnel
3. Outside tunnel
4. Pivot head to aircraft

Note: Additional Description of Boarding Bridges is Provided in Exhibits A & B of these specifications.

Bidder Information Form

Instructions: Complete the form below. Please provide legible, accurate, and complete contact information. PLEASE PRINT.

Bid Name & Number: IFB 16-009/JW, Sale of Used Low-Level Passenger Boarding Bridges

Name: _____

Phone Number (with area code): _____

Alternate Phone Number if available (with area code):_____

Email Address: _____

Mailing Address

_____
Address

_____
City, State, Zip Code

OFFER AND ACCEPTANCE FORM

OFFER TO CONTRACT

To Jefferson County:

We hereby offer and agree to purchase the materials or service (s) in compliance with all terms, conditions, specifications, and amendments in the Invitation for Bid and any written exceptions in the offer. We understand that the items in this Invitation for Bid, including, but not limited to, all required certificates are fully incorporated herein as a material and necessary part of the contract.

The undersigned hereby states, under penalty of perjury, that all information provided is true, accurate, and complete, and states that he/she has the authority to submit this bid, which will result in a binding contract if accepted by Jefferson County.

We acknowledge receipt of the following amendment(s): _____, _____, _____, _____.

I certify, under penalty of perjury, that I have the legal authorization to bind the firm hereunder:

_____
Company Name

_____
Address

_____
City State Zip

_____
Signature of Person Authorized to Sign

_____
Printed Name

_____
Title

For clarification of this offer, contact:

_____
Name

_____
Phone Fax

_____
E-mail

Bidder Shall Return Completed Form with Offer.

Acceptance of Offer

The Offer is hereby accepted for the following items: Sale of Used Low-Level Passenger Boarding Bridges.

The Contractor is now bound to purchase the materials or services listed by the attached contract and based upon the Invitation for Bid, including all terms, conditions, specifications, amendments, etc., and the Contractor's Offer as accepted by Jefferson County.

Payment shall be made by the successful bidder, by guaranteed funds, within fourteen (14) days of notification of award.

This contract shall henceforth be referred to as Contract No. 16-009/JW.

Countersigned:

Jeff R. Branick
County Judge

Date

Attest:

Carolyn L. Guidry
County Clerk

Bidder Shall Return Completed Form with Offer.

Bid Form

Note to Bidder: The Boarding Bridges will be sold as is, as one unit, as listed on the Bid Form Below. Boarding Bridges will not be sold separately.

Item Description	Bid Amount
Two (2) Used ThyssenKrupp Low-Level Passenger Boarding Bridges	$ _____

Payment by guaranteed funds shall be made by the Successful Bidder within fourteen (14) of notification of award.

Payment will be made to:

Jefferson County Auditor
Patrick Swain
1149 Peal Street, 7th Floor
Beaumont, TX 77701

Acknowledgment of Addenda (if any):

Addendum 1 _____ Date Received_____

Addendum 2 _____ Date Received_____

Addendum 3 _____ Date Received_____

Bidder Shall Return Completed Form with Offer.

EXHIBIT A: Photographs of Passenger Boarding Bridges

Photo of Passenger Boarding Bridge No. 1

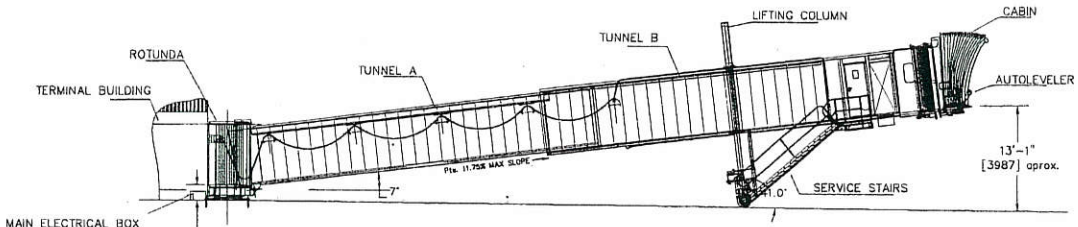
Photo of Passenger Boarding Bridge No. 2

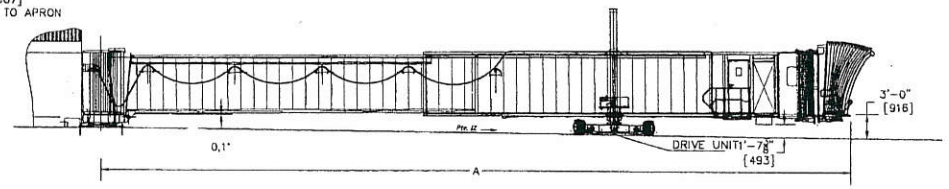
Photo of Passenger Boarding Bridge No. 2

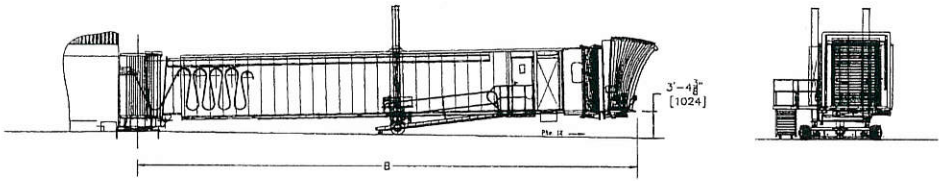
Photo of Passenger Boarding Bridge 1

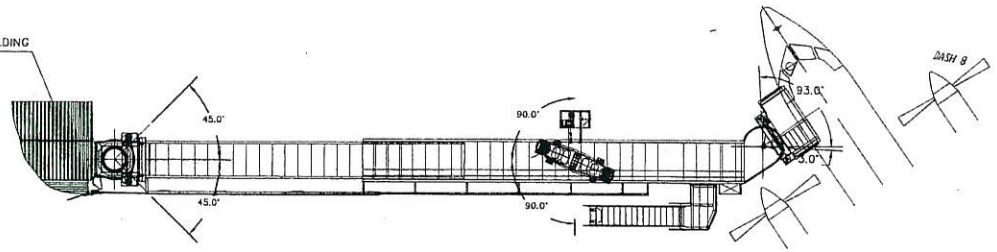
Photo of Passenger Boarding Bridges 1 & 2

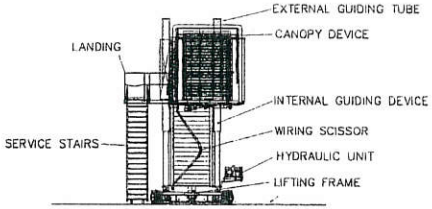
EXHIBIT B: Original Specifications Provided by ThyssenKrupp (Vendor Bridges Were Purchased From)











TRAVELLING SPEED

A) NORMAL SPEED
AT DRIVE UNIT: 78.72 ft/min [24,0 m/min]

B) LOW SPEED
AT DRIVE UNIT 22.96 ft/min [7,0 m/min]

LIFTING SPEED

AT LIFTING UNIT:
UP 3.28 ft/min [1 m/min]
DOWN 3.28 ft/min [1 m/min]

CABIN

CABIN ROTATION aprox. 2,6°/sec
CANOPY ROTATION aprox. 2,0°/sec

MODEL	A	B
TB 15/11,3-2	49.21' [15000]	37.07' [11300]
TB 17/12,3-2	55.77' [17000]	40.35' [12300]
TB 19/13,3-2	62.34' [19000]	43.64' [13300]
TB 21/14,3-2	68.90' [21000]	46.92' [14300]
TB 23/15,3-2	75.46' [23000]	50.20' [15300]
TB 25/16,3-2	82.02' [25000]	53.48' [16300]
TB 27/17,3-2	88.58' [27000]	56.76' [17300]
TB 29/18,3-2	95.14' [29000]	60.04' [18300]
TB 31/19,3-2	101.71' [31000]	63.32' [19300]
TB 33/20,3-2	108.27' [33000]	66.60' [20300]
TB 35/21,3-2	114.83' [35000]	69.88' [21300]
TB 37/22,5-2	121.39' [37000]	73.82' [22500]
TB 39/23,5-2	127.95' [39000]	77.10' [23500]
TB 41/24,8-2	134.51' [41000]	81.36' [24800]
TB 43/25,8-2	141.08' [43000]	84.65' [25800]
TB 45/26,8-2	147.64' [45000]	87.93' [26800]

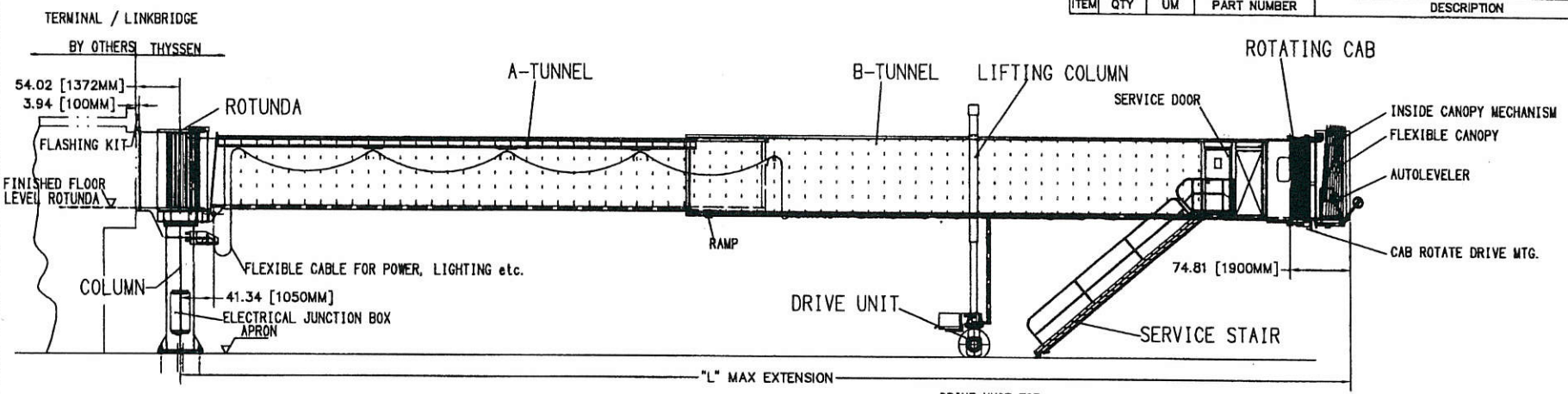
BRIDGE MODEL SHOWN: TB 29/18,3-2

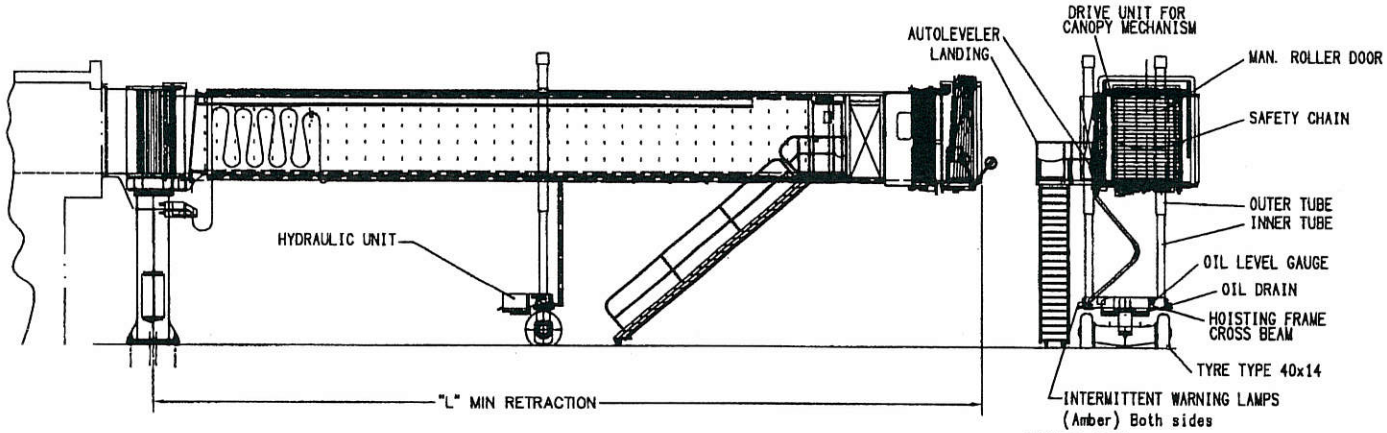
THYSSEN STEARNS

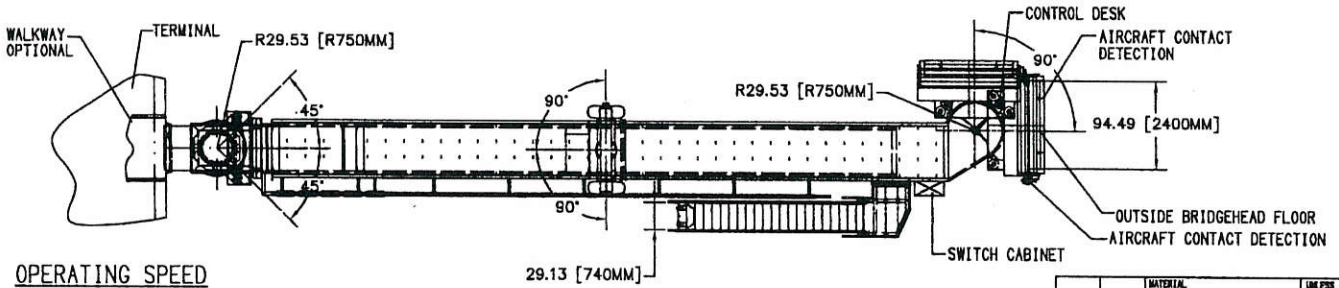
DUAL SUBMITTAL DRAWING
LOW LEVEL BRIDGE

A8-212042_1 D A8-212042

PARTS LIST				
ITEM	QTY	UM	PART NUMBER	DESCRIPTION







MODEL DRAWN DS 37/22.5-2

BRIDGE MODEL	DIM "L" MAX EXTENSION	DIM "L" MIN RETRACTION
DS 15/11.3-2	49.23FT/15.00M	37.08FT/11.30M
DS 17/12.3-2	55.79FT/17.00M	40.36FT/12.30M
DS 19/13.3-2	62.35FT/19.00M	43.65FT/13.30M
DS 21/14.3-2	68.92FT/21.00M	46.93FT/14.30M
DS 23/15.3-2	75.48FT/23.00M	50.21FT/15.30M
DS 25/16.3-2	82.04FT/25.00M	53.49FT/16.30M
DS 27/17.3-2	88.04FT/27.00M	56.77FT/17.30M
DS 29/18.3-2	95.17FT/29.00M	60.06FT/18.30M
DS 31/19.3-2	101.73FT/31.00M	63.34FT/19.30M
DS 33/20.3-2	108.30FT/33.00M	66.62FT/20.30M
DS 35/21.3-2	114.86FT/35.00M	69.90FT/21.30M
DS 37/22.5-2	121.42FT/37.00M	73.84FT/22.50M
DS 39/23.5-2	127.99FT/39.00M	77.12FT/23.50M
DS 41/24.8-2	134.55FT/41.00M	81.39FT/24.80M
DS 43/25.8-2	141.11FT/43.00M	84.67FT/25.80M
DS 45/26.8-2	147.68FT/45.00M	87.95FT/26.80M

OPERATING SPEED

DRIVING THE BRIDGE

A) NORMAL SPEED
MEASURED AT THE DRIVE UNIT 1.0 TO APPROX. 24.0 M/MIN = 3.28 TO 78.92 FT/MIN

B) SLOW SPEED
MEASURED AT THE DRIVE UNIT 1.0 TO APPROX. 7.0 M/MIN = 3.28 TO 22.96 FT/MIN

LIFTING AND LOWERING THE BRIDGE

MEASURED AT AT THE LIFTING COLUMN

1. LIFTING= APPROX. 1.0 M/MIN = 3.28 FT/MIN
2. LOWERING= APPROX. 1.0 M/MIN = 3.28 FT/MIN

ROTATING CAB

A) CAB ROTATION SPEED= APPROX 2.6 DEG/SEC

B) CANOPY EXTENSION SPEED= APPROX. 2.0 DEG/SEC

LTR	DATE	NEXT ASSEMBLY / WHERE USED
REVISIONS		REF/SIMILAR TO

MATERIAL
FINISH
UNLESS OTHERWISE SPECIFIED:
REMOVE ALL BURRS
BREAK ALL SHARP EDGES 1/32 R. MAX
DO NOT SCALE DRAWING
TOLERANCES
FRACTION ± 1/8 DECIMAL .XX ± .03 .XXX ± .015 ANGULAR ± 1°

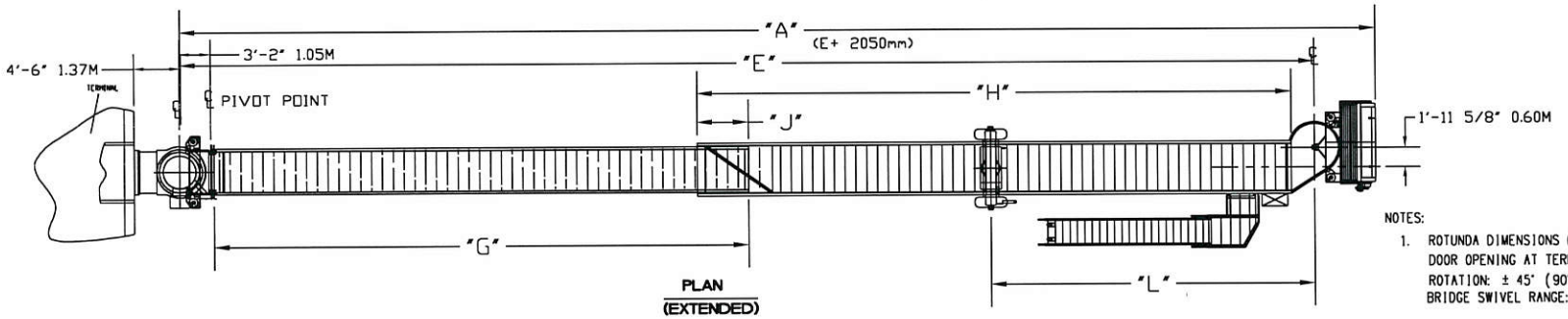
APPROVALS	DATE
DRAWN DM/LS	07-08-99
CHECKED	
ENGINEER	

THYSSEN STEARNS
AIRPORT BRIDGES and EQUIPMENT

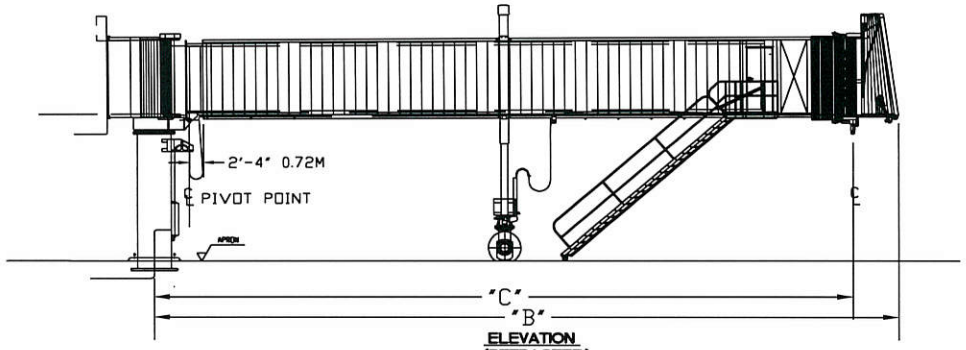
TITLE
PASSENGER BOARDING BRIDGE
DUAL-APRON DRIVE-TWO TUNNEL

AutoCad FILE NAME	SIZE	DWG NO.	REV
A8-210286_1	C	A8-210286	.
SCALE 1/8" =1'	RELEASE	SHEET 1 OF 1	

MODEL	A EXTENSION MAX		B RETRACTION MIN		C RETRACTION TO ELECTRICAL LIMITS		RECOMMENDED OPERATIONAL RETRACTION		E EXTENSION TO ELECTRICAL LIMITS		RECOMMENDED OPERATIONAL EXTENSION		G A-TUNNEL		H B-TUNNEL		J EXTENDED TUNNEL OVERLAP		BRIDGE TRAVEL TO LIMITS		L LIFT COLUMN LOCATION	
DS 15/11.3-2	49.23'	15.00M	37.08'	11.30M	30.36'	9.25M	33.64'	10.25M	42.50'	12.95M	39.22'	11.95M	21.06'	6.42M	21.06'	6.76M	6.57'	2.00M	12.14'	3.70M	13.16'	4.01M
DS 17/12.3-2	55.79'	17.00M	40.36'	12.30M	33.64'	10.25M	36.92'	11.25M	49.06'	14.95M	45.78'	13.95M	24.35'	7.42M	25.46'	7.76M	6.57'	2.00M	15.42'	4.70M	13.16'	4.01M
DS 19/13.3-2	62.35'	19.00M	43.65'	13.30M	36.92'	11.25M	40.20'	12.25M	55.62'	16.95M	52.34'	15.95M	27.62'	8.42M	28.75'	8.76M	6.57'	2.00M	18.71'	5.70M	14.80'	4.51M
DS 21/14.3-2	68.92'	21.00M	46.93'	14.30M	40.20'	12.25M	43.48'	13.25M	62.19'	18.95M	58.91'	17.95M	30.90'	9.42M	32.03'	9.76M	6.57'	2.00M	21.99'	6.70M	18.08'	5.51M
DS 23/15.3-2	75.48'	23.00M	50.21'	15.30M	43.48'	13.25M	46.76'	14.25M	68.75'	20.95M	65.47'	19.95M	34.19'	10.42M	35.31'	10.76M	6.57'	2.00M	25.27'	7.70M	19.72'	6.01M
DS 25/16.3-2	82.04'	25.00M	53.49'	16.30M	46.76'	14.25M	50.05'	15.25M	75.32'	22.95M	72.03'	21.95M	37.47'	11.42M	38.59'	11.76M	6.57'	2.00M	28.55'	8.70M	19.72'	6.01M
DS 27/17.3-2	88.04'	27.00M	56.77'	17.30M	50.05'	15.25M	53.33'	16.25M	81.88'	24.95M	78.50'	23.95M	40.75'	12.42M	41.89'	12.76M	6.57'	2.00M	31.83'	9.70M	21.36'	6.51M
DS 29/18.3-2	95.17'	29.00M	60.06'	18.30M	53.33'	16.25M	56.61'	17.25M	88.44'	26.95M	85.16'	25.95M	44.03'	13.42M	45.16'	13.76M	6.57'	2.00M	35.11'	10.70M	23.00'	7.01M
DS 31/19.3-2	101.73'	31.00M	63.34'	19.30M	56.61'	17.25M	59.89'	18.25M	95.00'	28.95M	91.72'	27.95M	47.31'	14.42M	48.44'	14.76M	6.57'	2.00M	38.40'	11.70M	26.29'	8.01M
DS 33/20.3-2	108.30'	33.00M	66.62'	20.30M	59.89'	18.25M	63.83'	19.45M	101.57'	30.95M	98.29'	29.95M	50.59'	15.42M	51.72'	15.76M	6.57'	2.00M	41.68'	12.70M	26.29'	8.01M
DS 35/21.3-2	114.86'	35.00M	69.90'	21.30M	63.17'	19.25M	67.11'	20.45M	108.13'	32.95M	104.85'	31.95M	53.88'	16.42M	55.00'	16.76M	6.57'	2.00M	44.96'	13.70M	27.93'	8.51M
DS 37/22.5-2	121.42'	37.00M	73.84'	22.50M	67.11'	20.45M	71.38'	21.75M	114.70'	34.95M	111.41'	33.95M	57.16'	17.42M	58.28'	18.26M	8.21'	2.50M	47.58'	14.50M	31.21'	9.51M
DS 39/23.5-2	127.99'	39.00M	77.12'	23.50M	71.38'	21.45M	74.66'	22.75M	121.26'	36.95M	117.98'	35.95M	60.44'	18.42M	61.56'	19.26M	8.21'	2.50M	50.87'	15.50M	31.21'	9.51M
DS 41/24.8-2	134.55'	41.00M	81.39'	24.80M	74.66'	22.75M	77.94'	23.75M	127.82'	38.95M	124.54'	37.95M	65.37'	19.92M	64.85'	20.26M	9.85'	3.00M	53.16'	16.20M	34.49'	10.51M
DS 43/25.8-2	141.11'	43.00M	84.67'	25.80M	77.94'	23.75M	81.22'	24.75M	134.39'	40.95M	131.10'	39.95M	68.65'	20.92M	68.13'	21.26M	9.85'	3.00M	56.45'	17.20M	37.77'	11.51M
DS 45/26.8-2	147.68'	45.00M	87.95'	26.80M	81.22'	24.75M	84.50'	25.75M	140.95'	42.95M	137.67'	41.95M	71.93'	21.92M	71.40'	22.26M	9.85'	3.00M	59.73'	18.20M	41.05'	12.51M



PLAN
(EXTENDED)



ELEVATION
(RETRACTED)

NOTES:

1. ROTUNDA DIMENSIONS (NOMINAL) -
   DOOR OPENING AT TERMINAL: 1.25M x 2.315M.
   ROTATION: ± 45° (90° TOTAL)
   BRIDGE SWIVEL RANGE: +/- 45° STANDARD
   + 82° to - 8° w/ ADAPTER
   - 82° to + 8° w/ ADAPTER
2. TUNNEL INTERIOR DIMENSIONS (NOMINAL) -
   A - TUNNEL: 1.224M x 2.110M.
   B - TUNNEL: 1.494M x 2.395M.
3. ROTATING CAB DIMENSIONS (NOMINAL) -
   CANOPY WIDTH: 2.40M
   ROTATION: 90° LEFT ONLY
4. LIFT AND DRIVE DIMENSIONS (NOMINAL) -
   HYDRAULIC LIFT CYLINDER STROKE: 120"
   WHEEL ROTATION: 90° LEFT AND 90° RIGHT (180° TOTAL)
5. MECHANICAL STOPS ARE + 2.36" (60mm) PAST ELECTRICAL LIMITS.
6. RECOMMENDED RETRACTION AND EXTENSION IS 39.37" (1M) SHORT OF ELECTRICAL LIMITS.
7. TUNNEL DROP: .492" (150mm)

LTR	DATE	REVISIONS
A	5/5/99	

THYSSEN STEARNS
AIRPORT ENGINEERING and EQUIPMENT

TITLE: BRIDGE_OPERATIONAL_LIMITS
TSI_DUAL_BRIDGE_TWO_TUNNEL

DRAWING FILE NAME	SIZE	DWG NO.	REV
A8-209482A1	D	A8-209482	A

SCALE 1" = 10' | RELEASE | SHEET 1/1

A ThyssenKrupp Industries company

Thyssen Stearns Inc.

ThyssenKrupp

TECHNICAL DESCRIPTION

THYSSEN PASSENGER BOARDING BRIDGE
For Regional Aircraft

Type: APRON DRIVE / Steel Version

Thyssen Stearns Inc.
3201 N. Sylvania Ave., Suite 100E
Fort Worth, Texas 76111
Telephone: (817) 210-5000, Fax: (817) 834-6985
e-mail: info@tsibridges.com
Internet: www.thyssenkrupp.com

SUMMARY

1 GENERAL

1.1 Scope of work

The scope of work comprises all performances that are necessary for the manufacture of an operational passenger boarding.

The scope of work comprises design, manufacture, inspection, testing, packing and shipping, complete erection on the airport including acceptance and commissioning of all installation parts.

1.1.1 Application

The THYSSEN HENSCHEL passenger boarding bridge provides a safe and weatherproof access, for passengers to the various types of parked aircraft.

Each passenger boarding bridge comprises the following main assemblies:

- the column
- the rotunda
- the telescopic part in the form of two tunnels sliding into one another
- the elevating leg
- the drive unit
- the rotatable cabin (bridgehead)
- the service stairs

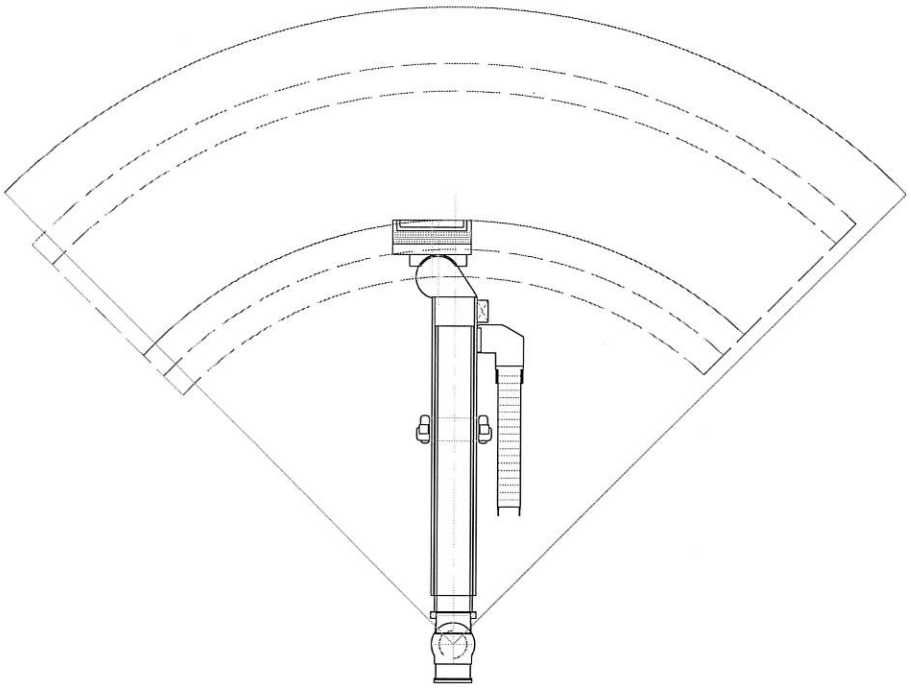
Movements of the passenger boarding bridge are controlled from the control panel located in the bridgehead.

1.1.2 Movement capabilities

The THYSSEN HENSCHEL PBB can be manoeuvred on the apron freely in each direction required within the arc of operation. Circular and radial drive occurs separately.

In case of need the independently driven apron drive wheels can be contra-rotated to permit adjustment at one point.

Height adjustment can be undertaken simultaneously with telescopic movements of the bridge.



1.1.3 Manufacturing quality

Manufacturing quality, of the highest standards, is guaranteed to meet the severe continuous wear conditions associated with passenger boarding bridges on their place of installation.

1.1.4 Technical definitions

For interpreting the specification the following words and expressions are defined thus:

Passenger boarding bridge	General term which describes a complete unit. It provides a safe and weatherproof access, for passengers to the various types of parked aircraft.
Passenger boarding bridge Type: Apron Drive:	A special design which possesses 3 degrees of liberty: - rotation - raising/lowering - telescopic movements
Gate, Position	Term describing the numbered entrances/exits for arriving and departing passengers in the airport terminal building
Tunnel	The individual tubular sections of a bridge - telescoping into one another
Rotunda	Element of the PBB, which connects the PBB to the airport terminal or to the fixed linkbridge
Column	Support base assembly that carries the rotunda.
Cabin (Bridgehead)	The rotatable aircraft side end of a PBB that docks to the aircraft.
Drive unit	Powered wheel and support assembly that carries the bridge and moves the passenger boarding bridge on the apron.
Elevating leg	Assembly upon which the bridge is raised/lowered

1.1.5 Acceptance

The scope of work includes an internal works acceptance of the PBB or of its main components. For the first passenger boarding bridge an acceptance by the customer in our works is provided. Besides the before mentioned internal test and acceptance procedures the following tests and acceptances will be carried out:

a) Testing and acceptance carried out by the technical control office TÜ Hessen, in detail:

a.a) Preliminary checking of the technical documents on the basis of a standard construction which has already been tested regarding:
- calculation
- electrical wiring diagram
- hydraulic scheme
- manufacturer's confirmation

a.b) Design and acceptance test in the manufacturer's works
-design test, spot-check
-functional testing
-examination of the equipment relevant regarding safety regulations

a.c) Final acceptance of the PBB on the airport
-functional test
-checking of the equipment being relevant regarding safety regulations

Note:

A load lest is not provided. Concerning this, see the test certificates enclosed in register? On the statical and dynamical load test of an apron drive passenger boarding of the same design which has been carried out in our works.

1.1.6 Spare parts

Concerning this, see the commercial part of our offer.

1.1.7 Technical documentation

The technical documentation comprises:

- Operating and maintenance instructions (operating manual),
- Other documents.

a) Operating and maintenance instructions (operating manual)

Detailed operating and maintenance instructions for the passenger boarding bridge will be prepared according to the following scheme. A preliminary copy (DRAFT) of the operating manual will be furnished 8 weeks prior to delivery of the bridges.

"X" copies of the definite operating manual will be furnished on delivery of the bridges.

Volume 1 Operating and Maintenance Manual

This volume comprises:

- Generalities, scope, date of issue, application, definition of terms,
- Technical information, supplements,
- Basic safety instructions and special safety instructions,
- Technical description,
- Operating instructions,
- Maintenance instructions,
- Notes to the maintenance instructions,
- if required safety data sheets,
- Description of the hydraulic installation.

Volume 2 Parts list (if possible vol. 2.1 - 2.n)

This volume comprises modified parts lists of the subassembly drawings (size A4)

Notes to the parts list,
- List of the main assemblies of each PBB,
- Lists and drawings of the main assembly COLUMN,
- Lists and drawings of the main assembly ROTUNDA,
- Lists and drawings of the main assembly TUNNEL,
- Lists and drawings of the main assembly BRIDGEHEAD/CABIN,
- Lists and drawings of the main assembly ELEVATING SYSTEM,
- Lists and drawings of the main assembly DRIVE UNIT,
- Lists and drawings of the main assembly SERVICE STAIRS,
- Lists and drawings of the main assembly GENERAL/ACCESSORIES,
- Lists and drawings of the main assembly DETACHABLE PARTS/OTHERS.

Volume 3 Annexes to the operating instructions

This volume comprises further descriptions of the manufacturers, -piece parts-lists.

Volume 4 Electric schemes (possibly volume 4.1 - 4.n)

This volume comprises:

- Schematic wiring scheme,
- Explanations to the schematic wiring scheme, (if possible included in the wiring scheme)
- terminal and cable diagram

Note:

- The operating and maintenance manual is furnished in English language.
- Schematic and physical wiring schemes are drawn up in size DIN A4 according to DIN 40719-part 2. The designation of the electrical appliances and lines is realized in accordance with the demands for passenger boarding bridges, i.e. analogous to DIN 40719-part 2.

b) Additional documents

The technical documentation will be completed by the documents described in the following.

These documents will be supplied 4 weeks after acceptance on the airport.

Volume 5 Test documents (if possible volume 5.1 - 5.n)

This volume comprises the checklists of the functional testing.

This document will be supplied in 1 copy.

Volume 6 Approval drawings (possibly volume 6.1 - 6.n)

This volume comprises copies of the drawings released for execution according to the list of documents to be presented for approval.

This document will be supplied in 1 copy.

Note:
The operating and maintenance manual will be furnished in English language

1.1.8 Training

Concerning this, see the commercial part of our offer.

2 DESIGN PARAMETERS

2.1 General criteria

2.1.1 Safety

The safety of all personnel (passenger and airport/airline staff) has overriding priority.
In the event of power failure or interruption, spring-loaded brakes operate on all bridge movement functions. This concept applies equally for the valves of the hydraulic drive to the elevating leg.
Mechanical stops are fitted to protect from dangerous over-running, especially in areas where components may become loose from supports, guides, or limit devices. Additionally to the mechanical stops, length or angle detectors as well as limit switches are provided for all main bridge drive movement functions (telescoping, swivelling around the rotunda, rotation of the drive unit).

Detailed descriptions of the electrical protection can be found in the chapters concerning "Limit switches" of chapter 5 SUBASSEMBLIES, COMPONENTS AND DETAILS. Further information on safety can be found in chapter 7 Safety systems.

2.1.2 Fire protection

With the following measures a comparatively high fire protection according to NFPA-415 is achieved for the offered THYSSEN HENSCHEL passenger boarding bridges.

a) Tunnel supporting structure and all other supporting components made of steel

b) Interior equipment of non or difficult inflammable materials

c) Wires in the electrical cabinet are provided with a flame retardent, halogen free insulation out of polyolefine cross linked by irradiation

d) Multicore lines to the loudspeakers and the fire alarm button (if installed) are realized as fire resistant lines with a maintenance of function of 180 minutes in case of a fire with a temperature of 750°.

e) Canopy side parts made of non-inflammable Trevira/glass fibre fabric (TG5)

f) Double bottom with mineral wool insulation for both bridge tunnels (with the exception of the fixed ramp of the A-tunnel.

g) Side wall panels with mineral wool insulation

h) Brush sealing between the tunnel elements.

i) Service door made of zinc coated steel sheet with mineral wool insulation and fireproof window; with automatic door closer.

2.1.3 Maintenance

THYSSEN HENSCHEL passenger boarding bridges are designed for an easy maintenance.

The few points that still are to be lubricated are easily accessible and so designed as to prevent excess lubricant from leaking into the passenger boarding bridge or onto the apron areas.

Individual mechanical, hydraulic, and electrical assemblies, used in the passenger boarding bridge, are so installed that they can be replaced easily and quickly.

2.1.4 Special devices for care and maintenance of the passenger boarding bridges

The following additional devices are part of the equipment of the passenger boarding bridge and are included in the scope of supply:

a) oil filter key

b) adjusting key for roller door motor

c) universal key for switch gear cabinet

d) 2 roller curtain keys

2.2 Structural characteristics

2.2.1 Operational life span:

THYSSEN HENSCHEL PBB is designed for an operating life of at least 20 years. It is assumed that the PBB will be operated and maintained by airport personnel or their approved agents, in accordance with the instructions given in the operating and maintenance manuals. This especially applies to the immediate elimination of damages at the bridge painting. All parts subject to normal wear and tear should be replaced or renewed in good time.

2.2.2 Anti-corrosion protection:

To achieve the long lifespan expectation, applicable in an airport environment, a corrosion protection system is used which is based on EPOXY or POLYURETHANE materials and the supporting panel sheets used in the telescopic tunnel as well as all other supporting sheet metal up to a thickness of 4 mm are generally hot dip galvanized.

A detailed description of the anti-corrosion system used for THYSSEN HENSCHEL PBB is enclosed in register 1 of this offer documentation.

The passenger boarding bridges are painted outside in all parts in a uniform colour of the category "A" (see register "X") which will be defined later with the exception of the drive system and all add-on pieces as telescopic drive, autoleveller, roller units etc. which will be painted uniformly in the colour RAL 9005 (black).

2.2.3 Loads

The following loads are the basis for the dimensioning of the passenger boarding bridge:

Bridge in operation, totally extended:	
Payload	40 psf
Roofload	16 psf
Wind velocity (operation)	60 mph
Bridge during manoeuvring:	
Roofload	16 psf
Wind velocity	60 mph
Bridge out of operation, totally retracted	
Roofload	16 psf
Wind velocity	100 mph

Note:
Additionally there are individual loads for aircraft supply units (if available):
- Pre conditioned air
- Ground power supply
- Potable water supply

2.3 Environmental criteria

All materials and components are selected for a long life span, taking particular account of the climatic conditions that apply at the airport, i.e.:

Temperature from - 25° to +125° F

Relative humidity 100 %

Corrosive saline environment

3 STANDARDS AND REGULATIONS

The offered THYSSEN HENSCHEL passenger boarding bridges are designed according to the German (DIN, VDE), the European (EN, FEM), the International (ISO, IEC) standards as well as the corresponding IATA recommendations. Furthermore, the EG directives for machines (89/392/EWG) as well as its supplements (91/368/EWG) and (93/44/EWG) and the directive for low voltage (73/23/EWG) as well as its supplements (93/68/EWG) will be taken into consideration.

Furthermore the safety recommendations made up to now by the CEN work-group "Passenger boarding bridges" will be taken into consideration at the time of manufacture. (pr EN 12312-4, edition 1999, issued by the CEN/TC 274).

Additionally we will take the fire protection measures that we described under item "2.1.2 Fire protection" on page 5.

3.1 Mechanical

The design, calculation, dimensioning and manufacture of mechanical assemblies are in accordance with good engineering practice and as set out in the following literature:

- Dubbel, Vols. 1 & 2 - Mechanical Engineering pocket book
- HUETTE II A - Mechanical Engineering
- HAENCHEN - New resistance calculations for mechanical engineering
- VD1 - Guidelines (German Engineering Institute)
- TUV - Guidelines (German Technical Supervisory Assoc.)

3.2 Electrical

The electrical appliances, motors and installations are executed according to the regulations of VDE DIN, EN and IEC. Only materials and equipment marked with the VDE test mark or if provided with the CE symbol will be used.

The total equipment complies with the relevant EMV regulations.

The used electrical lines, devices and boards are approved by UL.

Electrical connection schemes or wiring diagrams are made up in size DIN A4 according to the DIN standard 40719- part 2. The designation of the electrical devices and lines is realized in accordance with the demands for passenger boarding bridges; i.e. analogue to DIN 40719 part 2.

4 PERFORMANCE DATA

4.1 Bridge dimensions

4.1.1 Main dimensions

Type	$L_{max.}$ (ft)	L_{min} (ft)	$L_{max.}$ (m)	L_{min} (m)
DS 15,0/11,3-2	49.23	37.08	15.0	11.3
DS 17,0/12,3-2	55.79	40.36	17.0	12.3
DS 19,0/13,3-2	62.35	43.65	19.0	13.3
DS 21,0/14,3-2	68.92	46.93	21.0	14.3
DS 23,0/15,3-2	75.48	50.21	23.0	15.3
DS 25,0/16,3-2	82.04	53.49	25.0	16.3
DS 27,0/17,3-2	88.04	56.77	27.0	17.3
DS 29,0/18,3-2	95.17	60.06	29.0	18.3
DS 31,0/19,3-2	101.73	63.34	31.0	19.3
DS 33,0/20,3-2	108.30	66.62	33.0	20.3
DS 35,0/21,3-2	114.86	69.90	35.0	21.3
DS 37,0/22,5-2	121.42	73.84	37.0	22.5
DS 39,0/23,5-2	127.99	77.12	39.0	23.5
DS 41,0/24,8-2	134.55	81.39	41.0	24.8
DS 43,0/25,8-2	141.11	84.67	43.0	25.8
DS 45,0/26,8-2	147.68	87.95	45.0	26.8

$L_{max/min}$ each measured from the middle of the rotunda up to the front edge of the cabin bumper when the cabin is in straight position!

4.1.2 Interior dimensions

Tunnel A	clear width	approx.	48.2 in
	clear height	approx.	83.07 in.
Tunnel B	clear width	approx.	58.8 in.
	clear height	approx.	94.3 in.
Rotunda	clear inner diameter	approx.	59.1 in.
	clear width to the building	approx.	49.2 in.
	clear height	approx.	90.9 in.

Cabin	clear diameter	approx.	59.1 in.
	clear width to the tunnel	approx.	46.9 in.
	clear height	approx.	93.9 in.
	clear canopy width	approx.	94.5 in.
	clear width of cabin closing door	approx.	65.2 in.
	clear height of cabin closing door	approx.	93.7 in.
Service stairs/- door	clear service door width	approx.	30 in.
	clear service door height	approx.	80 in.
	clear service stairs width	approx.	31.5 in.

4.2 Operating range

Type	**Telescopic range (ft)**
DS 15,0/11,3-2	12.14
DS 17,0/12,3-2	15.42
DS 19,0/13,3-2	18.70
DS 21,0/14,3-2	21.98
DS 23,0/15,3-2	25.26
DS 25,0/16,3-2	28.54
DS 27,0/17,3-2	31.82
DS 29,0/18,3-2	35.10
DS 31,0/19,3-2	38.39
DS 33,0/20,3-2	41.67
DS 35,0/21,3-2	44.95
DS 37,0/22,5-2	47.57
DS 39,0/23,5-2	50.85
DS 41,0/24,8-2	53.15
DS 43,0/25,8-2	56.43
DS 45,0/26,8-2	59.71

Elevating range

(Service height above apron)

min.	approx. 3.58 ft.	Dash 8
max.	approx. 13.45 ft.	TU 204

Each measured from the apron surface to the upper edge of the cabin sill.

Drive unit-swivelling range	
To the left	Approx. 90°
To the right	approx. 90°
Rotunda-swivelling range	adapted to the situation

To the left	approx. 45°
To the right	approx. 45°

Cabin-swivelling range

To the left	approx. 93°
To the right	approx. 3°

4.3 Operating speeds

Bridge driving speed
(measured at the drive unit)

Normal speed	from 0 to approx. 79 ft/min.
Slow speed	from 0 to approx. 23 ft/min.

Bridge lifting and lowering speed
(measured at the elevating leg)

Lifting	approx.	3.28 ft/min.
Lowering	approx.	3.28 ft/min.

Cabin rotation	approx.	2.6 °/sec
Canopy rotation	approx.	2.0 °/sec

4.4 Driving power (nominal performance at 50 Hz/60 Hz)

Elevating drive		approx.	6.4/7.8 hp (s2)	
Drive motor, altogether	2 x	approx.	10 hp	=approx. 20 hp (S2)
Cabin rotation drive		approx.	0.4/0.5 hp (S2)	
Canopy swivelling drive		approx.	0.8/0.8 hp	
Cabin floor drive		approx.	0.16/0.19 hp	
Roller door drive (if available)		approx.	0.2/0.2 hp	

4.5 Power consumption (connected loads)

Drives and auxiliary equipment

- power consumption approx. 25 KVA
- 3 x 480 V (± 10 %) + PE + N; 60 Hz (± 2 Hz)
- protected by 3x63 A

The electric power supply to the connecting box "ENERGY" at the column is provided by others.

5 SUBASSEMBLIES, COMPONENTS AND DETAILS

5.1 Transition to the building/to the walkway

The passage to the walkway/building is realized by a continuous NEOPRREN profile. One the one side it is fixed to the end of the rotunda adapter and on the other side it is fixed directly to an even surface at the walkway/building.

A painted steel sheet that serves as weather protection is finally arranged above this passage. Stainless screws fasten steel sheet and NEOPREN profile.

A ramp sheet (rolled INOX-sheet) bridges the gap at the flooring. Forces which result from the mobile bridge is not transferred to the building/walkway.

5.2 Foundation for column

The foundations are provided by other suppliers.

A ground installation according to DIN VDE 0185 or NFC 15.100 must be provided in the foundation realised by other suppliers. All safety measures concerning equipotential bonding/grounding are adapted to this standard.

5.3 Column

5.3.1 General description

The column forms the fastening base of the rotunda. All horizontal loads of the THYSSEN HENSCHEL passenger boarding bridge are leaded into the foundation via the column.

The column consists of the tubular body and the flange plates out of high-strength steel welded above and below.
The column is protected by means of an EPOXY or POLYURETHANE coating.

5.4 Rotunda

5.4.1 General description

The rotunda and the column, which is securely fixed to the apron via flange plate and anchor bolts, form the horizontal and vertical joint of the PBB.

The rotunda flooring, the ceiling and the sidewalls form the fixed part of the rotunda. These parts are firmly attached to the column via an intermediate assembly.

The support frame, tunnel support and support frame base, form the moveable part of the rotunda.

The vertical and horizontal load bearing of the passenger boarding bridge onto the column is realised with a ball bearing turntable. The ball bearing turntable permits an uninterrupted radial swing of the PBB around the rotunda axis. The system has long life lubrication and is designed for regreasing.

The rotunda flooring is manufactured in framework construction and consists of steel profiles. The floor plate out of sheet steel is welded on the flooring framework. For mounting purposes the rotunda flooring is equipped with removable square floor plate. The floor covering is stuck on the floor plate.

In direction to the inner tunnel the rotunda is fitted with all-around elastic sealing as protection against adverse weather conditions (rain, snow, and wind).

The sides of the rotunda are equipped with roller walls. The roller wall is mounted on its spring drum on the turnable rotunda support frame and on the other side with the fixed rotunda support frame.

This drum is arranged on the support frame via a lifetime lubricated deep groove ball flange bearing.
During the rotation movements of the rotunda one roller curtain is wound up on its spring-loaded drum while the other winds out. Pre-stressed spiral springs are fitted which guarantee that the roller curtain remains tensed,

independently of the curtains rolled in or out status.

Both spiral springs are connected with a re-stretchable chain that supports the winding in and out of the roller walls. The chain is re-stretchable.

The life-time lubricated ball bearing mounted guide rollers, which extend along the total length of the roller curtains maintain a constant gap width to the interior cladding panel.

The static support assemblies of the rotunda consist of steel and are protected with an EPOXY or POLYURETHANE coating.

5.4.2 Rotunda adapter

The rotunda adapter forms a tunnel-shaped passage from rotunda to walkway/building.

On the one side the adapter is welded to the rotunda extension. On the other side it forms a fastening base for the flexible passage. The adapter is realised as a one-sheet design. The sheets for the roof and the sides form at the same time the outer and inner cladding. The floor is covered with a floor covering according to 5.4.5.

The adapter consists of 4mm thick hot dip galvanised steel sheet and is additionally protected with a painting on an EPOXY- or POLYURETHAN.

5.4.3 Side wall cladding

The side wall cladding is made of steel sheet and with a coating on an EPOXY or POLYURETHAN basis which matches with the interior fittings of the tunnels.

5.4.4 Ceiling cladding

The rotunda ceiling of hot dip galvanised steel sheets with plastic coating on the visible surface.

The sheets are posed with a gap at the joints. Partly they are stuck to the supporting design and partly the are screwed at non-visible places. Floor covering

5.4.5 Floor covering

Without floor covering. The rotunda floor is prepared for the laying of a floor covering by other suppliers.

5.4.6 Roller walls

The roller walls consist of hot dip galvanised steel sheet profiles and remain unpainted.

5.4.7 Limit switches

The horizontal radial movements, of the PBB, around the rotunda are exclusively controlled by means of electrical components. Mechanical stops are not installed.

The radial movement is detected by means of an angle detector. The limit positions of the radial movement and the positions for changing over from normal speed to slow speed are determined in the programmable controller by means of this rotating angle measuring signal.

When overrunning the adjusted limit positions the mechanical safety switch is activated. This switches off the power supply independent of the PLC. The operation is only possible by authorised personal.

5.5 Tunnel

5.5.1 General description

The passenger boarding bridge comprises two sections one sliding inside the other. The airside section is called "B" and the rotunda-side section is called "A".

Tunnel "A" is flexibly linked to the rotunda support frame. The link support is maintenance-free and comprises a spherical plain ball bearing.

For the annual inspection the highly stressed link supports are easily accessible from outside.
The tunnel elements are horizontally and vertically guided to each other on the tunnel corner profiles by means of roller units or plastic sliding bearings.

For maintenance purposes the roller units are easily accessible from outside or from inside.

The bearings of the roller units are lubricated for lifetime and provided with a lubricating nipple for regreasing.

Water deflection profiles for melt and rain water are provided on the roof of the A- as well as on both sides in the overlapping zone.

The rainwater dripping from the inner tunnel is collected in the water ducts of the outer tunnel and discharged at the bridgehead end of the tunnel.

The floor interface transition between the tunnel elements is bridged by inter-ramps, with a very gentle incline aspect, for safe passage of passengers. An additional handrail is not required!

The tunnels are continuously built from fully supporting static panels in light gauge steel construction and present all around a completely smooth outer surface.

They are protected against corrosion by means of an EPOXY or POLYURETHANE coating. Due to this method, the tunnels are easily cleaned and resistant to dirt.

The neutral panelling structure, of the sidewalls, blends in with the existing facade of the building.

5.5.2 Special features

The fixed cab at the aircraft side end of the B-tunnel carries the rotating cabin. It forms the articulation of the cabin and is asymmetrically arranged to the tunnel axis. This arrangement provides considerable advantages for serving commuter aircraft with a propeller engine next to the door. Thus is achieved a maximum distance between fixed cab and rotating cab and the propeller engine.

The fixed cab consists of a fixed sheet wall on the right side in which are large window sized approx. 15 ¾" x 27 ½" is arranged. This gives the driver a very good view to possible obstacle and in particular to the engine (propeller) of the commuter aircraft.

The tunnel cross sections are smaller than the ones of the passenger boarding bridges that have been common up to now. However, this does not involve any disadvantages because the number of passengers of the aircraft that are to be served is smaller (see 4.2 Operating range). The smaller tunnel cross sections have been chosen in order to keep the moving masses small. This facilitates the manoeuvring in the proximity of the aircraft contour and minimises the risk of damaging the aircraft.

5.5.3 Side wall cladding

Hot dip galvanized steel sheets panels of width of 39 3/8 inches with plastic coating) on the visible surface are provided.This sheets are posed with a gap at the joints. Partly they are stuck to the bearing construction and partly they are screwed at non-visible places.

The side wall cladding is sufficiently ventilated at rear in order to protect from condensation water.

5.5.4 Ceiling cladding

Hot dip galvanized steel sheets panels of width of 39 3/8-inches with plastic coating on the visible surface are provided.
The sheets are posed with a gap at the joints. Partly they are stuck to the bearing construction and partly they are screwed at non-visible places.

The ceiling cladding is sufficiently ventilated at rear in order to protect from condensation water.

5.5.5 Floor covering

Without floor covering in the tunnel area.

The tunnel flooring is prepared for the laying of a floor covering by other suppliers.

In the area of the fixed cab (tunnel end in the area of the service door) are provided difficult inflammable nopped rubber tiles, make FREUDENBERG.

5.5.6 Limit switches

5.5.6.1 Limit switch telescopic movements

A tunnel length measuring system detects the telescopic movement. The end positions "retracted" and "extended" and the positions for changing over to slow speed are determined in the programmable controller by means of this tunnel length measuring system.

Before the mechanical limits are reached the mechanical safety limit switch is activated in case of overrunning the adjusted limit positions. This switches off the power supply independent of the PLC. The reoperation is only possible by authorized personal.

5.5.6.2 Limit switch service door

If the bridge is completely retracted the inner tunnel A overlaps the service door. In order to avoid injuries this limit switch has to cut off the drive motors independent of the programmable controller if the service door is open.

5.5.7 Lighting

A light tube system is installed as ceiling lighting in the right upper tunnel edge. It consists of 13-ft. units that form in combination a continuous light tube system over the entire tunnel length.

The light outlet openings are provided with an acrylic covering and approx. 48 inches long (depending on the type). A closed field of approx. 2 to 4 3/8 inches (depending on the type) is annexed to each with control devices or batteries (battery only for emergency lighting).

The normal lighting is controlled via a pushbutton in connection with the PLC. The pushbutton is located in the electrical cabinet door. The lamps of the emergency lighting are permanently switched on.

If further pushbuttons are required they will be indicated under chapter 5.5.10.

5.5.8 Cable guide system

All lines from the stationary to the movable bridge part are directed via cable trolley systems. The cable trolley system for the electrical equipment is provided on the side where the switch gears cabinet is located in the fixed cab.

5.5.9 Service door

The service door made of galvanized steel sheet is mounted in the fixed cab. It serves as access for airport staff and crew members and it can be used in all operating positions of the THYSSEN HENSCHEL passenger boarding bridge.

5.5.10 Additional equipment

5.5.10.1 Lighting switch

A four-edge operation button for switching the interior lighting on or off is provided outside next to the service door.

5.5.10.2 Sockets

A double socket is provided in the electrical cabinet for the power supply of an A 120V/15A alternating current device.

The socket is protected via a residual current operated device with a braking current of 30 mA and is individually protected by a circuit breaker.

5.5.10.3 Fastening for 400 Hz-installation

We have provided corresponding fastening points for the 400 Hz installation.

5.5.10.4 Fastening for PC-Air-installation

We have provided corresponding fastening points for the installation of the supports for the PC-air system.

5.5.10.5 Floor insulation

The flooring is insulated with 2 3/8-inch thick mineral wool and provided with a panel covering.

5.5.10.6 Floor covering

Steel sheet panels cover the floor with plastic coating on the bottom side.

5.5.10.7 Side wall insulation

The sidewall is insulated with 2 3/8-inch thick mineral wool.

5.5.10.8 Tunnel sealing

The tunnel sealing is to seal the gap between the tunnels as far as possible.
For this purpose brush strips are installed at the inner tunnel, which prevent to a large extent a penetration of smoke, dust etc.

5.5.10.9 Search light for engine

This searchlight is to illuminate the engine of commuter aircraft. It is installed outside at the top of the apron side end of tunnel B.

The searchlight is provided with a bulb 1x300 watt. It is switched on via a rotary switch on the control panel in connection with the programmable controller.

5.6 Cabin

5.6.1 General description

The bridgehead provided for docking to the aircraft is pivot mounted at the extremity of the larger tunnel, and is designed as to allow a swivelling of a total of 96° around the fixed cab.

Similar to the system used on the rotunda, roller wall fitted to spring loaded drums roll in or out depending on the direction of swivelling.

The roller wall is fixed at one end onto the spring-loaded drum. The drum is fitted to the bridgehead support via long term lubricated, grooved ball, flange bearings.

Spiral springs, inside the spring drum, guarantee that the roller wall remains under tension, independently of its rolled-in or out condition.

The lifetime lubricated ball bearing mounted guide rollers, which extend along the total length of the roller wall, maintain a constant gap width to the interior-cladding panel.

The cabin is guided at the cabin floor by guide rollers with lifetime lubricated roller bearings. On the roof it is guided by a central articulation with lifetime lubricated spherical bearing.

The control panel described under chapter Control panel is arranged in the left hand corner of the cabin.

The cabin floor consists of a frame made of steel-hollow profiles. This construction is covered at the top by a sheet that partly projects into the fixed cab. The gap between floor sheet and fixed cab floor is approx. 3/8 mm. This permits a passing without any danger.

This floor sheet serves as transition ramp for the passengers between the cabin and the tunnel and at the same time it serves as stand for the driver. A handle for the driver is installed at the left rear cabin wall. The floor covering is directly stuck onto the floor sheet.

The cabin walls consist of self-supporting, smooth sheets. In this place hollow profiles are not provided.

The cabin ceiling consists of a frame of steel-hollow profiles. Sheets at the top cover this construction and at the bottom which form the outside or inside coating.

The static support assemblies of the cabin consist of steel and are protected with an EPOXY or POLYURETHANE coating.

5.6.2 Special features

Due to the asymetrical arrangement of the fixed cab and the cabin articulation point a maximum distance between cabin and propeller engine is reached in case of serving commuter aircraft where the propeller engine is located next to the door.

The cabin is kept very compact in order to keep the moving masses small. This facilitates the manoeuvring next to the aircraft contour and minimizes the risk of damaging the aircraft.

Furthermore the cabin is provided with a special design of the cabin floor which also permits to serve aircraft with a door and stairs opening downward and with a railing on one or on both sides without any problems.

The cabin possesses a special canopy that is lower and fitted with more plies than the standard canopy. This guarantees the best possible sealing for the range of aircraft provided to be served especially for the commuter aircraft.

5.6.3 Front cabin floor (cabin sill)

The cabin sill has to permit a safe passage between aircraft and passenger boarding bridge without causing any damage to the aircraft.

The cabin sill is supported by lifetime lubricated rollers which permit a lateral displacement. It consists of a framework design to which a floor covering is fixed (see 5.6.6 Floor covering in the cabin sill). At the right edge is installed a railing provided with a baseboard, a strip at knee height and a handrail. A safety chain protects the gap between railing and right cabins wall if the cabin sill is displaced to the left side.
A flat bumper of weather resistant elastic material is fitted to the front border edge of the cabin sill.
In case of aircraft without stairs the bumper lies at the fuselage and in case of aircraft with stairs the bumper lies at the fuselage and on the upper service stair. Due to the flat design a simple and safe passage especially for wheel chair drivers is also guaranteed in case of docking to the aircraft stairs.

In case of aircraft stairs without railing the cabin sill remains in its extreme right position. This allows serving the aircraft in the same way as the standard bridge.

If a railing exists at one side the cabin sill is displaced to the left. Then the aircraft is docked. The railing of the aircraft stairs projects into the area that is given free from the displaced cabin sill. Then the cabin sill is moved back to the right up to railing.

If a railing exists at both sides the docking procedure is similar to the one with a one-sided railing. However, the area between both railings has to be bridged by a light ramp of glass fibre reinforced plastic (GFK).

5.6.4 Roller wall

The roller walls consist of hot-dip galvanized steel sheet profiles and remain unpainted.

5.6.5 Floor covering in the cabin

Difficult inflammable nopped rubber tiles are provided as floor covering.

5.6.6 Floor covering in the cabin sill

The outside floor in front of the cabin-closing door is equipped with an aluminium structure sheet.

5.6.7 Cabin closing door

The cabin opening facing the aircraft is closed with a roller door made of aluminium. The roller door is painted in a standard colour of the manufacturer.

5.6.8 Canopy

The cabin is equipped with a flexible bellows canopy which docks closely against the aircraft and surrounds the passageway ports as well as the opened aircraft door.

The canopy adjusts automatically to the fuselage contour, of each type of aircraft, by means of a special canopy kinematics.

To avoid damage of the aircraft's skin the canopy docks against the aircraft assisted by the canopy kinematics only under its own weight and with spring power support. The canopy is released from the aircraft by means of a cable retraction system operated with an axial cylinder motor with integrated planetary gear (canopy drive).

The canopy below is made of T5 (Roof)/TG5 (both Sides) -material; the individual plies are framed by an aluminium frame. Limitation belts determine the maximum rotation angle.

The three-section canopy bumper is filled with foamed material.
All three parts can be exchanged separately.

5.6.9 Automatic height adjustment (autoleveller)

A height adjustment control device is fitted on the right side of the cabin (as seen looking towards the aircraft), which ensures that the docked cabin **automatically** maintains interface alignment with the aircraft door sill. The rubber tyred sensing wheel exerts a pressure of l0 daN max. against the aircraft. The contact to the aircraft is controlled.

As soon as the key switch, on the main control panel, has been selected to "AUTOMATIC" all other motor powered bridge movements are locked out; i.e. the PBB can only be raised or lowered by means of the autoleveller system.

The autoleveller system compensates height variations, between PBB and aircraft fuselage, exceeding 1 inch. The height adjustment-sensing wheel activates the relevant position switch, for control of raising or lowering, by means of a control element. An additional positioning switch for each direction serves for height adjustments exceeding 2 inch and for the control of the respective switch for 1 inch.

In the event of system failure an acoustic alarm is activated in addition. The adjustment period is limited to 5 s max. If in case of a failure the adjustment period exceeds 6 s the current supply for all drives is disconnected independently of the PLC. The reoperation is only possible after turning the operating mode selector into "Off" position.

5.6.10 Control panel

The control panel is installed in a recess at the left side of the rotating cabin.

It is divided into two parts:

a) A horizontal control panel plate with the following operating elements:
   - joystick for driving commands
   - EMERGENCY-OFF-button (see 8.2)
   - drive unit position indicator

b) A vertical control board with the following operating elements:
   - push buttons for auxiliary drives
   - selection of operating modes (see 6.7.3) - switch and key for auxiliary equipment

Its location secures a clear view of the apron. All command and display units that are necessary for the control of the bridge are located easily surveyable on this control panel. Special care was taken to the fact that the units allow an optimum operation.

The control panel plates are anodized aluminium plates to which characters and signs can be applied permanently and non-abrasively, if required.

Pushbuttons and switches are provided with lined commercial plates with the corresponding designation applied by factory. Pushbuttons are further equipped with insert plates with symbols regarding the corresponding direction of movement. All drives are controlled according to the dead man principle. They are switched on only as long as the key buttons are pressed.

The control panel is sufficiently protected against dust and water on the operator's side. The control switches are provided with a system of protection IP 65. A conductor collecting box for all outgoing lines is installed at the lower side and at the rear side like in the case of the switch gear cabinet.

5.6.11 Limit switches

5.6.11.1 Limit switch cabin rotation

The cabin swivelling movements are restricted by mechanical limit positions. Before reaching these end positions the swivelling drive, in the selected direction of travel, is disconnected via the progammable controller by means of magnetic limit switches. The rotation angle detector detects the current cabin position.

5.6.11.2 Limit switch canopy

Integrated limit switches limit the extension and retraction of the canopy.

5.6.11.3 Limit switch front cabin floor (in general)

The limit positions of the cabin floor are restricted by mechanical limit positions. Before they are reached the electric drive, in the selected direction of travel, is disconnected via the programmable controller by means of a mechanical limit switch.

5.6.11.4 Limit switch front cabin floor (for aircraft stairs)

In case of serving a commuter aircraft these limit switches have to protect the stairs folded downward especially the railing of these stairs.

The limit switches consists of a system of three contact bars. One contact bar is fitted to the right supporting structure of the canopy. It protects the right side of the aircraft stairs when driving to the left. One contact bar is fitted to the right side of the displaceable cabin floor. It protects the left side of the aircraft stairs when driving to the right or when displacing the floor to the right. One contact bar is fitted below at the front of the cabin. It protects the aircraft stairs and both railings when docking to the aircraft.

A horizontal force of approx. 11.2 LBF is enough for activating the contact bars.
When detecting an obstacle the contact bars generate signals.

5.6.12 Lighting

The cabin is equipped one built-on lamps. The lamp has two fluorescent lamps of 2x 36 watt.

5.6.13 Drives

5.6.13.1 Cabin drive for swivelling

A console, containing the cabin swivelling drive, is located on the lower cabin support. This comprises, in essence, of an AC gear motor with spring-operated disc brakes and a chain drive.
The drive is powered from a chain pinion located on the output gearing. Two chain guide wheels located on a rocker arm, grip around the chain.

Overload protection is achieved by means of a motor circuit breaker.

This drive is fitted with a simple and, practically maintenance free, solenoid operated spring actuated single-disk brake, to achieve optimal positioning accuracy.

5.6.13.2 Canopy drive for extension/retraction

The canopy, which is adjusted in the fore/aft direction, is driven by an A.C. motor integrated in the cable drum with a mounted spring operated single-disk brake and an additional planet gear.
Overload protection is achieved by means of a motor circuit breaker.

This drive is fitted with a simple and, practically maintenance free, solenoid operated spring actuated single-disk brake, to achieve optimal positioning accuracy.

5.6.13.3 Autoleveller drive forward/backward

An unventilated three-phase A.C. motor (rotary field magnet) drives the swivel arm of the autoleveller with additional planet gear.

The drive moves the swivel arm from the parking position towards the aircraft outside wall and backward again.

5.6.13.4 Roller door drive

No roller door drive. The roller door is operated manually.

5.6.14 Additional equipment

5.6.14.1 Spotlight under cabin

One searchlight (300 W) for the illumination of the area in front of the cabin is installed under the cabin. A rotary switch on the control panel in connection with the PLC activates it.

5.6.14.2 Telephone

An extension-telephone (wall apparatus) can be installed next to the control panel. The feeding lines and the fastenings are prepared.

5.6.14.3 Aircraft distance detection

An **ultrasonic sensor** is installed on the left side of the cabin below the cabin sill, on the right side of the cabin an **infrared-sensor** is installed next to the autoleveller. These sensors cause the compulsory change-over of the driving speed to slow speed if during approaching to an aircraft the distance to the aircraft becomes less than approx. 20 inches.

5.6.14.4 Window in the cabin closing door

6 view slots arranged in two vertical rows are provided in the cabin-closing door (roller door) in order to give the bridge driver a further improved view.

5.6.14.5 Roller curtain window

The right roller wall is fitted with 6 view slots which are vertically arranged in every second roller curtain slat in order to give the bridge driver a further improved view to the apron and in particular to the engine (propeller) of commuter aircraft. The left roller wall is fitted with 2 view slots.

5.6.14.6 Roller curtain covering

The roller curtain drums are provided with a covering along the entire height. This consists essentially of steel and is protected by a painting on an EPOXID and POLYUETHAN basis.

5.6.14.7 Lighting front cabin floor

The cabin floor in front of the cabin-closing door is sufficiently illuminated by a searchlight.

5.6.14.8 Safety chain

A single-strand safety chain is installed in front of the cabin-closing door. The chain links are painted in the signal colours yellow/red.

5.6.14.9 Electrically protected safety chain

The safety chain is electrically protected. If the safety chain is open the protection has to cut off the main.

5.7 Elevation system

5.7.1 General description

The elevation system is installed below the passenger boarding bridge; it executes the raising and lowering movements of the PBB gently and evenly.

The elevation unit is located towards the apron half way along the outer tunnel. This ensures sufficient space, between elevating leg and aircraft, for mobile ground handling equipment.

The elevation unit consists of the lower crossbeam, that rests upon the drive unit and the two telescopeable elevation legs. The outer guide pipe of the elevation legs is securely screwed to the outer tunnel. The inner guide pipe is fastened to the lower crossbeam. The sideways bearing of the telesopic tunnels is taken over by adjustable guide sheets made out of low wear, bearing material.

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One searchlight (300 W) for the illumination of the area in front of the cabin is installed under the cabin. A rotary switch on the control panel in connection with the PLC activates it.

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The elevation unit is located towards the apron half way along the outer tunnel. This ensures sufficient space, between elevating leg and aircraft, for mobile ground handling equipment.

The elevation unit consists of the lower crossbeam, that rests upon the drive unit and the two telescopeable elevation legs. The outer guide pipe of the elevation legs is securely screwed to the outer tunnel. The inner guide pipe is fastened to the lower crossbeam. The sideways bearing of the telesopic tunnels is taken over by adjustable guide sheets made out of low wear, bearing material.

The inner guide pipes with their visible guide surfaces are coated with zinc dust paint (cold galvanized). At the top and bottom the bridge is with its outer tunnel securely fastened to the outer guide pipes.

In the inside of the telescopic pipes the elevation legs is flexibly run on bearings and thus free of lateral forces. At the bottom of the cylinder are check valves which safely insure that no unintended lowering occurs e.g. when a hydraulic tube bursts.

On the lower elevation leg crossbeam is the hydraulic aggregate with high-pressure pump and control valve block. All hydraulic components are located for easy accessible maintenance.

Based upon the positive experience available and with reference to:

- reduced risks of breakdown
- little failure
- minimal inspection and operating costs
- simple maintenance

The elevation unit used in the THYSSEN HENSCHEL PBB is of the hydraulic type.

Raising and lowering of the bridge is made by means of two single stage hydraulic cylinders, which are supplied, from a hydraulic unit with integrated high pressure pump and valve block.
Automatic check valves, fitted to the elevating rams, prevent the lowering of the passenger boarding bridge, in the event of pipe/hose failure.

Operating pressure is approx. 2465 psi

The elevating cylinders are designed for a test pressure of 5076 psi. Hydraulic oil, type MOBIL SHC 542 should be applied as hydraulic fluid provided that it is available on the airport. Otherwise equivalent hydraulic oil should be used; approx. 48 gallons are required per bridge.

All static support assemblies are manufactured from high-grade steel and are protected with an EPOXY or POLYURETHANE coating.

5.7.2 Hydraulic scheme

See Register "X".

5.7.3 Drives

A three-phase motor drives the hydraulic aggregate. Concerning the nominal power see chapter 4.

5.8 Drive unit

5.8.1 General description

The cardan drive installation comprises a drive system frame, drive wheels with their tyres and drive motors with their wheel hub gear.

The drive unit is rotatably mounted to the elevation leg by means of a ball bearing turntable. This turntable absorbs the resultant static loads and permits a free and smooth swivelling of the drive unit. It has long-term lubrication and includes the ability of regreasing.

A cardanic coupling of the drive system, on the elevating leg, is achieved by means of the combination of the drive wheel axles with the rectangularily-arranged axles of the connecting pipes, which are below the turntable. Thus constraint forces created by, for instance, uneven apron surfaces are not transmitted to the bridge structure.

The drive unit frame carries the drive wheel axles and the rectangularily arranged axles of the connection pipes. Two support struts are located below the frame, which support it, on the apron, in the event of tyre failure.

All static supporting elements are made of high quality steel and protected by a colour coating on an EPOXY or POLYURETHAN basis.

5.8.2 Limit switches

The rotation of the drive unit is limited in such a way, that when 90° left or right has been reached the relevant directional drive is disconnected by the individual limit switch and the reverse direction is maintained until such time as the limit switch is no longer activated.

In the event of a failure of the corresponding magnetic limit switch, the applicable mechanical safety switch is operated. This disconnects the drive motor for rotation, in the relevant direction of travel, independently of the PLC.

A rotation angle detector detects the current position of the drive unit between the limit positions. The re-operation can only be done by authorized personal.

5.8.3 Drives

Each wheel is equipped with an individual drive. At identical speeds of the wheels, the drive unit is moved in a straight line forwards or backwards.

In the case of different speeds, the drive unit is turned to the left or to the right. For turning on the spot, the wheels are driven in counter-rotation.

Each wheel is mounted to a wheel hub gear which houses a planetary gear with correspondingly large multiplication. A four pole three-phase asynchronous motor with a spring pressure brake is directly flanged to the planetary gear. The motor is surface-cooled and is not equipped with an own fan. It is designed for short-time service (S2). A temperature switch is integrated into the motor winding for overload protection. A manual brake release installation is provided for venting the brake in order to be able to tow the PBB in the case of power failure. The release lever is detachable and is stored in the switch gear cabinet when it is not used.

In order to generate variable wheel or motor speeds with nearly constant torque, the motors are supplied independently from each other with the required variable three-phase voltage and variable frequency (U/f = constant).

For this purpose, a three-phase frequency converter is provided for each motor. The converters are made of semiconductor components without rotating parts and are electronically controlled. The frequency converter generates the three-phase voltage with a controlled DC-AC-converter from a direct voltage intermediate circuit with constant voltage. A filter and chokes in the input circuit prevents harmful effects on the supply network.

Different nominal and actual values can be displayed on a visual display with input keyboard and regulating parameters can be set.

The frequency converters are controlled and supervised independently from each other by the PLC. The nominal converter values are individually calculated in the PLC, that is, dependent on the joystick signals and the joystick control value.

- forward
- backward
- turn to left
- turn to right

This nominal value is formed in proportion to the excursion angle of the joystick lever, which is vertical in neutral position, but only, if the dead man key installed in the lever is pressed before excursion. The nominal values for forward or backward travel are divided into half in slow speed range. The frequency converter is provided for driving the asynchronous motors as well as for dynamically reducing the speed. Dynamic braking is required in case of changes of the nominal speed value and in case of self-propulsion of the passenger boarding bridge in certain inclined tunnel positions.

The spring pressure brake installed in each motor act as a stopping brake and as a safety brake if the dynamic brake does not operate.

For release, the spring pressure brake is supplied with direct current that is generated by rectifiers from the three-phase voltage supply network. It is controlled from two separate contactors that are controlled via separate outputs from the PLC.

With vented spring pressure brake, a signal for locking the drive system is transmitted to PLC.

Each of the two gear motors is fitted with a solenoid operated spring activated single-disk brake, which is released by controlled direct current.

The drive system brakes guarantee a safe and secure stationing of the passenger boarding bridge, under the relevant operational requirements, whenever it is parked.

These brakes can be released manually in the event of power failure, for instance, so that the PBB can be removed from the aircraft, by means of a tractor.

In case that the brakes are released manually signals are leaded to the programmable logic controller (PLC) to block the main drives.

5.8.4 Drive wheels

The drive wheels are equipped with demountable aircraft tyres fitted with air tube and rim band. The rim of the drive wheel is flanged to the hub gear. This permits to change complete wheels as for trucks.

5.9 Service stairs with landing

5.9.1 General description

The service stairs, with a landing and service door are fitted at the aircraft end of the bridge to allow access for service personnel to and from the apron.

The service stairs and the landing are equipped with a railing on both sides.
Access via the service steps is guaranteed at any operational position of the bridge.

The stairs are hinged to the landing. The steps change their slope according to the slope of the landing. The landing is screwed to the fixed cab.

All static support assemblies are manufactured from high grade steel and are protected with an EPOXY or POLYURETHANE coating.

5.9.2 Floor covering on landing

The landing is equipped with slip secure steps made from hot-dip galvanized steel sheet.

5.9.3 Service stairs

The service stairs are equipped with slip secure steps made from hot-dip galvanized steel sheet.

5.9.4 Additional equipment

5.9.4.1 Landing lighting

The landing and the stairs are sufficiently lightened by a lamp arranged at the top on the left next to the service door. A rotary switch on the control panel in connection with the programmable logic controller (PLC) switches on the lamp.

6 ELECTRIC SYSTEM (General)

6.1 General

The electric system corresponds to the VDE and CENELEC regulations being applicable at present. The device and installation material used is mainly commercial catalogue material of renowned manufacturers. The passenger boarding bridge is installed regarding modules. Each component forms an independent installation unit that can be tested separately. The single modules are connected to the switch gear cabinet or the connection box "ENERGY" by means of multicore lines. As far as necessary, these are plug connections.

6.2 Plug connections

Uniform devices make Harting, product line Han ... ES with system of protection IP 65 are used at the outside as plug connections. The contact inserts are provided with spring clamp connections (comparable to WAGO clamps). Socket and plug are identified by means of a marking in compliance with the electric diagrams. For best possible protection against atmospheric exposure, the plug connections are located as far as possible at the housing lower side. For plug connections inside of cabinets or housings, uniform open connector and spring strips make WAGO are used. They are also provided with spring clamp connections.

6.3 Terminal boxes

Terminal boxes are commercial steel sheet boxes, mainly with 7 7/8 in. x 7 7/8 in x 3 1/8 in. They are equipped with the required number of spring clamp connections make WAGO. The terminals and strip terminals are marked in compliance with the electric diagrams. The terminal boxes are marked outside at the supply line fitting by means of yellow weather-proof captive marking sleeves. Drain bores are located at the lower side.

6.4 Line entries

For the line entries in the outside, high-quality screw connections made of weather-proof polyamide and system of protection IP 68 are used. These are equipped with high-quality sealing and strain relief systems.

6.5 Connection box "ENERGY"

6.5.1 General description

A commercial steel sheet cabinet will be used as connection box "ENERGY", with an expected size of 47 1/4 in x 23 5/8 in. x 23 5/8 in. with system of protection IP 55. The door is locked by means of a cylinder lock. In the inside, the terminals for supply lines from the building are located, furthermore strip terminals, protective switches, low voltage relays, power supplies as well as the disconnect switch for the normal power supply line. Drain bores are located at the lower side of the housing.

Concerning the location see the arrangement drawing passenger boarding bridge enclosed in register "x".

6.5.2 Terminal dimensioning

The terminal for the supply lines from the building are dimensioned for the following cross section:

Normal power supply	6 to 2 awg
Power supply of lighting and auxiliary equipment (if available)	26 to 12 awg
Buffered supply for elevating system (if available)	26 to 12 awg
Auxiliary supply (if available)	26 to 12 awg
Power supply or command for obstruction light (if available)	26 to 12 awg

The terminal clamps are executed as cage clamps.

6.5.3 Power supply

The power supply is carried out via lines from the building provided by other suppliers. These lines are directed to the connection box "ENERGY".

The following lines are provided and connected at the installation of the bridge:

1) Normal power supply (maximum connecting cross section 2 awg), type of network TNC
   The normal power supply supplies in essence
   a) the drive motors, the auxiliary drives, the elevation system
   b) the lighting and the auxiliary equipment
   c) the buffered 24 V control network

The incoming lines are directed via a separating switch that is to be disconnected if the door to the connection box "ENERGY" is to be opened.

Single pole circuit breakers are provided for the protection of the individual electric circuits.

6.6 Electrical cabinet

6.6.1 General description

A recess at the side of the outer tunnel of the passenger boarding bridge serves as electrical cabinet. It forms part of the tunnel structure and is closed towards the fixed cab by means of a steel plate door covering the entire room height. The door is provided with profiled seals. Thus, sufficient protection against foreign matters, dust and water is provided for this location. The equipment rack for electric devices like relays, contactors, protective devices, the PLC, the frequency converters for the drive motors as well as the central strip terminal are located in the switch gear cabinet. The rack wiring is carried out by means of single core lines with high-quality insulation made of cross-linked polyolefine.

This material especially stands out for good mechanical strength, no halogen contents, flame resistant, and no development of corrosive gases and only low fume and smoke development in case of fire. These conductor lines are marked according to the electric diagrams.

The single core line colours are marked in accordance with the recommendations of EN60204 part 1 - 10.22 as follows:

Main circuit with alternating direct current	black
Protective conductor (T)	green/yellow
Control lines (< 60 V)	brown

Lines to nearly all other modules of the passenger boarding bridge are connected to the central strip terminal. These lines are connected via multi-point connections, make WAGO. The outgoing lines are directed out of the switch gear cabinet at its lower side. For this purpose, a line collecting box is installed under the switch gear cabinet.

All devices in the switch gear cabinet are identified by means of labels to which the corresponding mnemonic device names are printed in compliance with the electric diagrams. Switches or pushbuttons are marked by means of plates to which the designation is printed.

The equipment rack is equipped with a thermostatically controlled heating element of 400 W that heats up the air inside the cabinet in case of low temperatures

6.7 Control

6.7.1 Programmable logic controller (PLC)

For control and supervision of all electrically influenced installations of the passenger boarding bridge, a commercial PLC is provided.

It comprises a sub-rack with a power unit, a CPU (central processing unit) with program memory and various in/output modules.

The program memory is executed such as not to lose its contents of information in case of a power failure. Modifications are only possible by means of a suitable programming device.

6.7.2 Control Program

The control program is made by means of the language "Ladder" and is well structured.
It contains all logic operations required for controlling the output elements (contactors, relays, signalling unit) and considers the requirements of the Thyssen Henschel passenger boarding bridge.

Operational data memory program

This program is used for recording running times or the switching numbers of selected equipment parts.

6.7.3 Operating mode selection

An operating mode selector for the choice of "OFF", "MANUAL" and "AUTOMATIC" is provided on the control panel. It has 3 lock-in positions and is provided with a cylinder lock. The actuation is done by means of a key. As a standard the lock is provided with a closure type RONIS ... Other closures can be delivered on demand.

They key can be drawn off in the positions "OFF" and "AUTOMATIC" but not in the position "MANUAL".

6.8 Additional equipment

6.8.1 Point- and Go-System

The driver is able to choose between 'Normal' and 'Point and Go' operation by means of a switch on the control panel.

In position "Normal operation", the drive unit is driven according to the direction of the joystick. When the joystick is set to the straight-ahead driving arrow position, the drive unit travels straight-ahead; when it is set to the reverse-driving arrow position, it travels backwards.

The driving speed matches the angle at which the joystick is set. When you set the joystick to 90°, either to the left or to the right, the drive unit rotates at a constant speed either to the left or to the right. When the joystick is set to a higher angle, the drive unit rotates and also moves simultaneously according to the angle position of the joystick: either straight-ahead or backwards with the corresponding speed. The bridge is thus moved according to the angle of the drive unit.

In position "Point and Go" the drive unit automatically moves in the direction of the joystick. The speed matches the angle of the joystick to the vertical position.

It is for this reason that the driving control is equipped with analogue sensors both for the x-axis as well as the y-axis. The angle of the cabin position is also calculated. The desired value for the drive unit position and the speed is calculated and passed on to the drive motors by the control facility from these measurements. The position of the drive unit is matched with the position of the joystick by means of different wheel movements or speeds and the bridge is moved in the direction in which the joystick is displaying.

Movement is only possible when the dead-man button at the joystick is pressed and kept pressed before operation. Once the dead-man button or the joystick are released, the vehicle comes to an immediate halt.

6.8.2 Automatic preparking

Passenger boarding bridges are generally equipped with a normal driving control system. By means of the controller (joystick) the position of the drive unit is given and the driving speed is regulated infinitely variable. In this manner the bridge driver defines the course for the movements of the passenger boarding bridge from an initial position, e.g. parking position to a target position, e.g. preparking position.

However, in common bridge use this normal driving control system is disconnected by means of the switch "prepositioning mode" located in the electrical cabinet. Then the bridge is automatically moved via the prepositioning system from the parking position to the prepositioning point next to the aircraft door and back from the aircraft door. For the short distance from the prepositioning point to the aircraft door the Point- and Go-control procedure is used (see 6.8.1 Point- and Go-System.)

In the initial position, the parking position, the desired target position number is set via the selector switch "Prepositioning – Select". Then the pushbutton "Prepositioning - Operate" located next to it is pressed and maintained in this position. After that the bridge is at first swivelled in retracted condition into the provided rotunda angle, the cabin is swivelled into the provided cabin angle and then the bridge is extended as long as the provided tunnel length is reached. The short remaining way to the aircraft door is passed by using the Point- and Go-control.

For driving back from the aircraft the target position number for the parking position is set via the switch "Select". After pressing and keeping pressed the pusbutton "Operate" the bridge automatically drives back to its parking position.

During the automatic driving the same warning equipment is switched on as in case of manually controlled driving (flashlights at the drive unit and the siren "driving movements"). During this procedure the bridge driver must observe the apron permanently and in case of danger he must stop the movement by releasing the pushbutton "Operate". After elimination of the danger pressing again the pushbutton "Operate" can continue the movement.

7 Safety systems

In order to ensure the safety of operating functions, during passenger handling manoeuvres, a wide range of safety features has been installed.

In the following this equipment is described in detail:

- Safety brakes
- Safety limit switches
- Automatic height adjustment
- Optical warning devices
- Acoustic warning devices
- Signals
- Mechanical protective devices

7.1 Safety brakes

See "5.6.13.1 Cabin drive for swivelling" on page 20; "5.6.13.2 Canopy drive for extension/retraction" on page 20; "5.8.3 Drives" on page 23.

In the event of power failure, the automatic braking of all drive systems ensures stability of the passenger boarding bridge.

Each, and all, brakes used for the movement functions listed below, are of the safety brake type i.e. loss of power produces automatic brake application:

- Extension and retraction, bridge rotation
- Cabin rotation
- Canopy extension and retraction
- Roller door up and down (if available)

The hydraulic elevation system is fitted with check valves that close automatically in the event of system failure.

7.2 Safety limit switches

See 5.4.7 Limit switches" on page 13; 5.5.6 "Limit switches" on page 15; 5.6.11 "Limit switches" on page 19; 5.6.14.3 "Aircraft distance detection" on page 21; 5.8.2 "Limit switches" 23

7.3 Automatic height adjustment

See "5.6.9 Automatic height adjustment (autoleveller)" on page 19.

7.4 Optical warning devices

7.4.1 Flash lights at the elevating leg cross beam

Two warning flash lights (yellow) are installed at both ends of the elevating leg crossbeam; they are switched on in the key position "MANUAL".

7.5 Acoustic warning devices

7.5.1 Siren at the elevating unit

A siren fitted, in the area of the elevation system, operates whenever the passenger boarding bridge is moving. Volume and frequency are selected to overcome the ambient noise levels. The siren also sounds in the operational mode "AUTOMATIC" in case of failures of the autolevelling device or at the emergency lowering system (if available).

7.5.2 Buzzer in the electrical cabinet door

A buzzer fitted in the electrical cabinet door under control indicates malfunctions and breakdowns.

7.6 Mechanical safety devices

Mechanical stops

- The tunnel sections are fitted with mechanical stops to prevent overrun of the limit positions during telescopic movements.
- The elevation movements are limited by mechanical stops.
- The cabin is fitted with mechanical stops to prevent overrun of the swivelling range limits.

Other mechanical safety devices

- All exposed inner surfaces that are accessible for passengers and staff is free from sharp edges and other dangerous projections.

7.7 Additional equipment

7.7.1 Semi-automatic docking procedure

This pre-programmed docking procedure permits the bridge driver a simple and safe docking especially in view to the narrow conditions in case of docking to commuter aircraft.

If the operating mode selector is "Manual" position the joystick is blocked at first. The bridge driver can only drive the bridge via the system "Automatic preparking" described in chapter 6.8.2.

8 Emergency systems

8.1 General description

To ensure safe operational functions, as well as to indicate operational malfunctioning, safety devices are installed as listed in paragraph 7.

In addition to these, emergencies as listed below, may also occur:

- Power failure
- Uncontrolled PBB movements
- Failure of bridge components
- Gale warnings

THYSSEN HENSCHEL passenger boarding bridges are prepared for such events and are fitted with emergency equipment.

Set out below are the parts that provide reactive or proactive safety protection in the event of emergency.

8.2 Emergency stop system

In order to safely switch off the drive motors a contactor is provided. It is supplied from the 24 V controls network.

The contactor is in operation position with inoperative EMERGENCY-STOP-button, - its main contacts are closed.

When an EMERGENCY-STOP button is operated the electric circuit of the contactor is opened, consequently it opens its main contacts.

In the case of troubles in the PLC, the electric circuit towards the contactor is also opened via the watchdog contact.

The switch positions of the EMERGENCY-STOP buttons and of the contactor are transmitted to the PLC.

EMERGENCY-STOP buttons are provided at the following locations:

a) 1 x in the control panel

8.3 Towing of the PBB

The passenger boarding bridge is constructed to permit separation from an aircraft in the event of power failure or breakdown of a passenger boarding bridge component.

The following features of the passenger boarding bridge are affected:

- Device to manually release the drive system brakes
- Clevis type eyelets for a towing bar

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