



ARDEX TPO ROOFING SYSTEMS

TECHNICAL GUIDELINES

TABLE OF CONTENTS

Introduction

1. Roofing Systems
2. Systems Design
3. Installation
4. Product Data Sheets
5. Installation Details
6. Enclosures



Introduction

In the early 1960's, technologies derived from the elastomer & polymer industries were introduced as an alternative to the conventional multi-layer bituminous membranes which for many decades had been the primary roofing systems.

This manual introduces the ARDEX TPO Roofing Systems, of which the major component is the single-ply Thermoplastic Polyolefin membrane.

Polyolefin membranes were first introduced in the seventies for below grade and tunnel applications and use in the automotive industry. The TPO membrane was introduced into roofing in 1986. The first TPO roofs were installed in the late eighties.

The scrim-reinforced TPO membrane combines the performance of bitumen with the heat weldability of a thermoplastic in a flexible sheet with excellent layflat characteristics. The success of the TPO membrane can be attributed to its various performance benefits.

- **Environmentally friendly:** a TPO membrane is energy efficient. Its light-colored surface reflects the sunlight, eventually reducing building cooling costs. ARDEX's TPO's chlorine-free, non-halogenated formulation and hot-air welded seams further contribute to the system environmental friendliness.
- **Superior durability and longevity:** With no plasticizers incorporated, reinforced TPO membrane demonstrates a strong resistance to shrinkage and embrittlement. It provides excellent weatherability and strong resistance to UV radiation, ozone and common rooftop chemicals.

Today, hundreds of millions of square meters of TPO roofing membranes have been successfully installed worldwide from the cold weather conditions of Canada to the hot and humid climate of South East Asia thus assuring the watertight integrity of thousands of buildings and becoming one of the most widely accepted new technology membranes.

ARDEX Australia is part of the ARDEX Group, a company founded in Germany in the 1940s, that has grown to become a global business, providing engineered solutions for flooring, waterproofing and tiling applications.

Our waterproofing solutions are highly application specific. From sub-floor to roofing, we have developed products that stand the test of time – and moisture. ARDEX are now proud to introduce TPO (Thermoplastic polyolefin) membranes to the roofing market.

With almost 30 years in the commercial roofing industry, building upon a 100-year-plus heritage of success and innovation in rubber polymer technology. Firestone Building Products UltraPly TPO membrane, (branded ARDEX TPO Membranes) now offer a innovative roofing solution for your building structure.

This manual has been prepared to assist architects and specifiers working on the design of both new buildings and refurbishment projects in selecting the most appropriate system and components. It is also intended for roofing contractors to assist them in the proper installation of the ARDEX TPO Roofing Systems. Finally, it will help the building owner to monitor the selection and installation of his/her ARDEX TPO roof.

1 ■ ARDEX TPO ROOFING SYSTEMS

To ensure a long-lasting, trouble-free roof today, it is not sufficient to manufacture high quality roofing membranes. Experience learned that roofing membranes need to be compatible with other products in order to be integrated into a complete waterproofing system, which will function under extremely variable conditions.

Depending upon these conditions, the specifier can select one of the following roofing systems:

1	Ballasted System	p. 1.3
2	Inverted System	p. 1.4
3	Mechanically Attached System	p. 1.5
4	Fully Adhered System	p. 1.6

In the following pages you will find a brief description and illustration of each individual Ardex TPO Roofing System, including its main characteristics and advantages.

1.1 Ballasted System

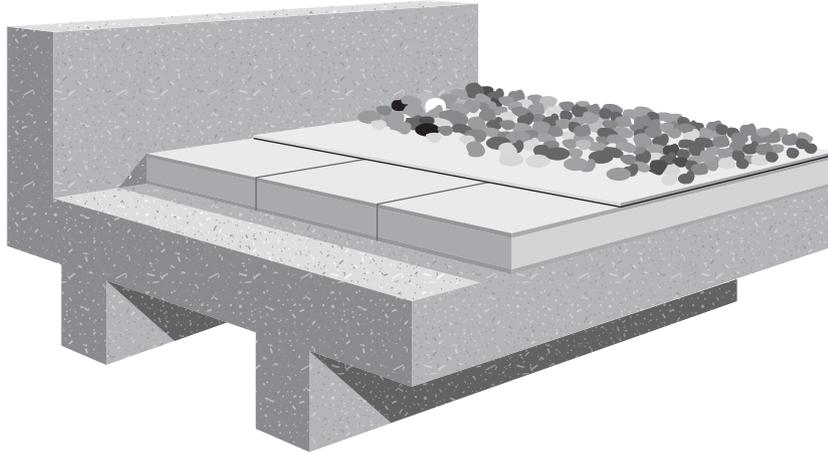


Fig. 1.1.1

The ARDEX TPO Ballasted System is the most economical TPO Roofing System available and is suitable for a wide variety of buildings.

The TPO sheets are loose laid over an acceptable substrate. Rough substrates need to be isolated with an acceptable protective layer. Adjoining sheets are overlapped a minimum of 75 mm and the seams are heat-welded to form a continuous watertight membrane. Once the seams are welded and roof perimeters and penetrations are flashed in accordance with ARDEX specifications, the TPO membrane is held in place using the following materials as ballast:

- Gravel, in the form of round, smooth, river washed aggregate without broken pieces, of adequate size (nominal 16 to 32 mm). A geofabric protective mat is recommended.
- Concrete pavers (min. 50 mm thickness) with smooth trowel finish. Installation of a protective mat is required.
- Crushed gravel that must be graduated, the larger the gravel, the higher the weight. A geofabric protective mat must be used.
- Poured in-situ concrete. A geofabric protective mat must be used.

The system features are:

- Use of large TPO panels up to 2.0 m.
- Fewer seams.
- Large choice of compatible substrates.
- Fast installation.
- Low installation cost.
- Excellent fire rating.
- Superb weathering resistance.

Prior to selection of this system, the specifier should evaluate structural conditions of the building to verify its load bearing capacity. Roof slopes and wind requirements should also be investigated.

1.2 Inverted System

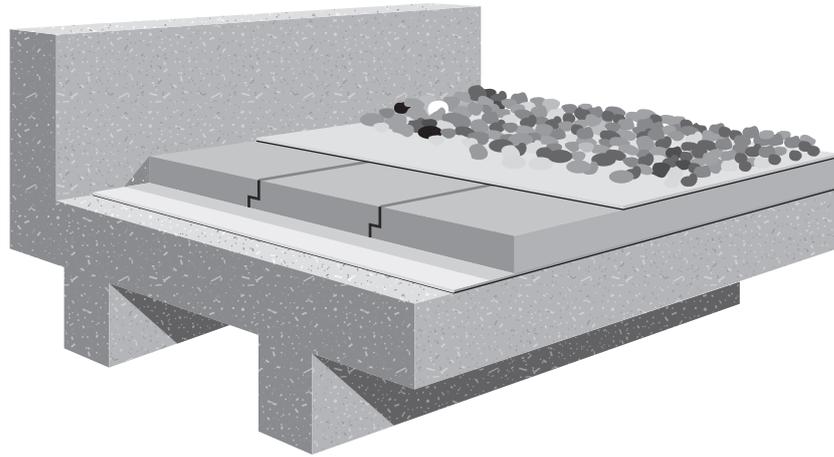


Fig. 1.2.1

The ARDEX TPO Inverted System is a variation of the conventional ballasted system. It is ideal for roofs with regular traffic or in severe weather climates.

The TPO sheets are loose laid over an acceptable substrate. Rough substrates need to be isolated with an acceptable protective mat. Adjoining sheets are overlapped a minimum of 75 mm and heat-welded to form a continuous watertight membrane. Once the roof perimeters and penetrations are flashed in accordance with ARDEX specifications, a layer of extruded polystyrene is placed over the membrane. A protective mat is then laid over the insulation and the total system is held in place using the following as ballast:

- Gravel, in the form of round, smooth, river washed aggregate without broken pieces of adequate size (nominal 16 to 32 mm).
- Concrete pavers (min. 50 mm thickness) with smooth trowel finish.
- Crushed gravel that must be graduated, the larger the gravel, the higher the weight.

The system features are :

- Use of large TPO panels up to 2.0 m.
- Fewer seams.
- Large choice of compatible substrates.
- Fast installation.
- Low installation cost.
- Extra durability.
- Flexibility for upgrading of insulation in reroofing projects.

Prior to selection of this system, the specifier should evaluate the structural conditions of the building with regard to its strength to accommodate the load. Roof slope, wind requirements and flashing height around details should also be investigated.

1.3 Mechanically Attached System

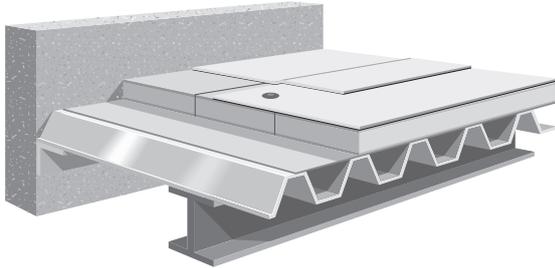


Fig. 1.3.1

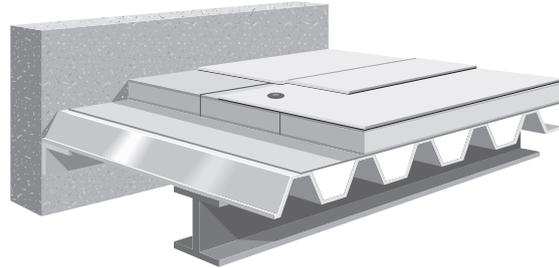


Fig. 1.3.2

The ARDEX TPO Mechanically Attached System is a lightweight system, suitable for roofs that cannot carry the additional load of ballast, where the roof deck is suitable for mechanical attachment.

The system uses up to 2.0 m wide panels, which are loose laid over the substrate. Membrane panels are mechanically attached with plates and fasteners placed in the seams of adjoining sheets. The width of the membrane and spacing of the plates and fasteners differ to accommodate for wind loadings.

Adjoining sheets are overlapped at least 150 mm in case of a seam with mechanical anchoring and 75 mm in case of a seam without mechanical anchoring. The sheets are heat-welded to form a continuous, watertight membrane. All flashings around roof perimeters and penetrations are installed in accordance with ARDEX details.

The system features are:

- Adaptable to unusual roof configurations.
- High wind uplift performance.
- Low material cost.
- Lightweight.

Prior to selection of this system, the specifier should evaluate the roof slope and determine whether the roof deck will provide sufficient pull-out resistance for the fastening system.

1.4 Fully Adhered System



Fig. 1.4.1

The ARDEX TPO Fully Adhered System is a lightweight system with outstanding design flexibility. It is suitable for contoured roofs, roofs with irregular shape and any roof with limited load bearing capacity, provided the substrate is compatible with adhesives.

The system typically uses up to 2.0 m wide panels, which are fully adhered directly to an acceptable substrate using Bonding Adhesive. Adjoining sheets are overlapped a minimum of 75 mm and the seams are heat-welded to form a continuous, watertight membrane. All flashings around roof perimeters and penetrations are installed in accordance with ARDEX details.

The system features are:

- Applicable on any slope.
- Applicable to unusual roof configurations.
- Lightweight.
- High wind uplift performance.
- Aesthetics.

Prior to selection of this system, the specifier should determine whether the substrate is compatible with Bonding Adhesive to provide sufficient adhesion. For insulated roofs the ability of the roof deck to provide sufficient pull-out resistance for the fastening system should be established.

2 ■ SYSTEM DESIGN

The selected ARDEX TPO System is only technically acceptable if all conditions and requirements outlined in this section have been met, assuming that general codes of practice, national and international regulations and installation specifications have been complied with.

The information provided within this chapter may assist the specifier and contractor in determining which ARDEX TPO Roofing System is most suitable for a particular roofing application. It may also help him to identify the basic design criteria for each roofing system. This chapter contains the following sections:

1	System Application	p. 2. 3
2	System Selection	p. 2. 4
3	Load Bearing Capacity	p. 2. 9
4	Roof Slope/Shape	p. 2. 10
5	Surface and Substrate Considerations	p. 2. 11
6	Re-roofing Considerations	p. 2. 12
7	Expansion Joints	p. 2. 14
8	Vapour Control Layer	p. 2. 14
9	Insulation	p. 2. 15
10	Insulation Attachment	p. 2. 19
11	Membrane	p. 2. 20
12	Membrane Securement	p. 2. 20
13	Fastener Considerations	p. 2. 22
14	Wind Design	p. 2. 24
15	Roof Penetrations	p. 2. 25
16	Flashing	p. 2. 26
17	Care and Maintenance	p. 2. 27
18	Membrane Repair	p. 2. 28

The same principles of assessment given in this section may also apply to the use of system components or techniques developed by other suppliers. In that case the instructions of the manufacturer concerned should also be complied with. The responsibility for the selection of products made by other manufacturers and their effectiveness rests exclusively with the designer and the component manufacturer.

Roofs that are subject to special conditions and design considerations not contained within this chapter, should be discussed with ARDEX's Technical Services Department.

2.1 System Application

The ARDEX TPO Systems that are described within these guidelines are applicable for roofing installations on commercial, industrial, public and administration buildings.

The information within this publication is not appropriate for:

- Non-roofing applications, such as basement waterproofing, lining, etc.
- Roofing applications where structural conditions are insufficient to support the load of the completed roof installations and/or other anticipated loads as identified by the designer.
- Roofing application subject to high traffic such as plaza or podium deck construction other than as a protected membrane system.

The ARDEX TPO System is not applicable without special approval from ARDEX's Technical Services Department for:

- Roofs subject to chemical discharge.
- Roofs subject to positive pressure, such as air infiltrating decks, canopies or overhangs.
- Light weight roofed buildings with large openings in a wall (greater than 10% of the wall surface) which could accidentally be left open in a storm, such as aircraft hangars, loading terminals, etc.
- Buildings located within specific areas, which are not mentioned in these specifications and require particular attention.

For roofs subject to local code requirements or special regulations that are not mentioned in this section, contact the local building authorities and ARDEX's Technical Services Department.



2.2 System Selection

The selection of a technically sound roofing system is not always simple. It requires knowledge of the characteristics and application conditions of all system components by the designer and/or contractor.

It has become increasingly difficult for manufacturers of roofing membranes to provide simple guidance on design, the reason being that the roofing industry offers a wide range of options for structural decks, insulation boards, membranes, fastening systems and other accessories. As a result, numerous combinations appear to be possible, but not all are technically acceptable.

To simplify the design process, the most frequently used ARDEX TPO roof applications have selected. These applications are presented in 4 different “selection-tables”, starting with the structural deck.

The following charts in this section cater for in-situ concrete, precast concrete, metal and wooden decks and provide information to determine the most applicable ARDEX TPO Roofing System.

By consulting the relevant selection-table, the designer and/or contractor will find general information on various structural conditions of the building (deck, load bearing capacity, slope) and also the technical requirements for the underlayers to the membrane (thermal insulation, substrate).

The following codes are used for the different insulation materials:

- EPS : Expanded Polystyrene
- XPS : Extruded Polystyrene
- PUR : Polyurethane
- PIR : Polyisocyanurate
- MW : Mineral Wool

For more specific information on insulation materials, substrate considerations, re-roofing, membrane securement and insulation attachment, refer to the respective items provided further in this section.

Installation of a ARDEX TPO Roofing System over structural decks and insulation boards other than the ones mentioned in the following charts, are only accepted following approval by ARDEX’s Technical Services Department.

2. SYSTEM DESIGN

IN-SITU CONCRETE ⁽¹⁾

Structural Deck

	EPS	XPS	PUR/PIR	MW	None/Direct Application
Thermal Insulation	Ballasted (2,3,4)	Ballasted (2,3)	Ballasted (2,3)	Ballasted (2,3,6)	Ballasted (2,3,8)
ARDEX System	M.A.S. (3,4)	Inverted (2,3,8)	M.A.S. (3)	M.A.S. (3,4,6)	M.A.S. (3,8)
Design Criteria	Adhered (5)		Adhered (7)	Adhered (5)	Adhered (9)

Structural Conditions

- (1) Concrete needs to be structurally sound and dry.
Consult ARDEX's Technical Services Department for more information about how to check moisture content of concrete.
- (2) Minimum load bearing capacity required.
- (3) Roof slope is limited.

Thermal Insulation

- (4) Minimum density required.
- (5) Requires an approved overlayment/facing.
- (6) High compressive strength.
- (7) Facing must be compatible and provide sufficient adhesion.

Note: Installation of vapour control layer should be determined by the designer.

Substrate

- (8) Installation of a protective mat (geotextile, minimum 300 gr/m²) is required over rough substrates.
- (9) If the substrate is smooth (wood float finished), clean, dry, free of sharp edges, fins, loose or foreign materials, oil, grease or other products which may damage the membrane.

Note: Mechanical attachment in in-situ concrete requires an appropriate fastening system and special consideration.

PRECAST CONCRETE ⁽¹⁾

Structural Deck

Thermal Insulation

ARDEX System

	EPS	XPS	PUR/PIR	MW	None/Direct Application
Structural Deck	Ballasted (2,3,4)	Ballasted (2,3)	Ballasted (2,3)	Ballasted (2,3,6)	Ballasted (2,3,8)
Thermal Insulation		Inverted (2,3,8)			
ARDEX System	M.A.S. (3,4)		M.A.S. (3)	M.A.S. (3,4,6)	M.A.S. (3,8)
Attachment	Adhered (5)		Adhered (7)	Adhered (5)	Adhered (9)

Design Criteria

Structural Conditions

- (1) Precast concrete decks are in dense or lightweight auto-claved concrete. The joints between the deck units should be filled with a sand and cement mortar. Panels must be structurally sound and dry.
- (2) Minimum load bearing capacity required.
- (3) Roof slope is limited.

Thermal Insulation

- (4) Minimum density required.
- (5) Requires an approved overlayment/facing.
- (6) High compressive strength.
- (7) Facing.

Note: Installation of vapour control layer should be determined by the designer.

Substrate

- (8) Installation of a protective mat (geotextile, minimum 300 gr/m²) is required over rough substrates.
- (9) Installation of an approved recovery board or acceptable insulation is required.

Note: Mechanical attachment in precast concrete panels requires an appropriate fastening system and special consideration.

2. SYSTEM DESIGN

METAL DECKING ⁽¹⁾

Structural Deck

	EPS	PUR/PIR	MW
Thermal Insulation			
ARDEX System	Ballasted (2,3,4) M.A.S. (3,4) Adhered (5)	Ballasted (2,3) M.A.S. (3) Adhered (7)	Ballasted (2,3) M.A.S. (3,6) Adhered (5)

Design Criteria

Structural Conditions

- (1) Metal decks require a minimum of 0.75 mm. Mechanical attachment into thinner decks requires an appropriate fastening system and special consideration.
- (2) Minimum load bearing capacity required.
- (3) Roof slope is limited.

Thermal Insulation

- (4) Minimum density required.
- (5) Requires an approved overlayment/facing.
- (6) High compressive strength.
- (7) Facing must be compatible and provide sufficient adhesion.

Note: Installation of vapour control layer should be determined by the designer..

WOODEN DECKS ⁽¹⁾

Structural Deck	EPS	XPS	PUR/PIR	MW	None/Direct Application
Thermal Insulation	Ballasted (2,3,4)	Ballasted (2,3)	Ballasted (2,3)	Ballasted (2,3,6)	Ballasted (2,3,8)
ARDEX System	M.A.S. (3,4)	Inverted (2,3,8)	M.A.S. (3)	M.A.S. (3,4,6)	M.A.S. (3,8)
Design Criteria	Adhered (5)		Adhered (7)	Adhered (5)	Adhered (9)

Structural Conditions

- (1) Timber boards (well seasoned, tongued and grooved), plywood exterior grade and OSB. Minimum thickness 18 mm.
- (2) Minimum load bearing capacity required.
- (3) Roof slope is limited.

Thermal Insulation

- (4) Minimum density required.
- (5) Requires an approved overlayment/facing.
- (6) High compressive strength.
- (7) Facing must be compatible and provide sufficient adhesion.

Note: Installation of vapour control layer should be determined by the designer.

Substrate

- (8) Installation of a protective mat (geotextile, minimum 300 gr/m²) is required over rough substrates.
- (9) Acceptable over plywood/OSB if the surface is clean, dry, smooth, free of sharp edges, fins, loose splinters, foreign materials, oil, grease and other materials which may damage the membrane. Timber decks require the installation of a recovery board.

2.3 Load Bearing Capacity

The roof deck serves as a primary support for the roofing system. Structurally, it transfers the weight of live and dead loads to supporting purlins, joists and beams. Live loads include snow, rain, moving installation equipment and wind. Dead loads include skylights, air conditioning units, roof deck, thermal insulation, membrane and ballast.

Deck deflections should be limited as required by local codes to accommodate the stresses of either concentrated or uniform loading.

When determining the structural ability of the deck to support the load of the completed roof installation, the designer must consider the weight of ballast required to comply with local wind uplift requirements.

Ballasted and Inverted Roofing Systems require under normal conditions a minimum load of 50 kg/m² in the field area of the roof and for some cases up to 100 kg/m² in perimeter and corner areas.

When concrete pavings are required, the weight and arrangement should be calculated as part of the dead loads of the roof. Care must be taken when placing mass ballast onto the roof prior to distributing it locally. Install ballast and/or pavers on a daily basis. Do not stock pile ballast materials.

The above also applies when placing the TPO membrane rolls onto the roof prior to installation. Distribute the rolls over the entire roof, as close as possible to their actual position. Do not stock pile the rolls.

Finally, ARDEX assumes no liability for structural analysis but strongly recommends that a structural engineer be consulted prior to the completion of the roof specification and job start.



2. SYSTEM DESIGN

2.4 Roof Slope/Shape

2.4.1 POSITIVE DRAINAGE

Roof deck designs should provide a fall for positive drainage to avoid ponding water around drain outlets and roof penetrations. ARDEX's definition of "inadequate drainage" is a condition existing on any area of the roof where water remains for more than 48 hours after precipitation.

The effective minimum finished fall should be in accordance with national code of practice.

Positive falls may be formed in the structure or within the layers above the deck.

The slope in the structure can be provided by:

- adjusting the height of beams and/or purlins,
- tapered supports,
- installation of furring pieces under the deck.

The slope above the deck can be provided by:

- screed or lightweight concrete,
- tapered insulation.

Attention should be given to provide proper flashing height at upstands, parapets and penetrations, when an additional slope has to be provided.

Drains should be located at the lowest points in the roof (maximum deflection), not at columns or bearing walls (points of minimum deflection).

The number and size of drains should be calculated in accordance with National Standards.

2.4.2 MAXIMUM SLOPE

The following table is provided to assist in determining the most applicable of the ARDEX TPO System based on the slope or shape of the roof.

Slope / Shape		System		
		Ballasted / Inverted	M.A.S	Adhered
Slope 0 – 10%	< 6°	A*	A	A
Slope 10 – 33%	≥ 6° and < 19°	NA	A	A
Slope > 33%	> 19°	NA	A **	A
Arch, Barrel shape		NA	A	A

A : Applicable.

NA : Not applicable.

A* : If the roof has a slope of over 5%, additional precautions should be taken to restrain the movement of ballast. This can be achieved by :

- Increasing size or weight of the ballast.
- Installation of minimum 50 mm thick concrete pavings at the lowest point of the ballast. Installations to protect gutters and drains.

A** : applicable only after special consideration from ARDEX.

2.5 Surface and Substrate Considerations

Prior to installation of the system, the surface of the roof should be inspected by the roofing contractor. It is the responsibility of the contractor to assure that the substrate finishing is suitable to receive the ARDEX TPO System.

The following table may assist you in identifying the general substrate requirements for direct application of the various TPO Systems.

General requirement	Specific description
Smooth	Free of sharp edges, fins. All rough surfaces that could damage the TPO membrane and flashing materials should be properly isolated with a leveling layer (protection mat, recovery board or insulation). <i>NOTE : In order to ensure the maximum working life of non-adhered ARDEX TPO membranes it is necessary to separate them from abrasive surfaces such as rough concrete, cementitious screeds, existing bituminous membrane. ARDEX recommends the use of a geotextile (min. 300 g/m²).</i>
Dry	Ponded water, snow, frost and ice must be removed from the work surface.
Compatible	Any contact between TPO materials and incompatible product such as grease, animal fats, coal tar, oil based products (mineral and vegetable origin), strong acids and fresh bitumen should be avoided.
No voids	All voids, greater than 5 mm wide must be properly filled with an acceptable fill material or overlaid with insulation.
No hot surfaces	Avoid continuous contact between TPO and steam or heat sources in excess of 60°C.
Clean	Heavy dirt must be removed with a hard bristled brush.

In addition to the information provided previously, the following specific substrate requirements are applicable:

- **Metal Decks**

It is assumed that the deck is detailed in such a way that it provides adequate support for the insulation at all perimeters and penetrations. Attention should also be paid to the direction of the flutes of the deck, so as to minimise the risk of ponding water being entrapped under the roofing system during installation.

- **In-situ concrete**

The finished surface should be as smooth as possible and should be provided by a power or wood float. Concrete and cementitious screeds contain considerable amounts of water. Construction water should be contained in the slab by applying ARDEX WPM 300 prior to installation. Concrete screeds are not acceptable for mechanical attachment.



2. SYSTEM DESIGN

- **Precast concrete**

All joints in the substrate should be filled with a sand and cement mortar, or a flexible polyurethane sealant as specified by the design engineer. Closed joints will minimise positive air pressures.

- **Wooden Decks**

The decks must be secured using fasteners which provide a smooth profile. The use of nails is not permitted. Treated plywood may be used, provided it has not been treated with ammonium phosphates. When using timber planking, only seasoned boards will be accepted. Tongue and grooved boards are recommended.

2.6 Re-roofing Considerations

In re-roofing applications, the performance of the new roofing system significantly depends upon the quality of the existing roof.

Apart from the considerations mentioned previously, additional measures need to be taken with regards to adaptation, overlayment and/or replacement of the existing system.

Inspections are required for every reroofing project to evaluate the moisture content of the existing roof, to identify any errors of design, and to determine the limiting factors that will influence the design of a new system. The inspection must take into account the condition of the structural roof deck, insulation and roofing membrane.

Structural decks must be inspected to determine their capacity of taking the additional loads during the re-roofing installation, including the storage of materials on the roof. The contractor should also investigate the condition of the deck.

Metal deckings are limited by their deflection and need to be assessed for their pull-out resistance.

Wooden decks and other degradable supports should always be fully examined for their quality (dryness, ...) and pull-out resistance. Any wet or unsound portions must be replaced with new materials prior to the installation of the membrane system.

Insulation boards need to be replaced if they are wet or degraded. It may be necessary to inspect the quality of the attachment of the insulation to the deck.

Compatibility of new insulation boards with the existing roofing system must also be considered.

The condition of the existing roofing membranes, which are to be left in position, will determine the necessity for a separation layer. The existing roofing membrane must be basically sound, rot-free, not saturated with water.

The table on the following page provides specific substrate requirements for various ARDEX TPO re-roofing applications.

Flashing heights may be limited. Existing building details (i.e. door, windows) may not allow for sufficient clearance to provide proper termination above the potential water level. Detailed consideration of this condition is critical to the integrity of the roofing system.

2. SYSTEM DESIGN

Substrate requirements for re-roofing

Existing membrane	System		
	Ballasted / Inverted	Adhered	M.A.S.
Bituminous / Mineral	2	3	2
Bituminous / Smooth	1	1	1
Mastic Asphalt	4	4	4
Coal Tar	3	3	3
Single Ply	4	4	4

- 1: Direct application, when the substrate meets general substrate requirements (see §2.5).
- 2: Roof deck requires installation of protection mat (geotextile – min. 300 gr/m²).
- 3: Roof deck requires installation of approved recovery board or insulation.
- 4: Consult ARDEX's Technical Services Department.

Note: Adhered and mechanically attached systems may be installed directly over existing bituminous membranes providing the bitumen has a softening point above 85°C. Adhered systems may be installed directly over existing smooth surfaced bituminous membranes that have not been re-saturated or coated. Verify that the existing roofing system is firmly attached to the deck and that interply adhesion is adequate and continuous.

Bituminous flashings will not be suitable for re-use and need to be stripped off, if interply adhesion is not adequate and continuous.

2.7 Expansion Joints

The need for expansion joints, as well as type, placement and location should be determined by the architect. Consideration for roof expansion joints should be investigated at all locations where:

- expansion or contraction joints are provided in the building structure,
- structural framing elements such as joists, purlins or steel deck change direction,
- different types of roof deck, e.g. steel and concrete, abut each other,
- additions are connected to existing buildings,
- movement between vertical walls and roof deck is anticipated,
- roof areas are larger than 60 m in any direction.

Consideration for expansion joints should also be investigated at junctions where interior heating conditions change, such as heated spaces abutting an unheated space.

Refer to the following section for additional information with regard to installation of expansion joints. In some cases it will be necessary to provide a compressible infill (insulation material) between the ends of the insulation boards to create a loop in vapour control layer and/or membrane.

2.8 Vapour Control Layer

A vapour control layer may be necessary to protect certain roofing components or to avoid internal condensation in the roof when high interior humidity is of concern. In some situations, a vapour control layer may serve as an air block for buildings under positive pressure.

The requirement for a vapour (control layer), as well as its type, installation and location should be determined by the designer/specifier. Consideration for use should be investigated if any of the following conditions exist:

- Projects where outside average mid winter temperatures below 5°C are expected and where average winter interior relative humidity of 45% or more is anticipated.
- Buildings with high humidity internal conditions, such as swimming pools, textile mills, food and other wet-process industrial plants. These buildings will have continuous internal temperatures above 20°C and a relative humidity of minimum 70%.
- Construction elements that may release moisture after the roof is installed, such as interior concrete and masonry, plaster finishes, cementitious roof screeds, fuel burning heaters etc.

Since the requirements and climatic conditions vary from country to country, the designer/ specifier should refer to national codes for recommendations on vapour control layers.

Vapour materials are available in synthetic materials (polyethylene, PVC, etc.). Bituminous felts can be used, provided there is no contact between the TPO membrane and fresh bitumen. Alternatively ARDEX WPM 300 may be used as a fully adhered vapour barrier.

The surface of decks containing large amounts of construction water (in-situ concrete, cementitious screeds, ...) should be adequately cured and dry before the vapour control layer is installed. Drying out will be restricted by the presence of a vapour control layer. In that case, drainage holes will have to be drilled to the underside of the deck to allow for drying.

2.9 Insulation

The function of thermal insulation in a roofing system is a complex one. Insulation is used to reduce heat loss, reduce the energy required to cool the building and to limit internal condensation. It is also used to provide a substrate that is:

- firm and compatible for the membrane,
- properly attached against wind forces,
- stable to minimize stresses to the membrane,
- of sufficient compressive strength to accept traffic and loading over the roof during construction, without being damaged.

Since requirements for thermal insulation vary from country to country (fire regulations, insulation level), the designer/specifier should refer to national codes for recommendations.

Due to the many types of insulation available, it is not possible to provide a complete listing of all insulations for use as immediate substrates for the ARDEX TPO systems. Therefore, a brief summary and description of the most commonly used insulation materials are provided in the chart on the following page. If the product to be used does not meet the technical requirements outlined in this table, it will be necessary to consult ARDEX's Technical Services Department for approval.

For specific data regarding the insulation materials (flute span, fastening pattern, ...), refer to the technical literature of the insulation manufacturer.



2. SYSTEM DESIGN

Thermal Insulation					Roofing System			
Insulation	Thermal	Volumic	Compressive	Ballasted	Inverted	M.A.S.	Adhered	
Expanded Polystyrene	0.034	Min. 20	Min. 100 (10% compression)	1	NA	1	2	
Extruded Polystyrene	0.029	Min. 33	Min. 300	1	1	1	NA	
Polyurethane	0.027	Min. 30	Min. 100 (10% compression)	1	NA	1	1	
Polyisocyanurate	0.027	Min. 30	Min. 100 (10% compression)	1	NA	1	1	
Mineral Wool	0.040	165–200	Class III UEAtc	3	NA	3	3	

Note: 1: Direct application.

2: Acceptable overlayment or facing required.

3: Only high-density boards are acceptable with sufficient resistance to dynamic loading.

2. SYSTEM DESIGN

Each insulation material to be used within the ARDEX TPO roofing systems needs to meet one or more of the specific technical requirements mentioned hereafter, such as:

- **Compressive strength:**

Additional consideration should be given to the long-term resilience of the insulation board, so that it remains capable of withstanding installation and general roof traffic.

Some compressive boards, such as mineral fibre boards, do not accept unlimited traffic and loading without being damaged.

- **Compatibility:**

Polystyrene materials should not come into contact with solvent based adhesives and cleaning products. The solvents used in these products are aggressive to polystyrene. ARDEX recommends the use of ARDEX WPM 642 water based adhesive in those areas.

- **Acceptable facer:**

Mineral wool boards are not suitable for direct application of a Fully Adhered System since they do not provide sufficient adhesion between the TPO membrane and the top facing. Some insulation boards are finished with facers not suitable for adhesion. Consult ARDEX's Technical Services Department for additional information. Polyurethane and Polyisocyanurate boards with glass fibre tissue or bituminous impregnated felt facer are suitable for adhesion.



2. SYSTEM DESIGN

The following table may assist you in calculating the required thickness of the insulation board.

In the first column of the chart, you'll find the different individual steps of the calculation method. These are illustrated with an example in the second part of the table.

Individual Steps	Example
Determine required U-value or R-value (Refer to National Standards)	$U = 0.40 \text{ W/m}^2 \text{ K}$
Calculate R1, required thermal resistance (Inverse of U-value)	$R1 = 2.5 \text{ m}^2 \text{ K/W}$
Calculate R2, thermal resistance non-insulated roof (Sum of thermal resistances of individual layers, plus an allowance of $0.15 \text{ m}^2 \text{ K/W}$ for external and internal resistances)	$R2 = 0.0012/0.17 + 0.15/2.5 + 0.15$ $= 0.217 \text{ m}^2 \text{ K/W}$
Calculate R3, required thermal resistance to meet standard. $R3 = R1 - R2$	$R3 = 2.5 - 0.217 = 2.283 \text{ m}^2 \text{ K/W}$
Calculate d = required thickness of insulation. (Multiply R3 with thermal conductivity of insulation material)	$d = 2.283 \times 0.0027$ $= 0.061 \text{ m}$ $= 62 \text{ mm}$

Note : U-value ($\text{W/m}^2 \text{ K}$) expresses the rate of energy loss through a structure.

For the above illustrated example, the following materials and indicative values were used.

Material	Thickness [m]	I-value [W/mK]
TPO-Membrane	0.0012	0.17
PIR	0.05	0.027
Concrete Deck	0.15	2.5

The U-value is calculated by inverting the sum of the thermal resistances of all layers of the roofing system. Thermal resistances of each individual layer are determined by dividing the thickness of the layer by the thermal conductivity (I-value) of the material.

The above-calculated value indicates the minimum thickness for fully supported insulation. Consult the insulation manufacturer for maximum flute spans when installing over steel decks.

The above-calculated value does not take into account possible heat losses in case of mechanically attached insulation boards and/or membranes. Consult national codes with regards to heat loss calculation in case of mechanically attached systems.

2.10 Insulation Attachment

2.10.1 GENERAL INSTALLATION REQUIREMENTS

Insulation must be neatly fitted to all roof penetrations, projections, upstands, etc.

Care should be taken not to install more insulation than can be covered with TPO membrane and waterproofed before the end of each working day or the onset of inclement weather.

In order to avoid thermal bridging we recommend to install 2 layers of insulation with staggered joints.

2.10.2 SPECIFIC INSTALLATION REQUIREMENTS

Ballasted And Inverted Systems do not require an attachment of the insulation. When insulation attachment is specified, acceptable plastic insulation plates which lock and recess the fastener heads shall be used. Expanded polystyrene insulation shall not be pre-attached.

Mechanically Attached Systems require that the insulation attachment is designed independently from the requirements for membrane securement. Insulation must be installed in accordance with the minimum fastening rate and corresponding pattern as specified by the insulation manufacturer. Additional fasteners may be required in areas of high wind loads, around the perimeter and in the corner of the roof for code compliance. Consult local wind uplift standards for additional information.

Fully Adhered Systems require that the insulation is installed in accordance with the minimum fastening rate and corresponding pattern as specified by the insulation manufacturer. Additional fasteners may be required in areas of high wind loads, around the perimeter and in the corner of the roof for code compliance. Consult local wind uplift standards for additional information. ARDEX does not recommend insulation attachment with bitumen. However, if this method of attachment is selected by the designer, the following requirements must be met:

- The proposed insulation shall be compatible with the roof substrate, the proposed bitumen and the requirements of the system.
- Bitumen with a high melting point (above 85°C) shall be used.
- Insulation attachment directly to steel deck is not allowed.
- Expanded or extruded polystyrene shall not be attached with bitumen.
- Excess of bitumen between adjoining insulation boards shall be removed prior to installation of the membrane.



2. SYSTEM DESIGN

2.11 Membrane

Panel size may vary in relation to the selected system and building conditions.

Width of TPO panels is subject to fastener density and spacing requirements between plates. The widths have to be adjusted in function of site conditions such as number, type and spacing of roof, obstructions, size of building, wind, etc.

2.12 Membrane Securement

There are three methods to secure the TPO membrane to the substrate: ballasting, mechanical attachment with fasteners and bonding with adhesive. The following information outlines the various options for securement of the TPO membrane in the field.

2.12.1 BALLAST

The designer shall be responsible for the design and selection of the ballast on a specific building. Ballast shall be of adequate size and weight as to provide proper protection against wind uplift.

The following table may assist you in identifying the ballast material to be used and protection requirements for the TPO membrane. Refer to local building codes for additional information regarding requirements for coverage rate.

Ballast Material	Description	Protection Requirements
River washed gravel	Smooth, river washed aggregate with rounded edges and corners, without broken pieces. Nominal 16/32 mm. Minimum weight of 50 kg/m ² .	None (although protection mat is recommended for additional protection)
Crushed gravel	Crushed stones, free of excessive fractures, sand or foreign substances. Minimum weight of 50 kg/m ² .	Protection mat Geotextile of min. 300 gr/m ²
Concrete pavers	50 mm thick with smooth trowel finish.	Protection mat Geotextile of min. 300 gr/m ²

2. SYSTEM DESIGN

2.12.2 FULLY BONDING

The TPO membrane shall be completely (100%) bonded to a dry and clean substrate with ARDEX TPO Bonding Adhesive applied to both mating surfaces, the substrate and the back side of the membrane.

2.12.3 MECHANICAL ATTACHMENT

Fastener layout should be determined in compliance with the designed wind load and pull-out resistance of the fastener/deck system.

The TPO membrane panels are to be attached to the substrate using approved ARDEX plates and fasteners positioned in the overlap of adjoining membranes.

As an alternative to mechanical attachment, the perimeter zone of the roof may be fully adhered. The substrate to be adhered to shall be identical to the mechanically attached area. This area shall be installed in accordance with the requirements for the adhered system. The adhered perimeter zone shall be separated from the centre zone of the roof by means of a mechanical fastening in the seam area.

2.12.4 BASE TIE-IN

Additionally to securement of the membrane in the field as described above, mechanical attachment of the membrane is required in all ARDEX TPO systems at all locations where the membrane terminates (roof edges, penetrations, air conditioning units, drains) and/or goes through an angle change greater than 15° such as roof edges, curbs, interior walls, etc.

Drainage outlet flanges must be secured directly to the deck with acceptable fasteners, in order to provide sufficient clamping and evenly compress the Water Block Sealant.



2. SYSTEM DESIGN

2.13 Fastener Considerations

The following table may assist you in selecting the appropriate roofing fastener for mechanical attachment of the TPO membrane. The fastener must be compatible with ARDEX HD Seam plates, ARDEX Pressure Seal or edging profiles, and their installation requirements. The following table will also provide information with regard to the minimum pull-out and penetration requirements of the fastener into the substrate. Site pull-out tests will need to be conducted on re-roofing projects in case of degradable supports or when in doubt.

Application	Substrate	Fastener	Penetration (P) Embedment (E) [mm]	Minimum Pull-out [kN]
Membrane	Steel (1) Min 0.75 mm	All Purpose	19 (P)	1.5
Membrane	Plywood / OSB Min. 18 mm	All Purpose	25 (E)	1.5
Membrane	Timber Min. 18 mm	All Purpose	25 (E)	1.5
Membrane	Concrete	Heavy Duty	25 (E)	3.0
Base Tie-in	Vertical Concrete	Heavy Duty	25 (E)	0.9
Base Tie-in	Masonry (2)	Heavy Duty	25 (E)	0.9

- Notes:
1. Verify pull-out capacity of substrate when fixing to thinner profiles (i.e. cladding structures).
 2. The above fastener considerations are intended as a guide only. The actual system used is at the discretion of the design engineer..

2. SYSTEM DESIGN

Any substrate (deck or wall) that is to provide mechanical attachment of the roofing system must provide a minimum pull-out capacity per fastener as indicated in the previous table. An alternate fastening system must be designed to accommodate the weak substrate with the actual fastener pull-out capacity.

Due to the variety of physical conditions that can affect pull-out resistance, ARDEX recommends that on site tests be conducted by an independent testing organisation to determine actual pull-out values.

All sections of the substrate where integrity is in question should be tested. Test areas shall include corners and perimeters.

The minimum number of pull-out tests recommended is in relation to the roof size, as indicated in the following table.

Roof Size (m ²)	Minimum number of tests
< 1000	6
1000 – 5000	10
5000 – 10000	20
> 10000	1 per 500 m ²

When new construction prevents preliminary on-site tests, the deck manufacturer should supply estimated pull-out values for design and estimating purposes. On-site verification of the pull-out capacity should be confirmed prior to system installation.

2.14 Wind Design

As wind passes over the roof surface of a building, both positive and negative pressures are created by its acceleration. These pressures act on every part of the roof and have to be resisted by the system.

As a result there is a general level of wind uplift force across the roof that will differ in local areas such as perimeter, ridges, roof steps, areas around penthouses, etc..

Besides this, in some cases air will leak into the building through cladding around openings (windows, doors, ...) and cause internal pressures on the membrane, when the roof deck is air permeable (metal decking, timber, ...).

Impermeable decks such as concrete or the installation of an air barrier will prevent additional internal pressures.

The designer/specifier shall be responsible for the design of the system. Calculations should take into account the following factors:

- wind speed,
- building location (topography of surroundings),
- building dimensions (height, length, width),
- roof substrate (permeable, impermeable),
- roof details (openings, ...),
- safety factors,
- wall openings.

For Ballasted/Inverted Systems, the minimum ballast coverage rate is 50 kg/m².

If a gravel stop is used at the building perimeter, its height above the roof system surface must be a minimum of 50 mm and higher when it is required to retain the ballast.

Refer to national codes or wind design guidelines for Ballasted Single-Ply Roofing Systems for more specific information with regards to ballast.

For Mechanically Attached Systems, the density of fasteners depends on the following factors:

- actual wind load,
- pull-out strength of fastener,
- design and strength of plate,
- safety factor.

Perimeter and corner areas use smaller membrane panels or can be fully adhered to comply with higher wind loads.

For Fully Adhered Systems, tests performed in accordance with European specifications indicate that on substrates with high cohesive strength, the adhesion of the system is sufficient to resist the effects of wind uplift pressures up to 3.5 kN/m² with a safety factor of 2, provided that the substrate is sufficiently anchored and the membrane properly installed.

2.15 Roof Penetrations

2.15.1 SKYLIGHTS

Skylight flanges should be firmly secured to the substrate with acceptable fasteners at 300 mm centres (maximum). Bowing of the skylight flange between the fixings is not allowed. Skylight upstands shall be flashed with separate TPO membrane strips.

2.15.2 PIPES

Wherever possible, all round rigid pipe penetrations ranging in size from 25 to 203 mm outside diameter shall be dressed with ARDEX Pre-molded Pipe Flashings (Universal or Large). If it is not possible to install a pre-molded pipe flashing onto the pipe due to site conditions (difficult access, ...), ARDEX requires the use of WPM 623 Unsupported Flashing in accordance with the details outlined in the following sections. Pre-molded pipe flashings should not be cut or patched to accommodate a pipe penetration.

Pre-molded flashings and ARDEX WPM 623 Unsupported Flashing should not be installed around hot pipes (temperature in excess of 60°C). Hot pipes require the installation of an insulating sleeve, prior to being flashed. Rigid pipe penetrations with an outside diameter larger than 203 mm should be covered with ARDEX WPM 623 Unsupported Flashing in accordance with ARDEX details.

2.15.3 PENETRATION POCKETS

The following situations require the installation of a penetration pocket:

- rigid pipes with an outside diameter less than 25 mm,
- flexible pipes,
- cluster of pipes,
- unusual shapes such as structural beams, channels, etc.

ARDEX requires a minimum clearance of 25 mm between the pipes etc. on all sides of the penetration pocket, in order to assure adequate space for the application of ARDEX WPM 659 Pourable Sealer.

2.15.4 ROOF DRAINS

ARDEX requires that a clamping system is used in connection with the TPO membrane at these locations.



2.16 Flashing Upstands

Upstands can be flashed using TPO unsupported membrane or TPO coated metal.

Where possible, provide the minimum design height required by local building regulations for all upstand terminations. Upstand height shall be at least as high as the potential water level that would be reached as a result of a blocked drainage system. The installation of a ARDEX Pressure Seal detail is required wherever the vertical termination height is 200 mm or less.

Do not flash over existing through-wall flashings, weep holes and overflow scuppers.

If existing bitumen membrane flashings are to remain, they must have firm attachment to the substrate and have adequate and continuous interply adhesion if the existing flashing is to be totally covered with TPO membrane. Terminations of the ARDEX TPO should be made directly to the vertical substrate and not to the existing waterproofing material.

When using a surface mounted termination (ARDEX Pressure Seal, counterflashing, ...) ensure that the termination provides a constant seal at the wall using polyurethane sealant and that the surface above the termination is watertight.

Render, textured masonry, corrugated metal panels or any uneven surface are not suitable substrates to be dressed with TPO membrane. Such surfaces must be prepared to provide an acceptable substrate (refer ARDEX Technical Services Department).

Very porous substrates (rough wood, concrete blocks, ...) may require two coats of Bonding Adhesive, to ensure proper adhesion. Check by adhering a small piece of membrane to the porous substrate to verify the bonding strength.

Counter flashings, copings and other perimeter or penetration metal work shall be properly fastened and sealed by the roofing contractor.

Care should be taken to ensure that the membrane is not in contact with sharp edges and corners, and that it is not unsupported over voids bigger than 5 mm.

2.17 Care And Maintenance

ARDEX TPO membranes and flashings do not require an additional protection against weathering, U.V. light or ozone.

All components of the TPO System should be protected from discharges such as petroleum products, greases, oils (mineral and vegetable), organic based solvents, animal fats and fresh bitumen (less than 60 days old). Any direct contact with steam or heat sources where the in-service temperature is in excess of 60°C should be avoided.

Protect the ARDEX TPO Roofing System from mechanical damage by others. Sharp or rough edged foreign materials such as screws, metal shavings, nails, etc. can be the cause of damage to the membrane and should be removed from the roof during annual inspections.

Use a suitable plank of wood or insulation whenever ladders are used on top of a ARDEX TPO Roofing System, to avoid damage to the membrane and/or insulation.

ARDEX TPO roofs will accommodate reasonable and limited traffic for occasional maintenance but are not designed to support frequent traffic. The building owner is responsible for maintaining walkways in specific areas such as access points to the roof (doorways, ladders, ...) and on roofs subjected to traffic more frequent than once per month.

For Mechanically Attached Systems, ARDEX recommends to use ARDEX Eco Walkway Pads, concrete pavers are not acceptable. For Ballasted and Inverted Systems, ARDEX requires to substitute the Eco Walkway Pads by concrete pavers within 3 m of the edge of the roof.

Rainwater outlets, scuppers and gutters can become blocked and should be inspected annually to ensure that roof drainage is able to perform as designed.

The addition of new details to the roof such as roof lights, drains, extracting fans, etc. will require an adjustment of the existing roofing system. This should be performed by a ARDEX licensed contractor in accordance with ARDEX's recommendations.

Roof membrane surfaces (especially on slopes) can become slippery when covered by water, ice or snow. Care should be taken when walking over these surfaces to avoid personal accidents.



2. SYSTEM DESIGN

2.18 Membrane Repair

If damage does occur to the ARDEX TPO Roofing System, it can easily be repaired to its original watertight condition by patching.

ARDEX WPM 623 Unsupported Flashing should be repaired with WPM 623 Unsupported Flashing material. ARDEX TPO membrane can be repaired with TPO membrane or WPM 623 Unsupported Flashing depending on the nature of the damage. Small damage such as pinholes and cuts less than 50 mm may be patched with WPM 623 Unsupported Flashing. Larger damage should be repaired with reinforced TPO membrane. Repairs with non-ARDEX materials are not allowed.

Prior to any repair, water that has entered through the damaged area should be removed. Residual dampness will in most cases evaporate through the building structure.

The surface around the damaged area must be clean and dry. Clean the area to be repaired thoroughly with xylene, or acetone and allow to dry properly. For general cleaning, warm soapy water may be used.

Install the patch in accordance with ARDEX's installation specifications. The patch must have rounded corners, and cover the damaged area by at least 50 mm in each direction.

3. INSTALLATION

The information provided within this chapter may assist the contractor to install the ARDEX TPO Systems in accordance with ARDEX's requirements. It may also help him and the designer to inspect the completed installation. For a more practical use, we collected the information in a chronological order. The reader may consult the illustrations at the end of this document when additional information is required.

This chapter contains the following sections:

1	Membrane Installation	p. 3.3
2	Membrane Welding	p. 3.7
3	Base Tie-in	p. 3.9
4	Wall Flashing	p. 3.10
5	Corners	p. 3.12
6	Pipe Penetrations	p. 3.13
7	Drains and Scuppers	p. 3.16
8	Expansion Joints	p. 3.17
9	Roof Edges	p. 3.18
10	Wall Terminations	p. 3.19
11	Membrane Repair	p. 3.20
12	Miscellaneous	p. 3.21

3. INSTALLATION

3.1 Membrane Installation

3.1.1 MEMBRANE INSTALLATION – GENERAL

Prior to the installation of the roofing membrane, the contractor must check if the roof substrate complies with ARDEX's design instructions, and is sufficiently structurally sound to accept the membrane.

Any defects in the substrate need to be corrected and the final surface has to be prepared to meet the requirements previously outlined.

It is important that the substrate is free of any sharp objects and/or products that may damage the membrane.

Place the TPO roll as close as possible to its final position. Inspect the wrapper and TPO roll for damage before and during the installation. Unroll the TPO membrane and prior to any attachment, cutting or welding, allow each panel to relax a minimum of 30 minutes. Cut a cross-shaped opening above every drain to evacuate excess ponding water, in case of sudden rainfall.

The TPO panels shall be installed in a fashion so that field and flashing splices are installed to shed water. Straight cuts are very important for a neat and easy application.

Allow ample material for splicing determined by the type of seam and tie-ins.

Temporary ballasting during installation may be required to keep the membrane in place until it is secured to the substrate. Suggested temporary ballasting includes sand bags and other non-abrasive materials such as rubber tires, etc. Never leave the project without temporary ballasting loose laid sheets.



3. INSTALLATION

3.1.2 MEMBRANE INSTALLATION – MECHANICALLY ATTACHED (M.A.S.)

Applicability

This technique is applicable for the mechanically attached system M.A.S.

Installation Instructions

Consult the wind design calculation for information about the density and position of the plates and fasteners and the size of local wind zones (zones of high wind pressure, such as perimeter, ridge, base of roof step, base of penthouse, etc.).

Position adjoining sheets with a minimum side overlap of 150 mm in case of a mechanical anchoring in the seam and a minimum of 75 mm for seams with no mechanical anchoring. Allow the membranes to relax a minimum of 30 minutes.

Orient TPO panels so that any exposed (cut) edges of a panel are used as the bottom panel in splices whenever possible. If cut edges are exposed, they must be sealed with ARDEX WPM 651 Cut Edge Sealant.

The inside edge of the membranes are mechanically attached to the substrate with approved plates and fasteners. The plates need to be positioned at least 20 mm in from the edge of the membrane.

In the central zone of the roof, the membrane shall be mechanically attached with approved plates and fasteners in the side laps of the membrane. On metal decks it is important that the membranes run as much as possible perpendicular to the direction of the flutes of the deck, to avoid overloading of the structure.

At perimeters and in zones of higher wind pressure, the TPO membrane may be either fully adhered to the substrate following the technique described hereafter or mechanically attached in the overlap. When wind calculations require an even smaller spacing between fastener rows than mentioned in the table above, a 2.00 m wide membrane may be cut in half on site to produce a panel width of 1.00 m providing spacing between fastener rows of respectively 0.85 m and 1.07 m.

A row of fasteners and plates shall be installed along the inside edge of the perimeter sheets, to separate the perimeter zones from the central zone of the roof. In the case of a fully adhered perimeter zone, care must be taken not to apply Bonding Adhesive onto the inside portion of the perimeter sheets located beyond the fastening plates.

When working onto a continuous support (concrete, wood, ...), an alternative layout for TPO sheets may be used for practical reasons. In this layout, perimeter zone panels are laid parallel to the parapet. Field zone panels can be laid in the most practical direction.

The fasteners must be properly engaged in the deck. Use caution not to overdrive fasteners, as this will reduce the pull-out value of the fastener. An electric screw gun with an automatic clutch control or an automatic installation tool may be used. Once the tools have been set, all fastener installation will be consistent.

The end and side laps of adjoining sheets shall be spliced as outlined in the following section.

3. INSTALLATION

3.1.3 MEMBRANE INSTALLATION WITH BONDING ADHESIVE

Applicability

This technique is applicable for fully adhered systems and as an alternative to mechanical attachment in the perimeter zones of the mechanically attached system.

Installation Instructions

Position adjoining sheets with a minimum overlap of 75 mm and allow to relax a minimum of 30 minutes.

Orient TPO panels so that any exposed (cut) edges of a panel are used as the bottom panel in splices whenever possible. If cut edges are exposed, they must be sealed with ARDEX WPM 651 Cut Edge Sealant or ARDEX WPM 657 General Purpose Sealant.

Fold the first membrane back, evenly onto itself so as to expose the underside and the substrate. The sheet fold should lay smooth so as to minimize the formation of wrinkles during and after installation.

Before bonding, remove excess dust or other contaminants. Wipe the substrate and the mating surface of the sheet with a stiff broom.

The TPO-sheets are to be fully adhered with TPO Bonding Adhesive. Stir the Bonding Adhesive before and during application to achieve a uniform mix with no sediment on the bottom. Properly mixed adhesive is critical for desired performance and uniformity of the bond.

The Bonding Adhesive must be roller applied in a thin even coat on both mating surfaces. ARDEX recommends a two-man operation to facilitate equal drying times. Apply Bonding Adhesive to lighter coloured surface and/or shady surfaces first to aid in drying. Avoid globs or puddles of adhesive during application. An excess of adhesive will prolong the drying time and reduce production. Use large solvent resistant rollers with short hairs to apply the adhesive evenly. Care must be taken not to apply Bonding Adhesive over an area that is to be welded to another sheet. Use a chalkline to mark the splicing area that has to remain clean.

Allow bonding adhesive to flash off until tacky. Drying time will differ with various climatic conditions and coverage rate. Never use a hot air dryer to accelerate this process.

Touch the surface with a clean, dry finger to check the adhesive for dryness. As you are touching the adhesive, push straight down to check the mass of adhesive under its surface for stringing. Push forward on the adhesive at an angle to ensure that it is dry throughout its thickness. If either motion exposes wet or stringy adhesive when the finger is lifted then it is not ready for mating. Allow extra time for the adhesive film to properly flash-off before retesting. Adhering two surfaces that have not completely flashed off may result in blisters and bubbles in the membrane, caused by the trapped water.

As the first sheet is flashing off, lay out the adjoining sheets and allow them to relax.

Bond the membrane, starting at the fold. Roll the previously coated portion of the sheet into the coated substrate, slowly and evenly to minimize wrinkles.

Compress the bonded half to the substrate with a stiff brush to ensure proper contact. Extra compression will strengthen the bond. Repeat the bonding procedure to complete the bonding of the sheet.

Take special precautions when the outside temperature is below 10°C, when the dew point is near the ambient outside temperature. Certain combinations of temperature and humidity may cause condensation on the surface of the Bonding Adhesive. This is referred to as “blushing”. If this condition occurs, do not mate the surfaces. Wait until the ambient air conditions no longer cause condensation, dry the surface with clean, dry rags, apply a thin additional layer of adhesive and proceed.



3. INSTALLATION

3.1.4 MEMBRANE INSTALLATION WITH BALLAST

Applicability

This technique is applicable for ballasted and inverted systems.

Installation Instructions

Position adjoining sheets with a minimum overlap of 75 mm and allow to relax a minimum of 30 minutes. Orient TPO panels so that any exposed (cut) edges of a panel are used as the bottom panel in splices whenever possible. If cut edges are exposed, they must be sealed with ARDEX WPM 651 Cut Edge Sealant or ARDEX WPM 657 General Purpose Sealant.

Cover loosely laid roofing sections as soon as possible with:

- Gravel, in the form of round, smooth, river washed aggregate without broken pieces of adequate size (nominal 16-32 mm). Make sure that the roofing membrane is completely covered. A ballast of minimum 50 kg/m² is required. However this may not always provide complete membrane coverage or meet local requirements.
- Graduated, crushed gravel. This type of ballast contains broken pieces and may damage the TPO membrane during installation. ARDEX therefore recommends installing a geotextile (min. 300 gr/m²) between ballast and membrane.
- Concrete pavers, with smooth trowel finish. Install a geotextile directly beneath the concrete pavers.
- Other types of ballast may be used (earth, poured concrete, etc.) for other types of applications (parking decks, green roofs, etc.) but require a specific study. Consult local standards for type, adequate size, and minimum weight of ballast and consult ARDEX's Technical Services Department for appropriate detailing.
- In case of re-roofing, existing gravel may be re-used on the new roofing system provided it is of adequate size and weight. It is recommended to install a geotextile (min. 300 gr/m²) between the TPO membrane and the recovered gravel.

Do not stock pile ballast on the roof deck. Spread the ballast over the TPO membrane as specified, using soft tools (rubber-tyre buggies, squeegees, etc.), avoid direct contact with the membrane when projected.

Spread the ballast around details by hand/foot so as not to damage the freshly installed detail. Any ballast that is displaced by a walkway pad, should be distributed around the pad so as to maintain the specified average coverage rate.

On roofs with a flat edge, the installation of TPO walkway pads within 3 m of the roof edge is not allowed. Use concrete pavers.

For Inverted Systems, install the extruded polystyrene insulation directly over the TPO membrane. The insulation boards shall be installed within 6 mm of all projections. Do not bond the insulation boards to the membrane or to each other.

Unroll a protection mat over the insulation overlapping at side laps a minimum of 100 mm and at end laps a minimum of 150 mm. The mat shall extend up at all vertical penetrations 10 mm above the ballast.

3. INSTALLATION

3.2 Membrane Welding

General Requirements

All lap splices need to be hot air welded. Wherever possible, all field splices on the horizontal surface (including flashing) should be completed using an automatic heat welder that has been designed for hot air welding of thermoplastic membranes. Handheld welders should only be used on vertical welds or where an automatic is not practical or can not be used.

Set-up of the welding equipment is the responsibility of the installer. The air intake, temperature and speed of the machine must be adjusted to provide proper seam strength. Practice welds should be made and tested to insure proper set-up of the automatic welder.

Typical welding conditions on a 10°C day in the sun are as follows: 565 – 621°C at 2.4 – 3.7 m/min. with 2 weights added at 80 -100% air flow. For these typical equipment settings the ambient temperature should be from -6°C to 33°C.

When weather conditions vary, adjustments to the welding machine must be made. It is recommended that this be done using spare material. In addition, there must be destructive tests performed at the beginning of each working day and every time there is an interruption in the welding process (i.e. power failure, welder shut down, job site conditions change and after lunch). There should be periodic checks to verify good peel strength. A proper weld will always delaminate at the scrim when peeled open.

An ample power supply must be provided to all heat welding equipment. A generator, which is dedicated to the heat welding equipment, is recommended on all installations. Using generator equipment eliminates power surges or lapses that would occur if the particular building electrical services were used. Minimum power requirements are 220 volts, 30 amp, 7500 watts or greater if the equipment manufacturer recommends so. It is recommended that each piece of automatic welding equipment has its own generator. More than one piece of welding equipment can be run of a generator providing the proper increase in generator output is provided. In most cases an increase from 7500 watts to 10000 watts is sufficient.

Installation instructions

Position the sheets at the splice area with an overlap as described in table hereafter.

System	Min. membrane overlap
Ballasted, Inverted, Adhered	75 mm
M.A.S.	150 mm (laps with mechanical anchoring) 75 mm (laps without mechanical anchoring)

Using a clean white cotton rag dampened with xylene or acetone, thoroughly clean an area on both sheets at least 150 mm wide if the seam area has become heavily contaminated with dirt, debris, mud, etc.

Set up the welding equipment as per the general instructions above. When welding, if the material becomes liquid, the welder is too hot. When making an automatic weld, very slight amount of the dark gray material will be visible at the seam edge.

Seams made with an automatic welder must be a minimum of 38 mm wide. Seams made with hand welders must be a minimum of 50 mm wide.

Probe all completed welds using a slotted screwdriver or dull cotter pin puller type tool to verify seam integrity daily. Do not probe welds until they have had time to cool. Any welds found to be insufficiently welded need to be repaired.



3. INSTALLATION

Special Considerations

T-joint patches are recommended if probing reveals the presence of voids or cold welds and are required at all intersections of field seams if a membrane thicker than 1.2 mm is used. T-joint patches can be cut from ARDEX WPM 623 Unsupported Flashing.

Orient TPO panels so that any exposed (cut) edges of a panel are used as the bottom panel in splices whenever possible. If cut edges are exposed, they must be sealed with ARDEX WPM 651 Cut Edge Sealant or ARDEX WPM 657 General Purpose Sealant.

In case of a mechanically attached system, the inside edge of the membranes are mechanically attached to the substrate with approved plates and fasteners. The plates need to be positioned at least 20 mm in from the edge of the membrane. Spacing between fasteners should not exceed 250 mm.

3.3 Base Tie-in

3.3.1 BASE TIE-IN GENERAL

In order to account for structural movement of the substrate, stresses inherent in the handling and production of TPO sheets and thermal variations, the TPO membrane should be mechanically attached at all locations where the membrane ends or passes through an angle change greater than 15°, such as roof edges, curbs, interior walls, around roof penetrations, etc. If the securement is inadequate to resist these stresses, the membrane may tear or pull away from the termination and allow water to enter the building. For situations where the installation of a base tie-in detail is required but not feasible, consult ARDEX's Technical Services Department for advice.

3.3.2 BASE TIE-IN WITH PLATES

Installation instructions

Plates and fasteners are either installed on the flat roof substrate or on the wall. The selection for vertical or horizontal attachment is related to the ease of application (nature of substrate, thickness of insulation).

Horizontal installation

Install the plates as close as possible to the angle change but no closer than 15 mm from the membrane edge. The TPO membrane must extend 15 mm beyond the edge of the plates. The plates should be fastened at max. 300 mm centres with appropriate fasteners. Plates should be positioned as close as possible to the inside and outside corners and no more than 150 mm out from the corner.

Vertical installation

The TPO field membrane should be positioned against the upstand, extending 15 mm above the top edge of the plates. For curved curbs, the membrane should be cut to the shape of the curve to avoid wrinkles in the field membrane.

Install the plates on the vertical within 15 mm of the angle change but with the fastener no more than 150 mm out from the angle change. No bridging of the membrane at the angle change is allowed. The plates should be fastened at max. 300 mm centres with appropriate fasteners.

Use a vacuum machine to pick up all dust, when holes are pre-drilled, prior to starting wall flashing.



3. INSTALLATION

3.4 Wall Flashing

The Wall Flashing details are in line with two method of base tie-in, previously described. Upstand can be flashed with separate strips of TPO membrane. The wall flashing should always be terminated per the detail illustrated at the end of this document.

3.4.1 FLASHING USING TPO MEMBRANE

General installation instructions

Evaluate the substrate and the quality of all existing flashings. The substrate must be secure and smooth to allow for adequate adhesion. Textured masonry, corrugated metal panels, uneven substrates and some insulation materials may require an overlayment in accordance with the requirements previously mentioned. If adhesion is not sufficient, remove loose, unsecured, mineral surfaced or coated flashings to provide a smooth and sound substrate.

Intermediate attachment of the TPO wall flashing is required regardless of wall height when TPO membrane is not adhered to the wall or curb, under the conditions mentioned in the table below.

Wall Height	Intermediate attachment requirements
up to 0.45 m	None
> 0.45 m	Every 0.6 m, using approved fasteners and plates 300 mm o.c. max.

When the TPO membrane is adhered to the wall or curb, intermediate attachment is required under the conditions mentioned in the table below.

Wall Height	Intermediate attachment requirements
up to 1.0 m	None
From 1.0 to 2.0 m	One attachment at $\frac{1}{2}$ wall height, using approved fasteners and plates 300 mm o.c. max.
Above 2.0 m	One attachment every 1 m, using approved fasteners and plates 300 mm o.c. max.

All seams must meet requirements mentioned in § 3.2.

When measuring the width of the TPO material, allow the TPO strip to cover the wall to the height required, plus min. 150 mm for the seam onto the horizontal TPO sheet and an additional 150 mm for every intermediate attachment required as per indications above. The longest pieces practical can be used to flash high walls to the specified height. Selecting the correct cut for TPO strips is a time saver.

3. INSTALLATION

Adhering TPO membrane to the wall/curb

Position the TPO strip 150 mm from the angle break along the wall to be flashed. Apply ARDEX WPM 642 Bonding Adhesive at about the same time to both the membrane flashing and the surface to which it is being bonded so as to allow approximately the same drying time. Apply the adhesive by rolling it onto the mating surfaces evenly, avoiding globs or puddles. Make sure not to apply any adhesive to any area to be welded.

Allow the TPO Bonding Adhesive to flash off until tacky. Touch the Bonding Adhesive with a clean, dry finger to be certain that the adhesive does not stick or string. As you are touching the adhesive, push straight down to check for stringing, also push forward on the adhesive at an angle to ensure the adhesive is ready throughout its thickness. If either motion expresses wet or stringy adhesive when the finger is lifted, then it is not ready for mating. Flash off time will vary depending on the ambient air conditions. When flashing to metal work, the metal will act as a barrier to the solvents. The solvents can only dry through one surface (the adhesive), this will make the drying process slower than onto the membrane.

Roll the TPO flashing into the wall, keeping a rounded leading edge. Mate the flashing by hand and broom with a stiff brush.

Complete the splice between membrane flashing and the main roof sheet by hot air welding. Please refer to § 3.2 for further details about lap splicing.

Special Considerations

Adjoining wall flashings are overlapped using standard seaming techniques. The installation of a joint cover piece at the base is required.



3. INSTALLATION

3.5 Corners

3.5.1 CORNERS GENERAL

This section provides information with regard to detailing in and around corners.

All corners should be flashed using one of the following techniques:

- Pre-Molded Corner (inside & outside).
- Field fabricated corner flashing.
- Installation instructions

TPO corners come in groups of 1 inside/outside corner piece which must be cut individually for specific application. Cut the corner out of the pre-molded piece and round off all corners prior to heat welding into place.

Care should be given during the heat welding process in order to prevent heat build up that could damage the TPO pre-molded corner.

Please refer to the drawings in chapter 5 of these guidelines for further details about inside and outside corners using pre-molded corners or unsupported flashing.

3.6 Pipe Penetrations

3.6.1 PENETRATIONS GENERAL

This section provides information with regard to detailing around circular and odd shaped roof penetrations.

All penetrations passing through the membrane should be flashed using one of the following techniques:

- Pre-Molded Pipe Flashing.
- Field fabricated pipe flashing.
- Penetration pocket.

For re-roofing applications, all existing flashings should be stripped off (i.e. lead, existing roofing membranes, mastic, etc.) prior to installation of the new detail. The flashing seal must be made directly to the penetration.

All pipes must be anchored to the deck, as loose pipes move and may damage the flashing.

All TPO components should be protected from direct contact with steam or heat sources when the in-service temperature of the penetration is in excess of 60°C. In such cases the flashing can be installed directly to an intermediate insulated cool sleeve.

All metal edges used at pipe penetrations must have rounded corners.

3.6.2 PRE-MOLDED PIPE FLASHING

Applicability

ARDEX TPO Pipe Flashings are specifically designed to be used in roofing applications for flashing of round penetrations.

The Universal Pre-molded Pipe Flashing is designed for circular pipes from 25 to 152 mm in diameter where the top of the pipe is accessible. The Large Pre-Molded Pipe Flashing is designed for circular pipes from 106 to 203 mm in diameter where the top of the pipe is accessible.

This technique is not applicable for the following situations: structural steel tubing, multiple penetrations close to one another, when the pipe is too close to the wall, flexible penetrations such as cables, on uneven surfaces, for thin metal stacks or hot pipes.

Installation instructions

Clean the pipe and the field membrane around the pipe (approximately 150 mm) with xylene or acetone if the seam area has become heavily contaminated with dirt, debris, mud, etc. If the pipe is rusted or cannot be cleaned with xylene or acetone, clean it with a steel brush, then when possible with xylene or acetone.

Each pipe boot will fit various penetrations and shall be cut at the correct place to insure a tight fit before installation. Select the pipe boot size that corresponds to the outside diameter of the penetration to be flashed. Cut out a circle on the outside of a level ring of the pipe boot that is smaller than the penetration.

Cut the extra material from the pipe boot base around the indented circle. Heat weld the boot into place and install the clamp and sealant per current ARDEX TPO specifications.

Install the stainless steel clamping ring and tighten the locking screw. It is important that the clamping ring seats onto a flattened surface of the boot. Finish by applying a bead of ARDEX WPM 657 General Purpose Sealant around the entire circumference of the pipe.



3. INSTALLATION

3.6.3 FIELD FABRICATED PIPE FLASHING

Applicability

This technique applies to circular pipes or supports where the top is not accessible and for accessible pipes larger than 203 mm in diameter. This technique cannot be used for multiple penetrations, flexible conduits, cables, small pipes less than 25 mm in diameter and hot pipes.

In many cases, the field membrane should be cut to work around the penetration. The cut must be repaired prior to installation pipe flashing. The covering piece must lap a minimum of 75 mm beyond the cut in all directions.

Installation instructions

Refer to the illustrations at the end of this document for additional information.

3.6.4 PENETRATION POCKET

Applicability

Penetration Pockets are designed as a last resort for flashing penetrations that cannot be flashed in any other way. This technique applies to clusters of pipes, odd shaped roof penetrations, I-beams, small pipes less than 25 mm in diameter. Up to a pipe diameter or cluster of 90 mm a pre-molded TPO Penetration Pocket can be used, for larger openings a pocket can be made out of TPO coated metal.

Installation instructions

Seal around the penetration prior to installation to prevent Pourable Sealer from flowing into the roof system and possibly into the building.

In many cases, the field membrane should be cut to work around the penetration. The cut must be repaired prior to installation of the penetration pocket. The covering piece must lap a minimum of 75 mm beyond the cut in all directions.

Pre-molded TPO Penetration Pocket

Open the PVC ring and place it around the penetration. If required, cut the TPO Penetration Pocket through the flange and side in one place and install it over the PVC ring so that the ring fits completely inside the top overhang of the pocket. Then cut a piece of TPO flashing long enough to cover the cut in the pocket and the membrane. Heat weld the flashing on the vertical cut in the pocket and to the lip in the cavity. Center the pocket around the penetration and weld the flange to the membrane. Next, weld the flashing onto the flange and cut membrane. Weld and roll the flange step-off thoroughly.

3.7 Drains and Scuppers

3.7.1 DRAIN WITH CLAMPING RING

Applicability

Roof drains with clamping ring are designed for vertical drainage of new roofs.

Installation instructions

When re-roofing, existing flashing, roofing materials must be removed down to the metal sump. Broken clamping rings must be repaired or replaced. Broken drain bolts must be drilled, tapped and replaced.

Provide a clean even finish on the mating surfaces between the clamping ring and the drain bowl.

Taper insulation around the drain to provide a smooth transition from the roof surface to the drain. Use tapered insulation with suitable bonding surface to create a slope. The slope shall not exceed 1:12.

Position the TPO membrane, then cut a hole for the roof drain. Cut a circular drainpipe, but allow 10 to 20 mm of membrane extending inside the clamping ring past the drain bolts.

Make round clean holes in the TPO membrane to align with clamping bolts. Use a paper punch or a hammer. Do not cut the membrane back to the bolt holes.

Place the clamping ring over the TPO membrane and install the clamping bolts. Tighten the clamping bolts to achieve a constant compression.

Install the drain basket and twist-lock if the drain has a twist-lock system.

3.7.2 ROOF DRAIN INSERT

Applicability

Drain inserts are typically used on drains with little or no sump and for re-roofing applications.

Installation instructions

Remove the existing drain inserts on re-roofing projects.

The field sheet must be in place prior to installation of the drain insert. Cut a circular hole over the centre of the drain. The hole should be as large as the drainpipe.

Install the drain insert in the hole. Drain insert flanges may be fastened using plates and fasteners.

Heat weld a piece of TPO membrane or ARDEX WPM 623 TPO Unsupported Flashing to the flange and onto the field membrane. Please refer to the § 3.2 for overlap and welding requirements.

All cut edges with scrim exposed must be sealed with ARDEX WPM 651 Cut Edge Sealant or WPM 657 General Purpose Sealant.

Refer to the illustrations at the end of this document for additional information.



3. INSTALLATION

3.7.3 SCUPPER

Applicability

Scuppers are used for roofs with a horizontal drainage system in vertical walls.

Installation instructions

The scupper insert piece usually consists of a welded metal sleeve fabricated using TPO Coated metal or of a pre-molded TPO scupper insert piece.

The entire interior of the flange needs to be flashed if the scupper insert is not welded watertight. All corners of the flanges need to be rounded. Remove existing scuppers and provide new watertight ones on re-roofing projects.

The TPO wall flashing membrane must be in place prior to installation of the scupper insert. Cut a hole over the centre of the drain. The hole should be as large as the drainpipe.

Install the drain insert in the hole. Apply a layer of ARDEX WPM 657 General Purpose Sealant sealant between the flange of the scupper insert piece and the TPO membrane around the drainpipe. Use a minimum of one quarter of a tube per drain. Scupper insert flanges may be fastened using plates and fasteners.

Heat weld a piece of TPO membrane or ARDEX WPM 623 Unsupported Flashing to the flange and onto the field membrane. Please refer to the § 3.2 for overlap and welding requirements.

All cut edges with scrim exposed must be sealed with ARDEX WPM 651 Cut Edge Sealant or ARDEX WPM 657 General Purpose Sealant.

Refer to the illustrations at the end of this document for additional information.

3.8 Expansion Joints

Applicability

Expansion joints should be installed at all locations as specified by the designer.

Expansion joints have an extreme durability due to the high resistance to tear and long life performance of the TPO membrane when exposed to intense sunlight and external weather conditions, provided the detail is installed in accordance with the following instructions.

Installation instructions

The TPO membrane should be mechanically attached at both sides of the expansion joint using approved plates and appropriate fasteners, 300 mm on centre.

Install a compressible tube over the expansion joint. The diameter of the insulation tube must exceed the deck or insulation opening by minimum 25 mm. Weld a TPO cover piece onto the field membrane using standard welding techniques.

Refer to the detail drawings at the end of this document for additional information with regards to other types of expansion joints.



3. INSTALLATION

3.9 Roof Edges

Applicability

A roof edge detail should be installed as specified by the designer at all flat edges of the roof where the field membrane ends and at internal and external gutters. The standard roof edge details in this section are generally applicable. Consult ARDEX's Technical Services Department for assistance when designing an alternative detail that is more suitable for specific roof conditions.

Installation instructions

Allow the TPO field membrane to pass over the edge by minimum 100 mm and fully adhere it to the front of the wall over its full length. Use stainless steel screws to fasten the metal edge profile at 100 mm on centre. Whenever possible, fasten as close as possible to the edge of the flange. Make sure that the front part of the profile extends a minimum of 25 mm over the edge of the TPO membrane. Flash the horizontal flange of the metal profile with ARDEX TPO QuickSeam Flashing. Ensure adequate overlap.

Special considerations should be made at the end of a roll, at field splices, corners and where adjoining pieces of metal edge profile overlap.

Metal external gutters require the installation of an appropriate metal edge profile, which is adjusted to the shape of the gutter. Install the profile as previously explained and use TPO QuickSeam Flashing to flash in the flange of the profile.

Concrete external gutters should be flashed with separate strips of TPO membrane. The flashing membrane should be fully adhered onto the substrate over the full extent of the gutter.

Make sure that the flashing strips for the gutter extend a minimum of 150 mm at the internal edge of the gutter, so as to provide sufficient overlap for a welded seam detail including a mechanical anchoring. The external edge of the gutter must be terminated with a wall termination detail.

Internal gutters are to be flashed with separate strips of TPO membrane. The flashing membrane needs to be fully adhered onto the substrate over the full extent of the gutter. Where possible avoid seams in the gutter, by using long pieces of membrane.

Make sure that the flashing strips extend a minimum of 150 mm at both edges of the gutter, so as to provide sufficient overlap for a welded seam detail including a mechanical anchoring.

3.10 Wall Terminations

Applicability

A wall termination detail should be installed as specified by the designer and is applicable at all locations where the TPO flashing ends at wall or curb upstand. The standard termination details in this section are applicable for each ARDEX TPO system. Consult ARDEX Technical Services Department for assistance when specific roof conditions require the design of an alternative detail. Coping stones, metal copings and metal edge profile details are used for upstands to be completely covered with TPO flashing. Counterflashing and termination details can be used at upstands that are not flashed over their entire height.

Installation instructions

Coping stone

Stop the TPO flashings at a sufficient distance of the wall edge so as to allow a good adhesion of the mortar to the wall without compromising the watertightness of the detail. The TPO flashing should be fully adhered to the substrate over its entire length.

Metal Coping

Install a wood nailer on top of the wall. Allow the TPO flashing to extend beyond the wall edge by minimum 50 mm and fully adhere it to the wood nailer over its full length. Use galvanised nails with large head (\varnothing 10 mm) to nail the TPO flashing 150 mm on centre at the vertical face of the wood nailer. Ensure that the front part of the metal coping extends beyond the underside of the wood nailer by a minimum of 25 mm.

Termination Bar

The required height for the TPO flashing should be determined by local regulations. For situations where this condition cannot be satisfied, ARDEX requires that the flashing height exceeds the potential water level of a blocked drain. Suitable substrates for a Termination Bar are concrete, smooth bricks, blocks or masonry. A termination bar may never be mounted to a wooden substrate. The termination bar must be installed directly to the wall surface, not to existing flashings, sheet metal, etc. Pre-drill holes into the brick, masonry or concrete and not into the soft mortar joint.

Keep a minimum space of 5 mm between two adjoining bars. A Termination Bar must be cut at inside and outside corners. Do not bend the bar around the corners.

Prior to installation of the Termination Bar, pull back the topside of the membrane flashing 20 mm and apply a bead of General Purpose Sealant between the membrane and the wall.

Install the Termination Bar with an acceptable fastening system at max. 200 mm on centers. A continuous compression is required and may need additional fastening. Each Termination Bar must be fastened a maximum of 25 mm from the end. Apply a bead of General Purpose Sealant on the topside of the bar.

At all locations where base flashings end, install the Termination Bar vertically. Apply General Purpose Sealant to both sides of the bar.

Counterflashing

The TPO membrane flashing shall be mechanically attached at the top with a metal batten strip. Apply a bead of General Purpose Sealant on the topside of the metal bar.

Allow the counterflashing to cover the top of the metal strip by minimum 100 mm.



3. INSTALLATION

3.11 Membrane Repair

Applicability

Repair of cuts and punctures in the TPO membrane or Unsupported Flashing, contamination of the membrane with hazardous products, voids in heat welded seams.

Installation instructions

Reinforced Membrane

Patches must be at least 150 mm x 150 mm in size and made to be a minimum of 75 mm longer on all sides than the repair area. The patch must consist of a solid weld. These patches are used for deck sheet repairs only.

Strips of reinforced membrane can be used in long areas such as seams or cuts. Strips must be 150 mm wide minimum and 75 mm longer on each end than the repair area. A 38 mm wide seam is required on all sides of this repair.

NOTE: Pay particular attention when welding in step-down areas to roll into these areas while welding. Also, use a pre-weld to hold strip in place while welding.

Unsupported Membrane

Unsupported membrane is to be used when repairing any detail areas with angle changes, such as pipe wraps, wall seams, corner patches and pitch pans. All unsupported patches must be fully welded and be 50 mm or larger on all sides of the repair area. Minimum patch must be no less than 100 mm x 100 mm.

Voids

Voids can be cleaned and re-welded after probing. Use your probe to hold the fold open, insert heat gun nozzle and weld. If the void is in a difficult area, use a patch over the void using the patch specification.

NOTE: Be careful when welding repairs. You can cause more damage by overheating these smaller areas. Turn the heat down to avoid burning and scorching. Use a smaller nozzle with repairing voids in seams. Always clean before repairing.

3.12 Miscellaneous

Roof Walkways

Prior to heat welding the walkway pad to the TPO Roofing System, the membrane needs to be clean and free of dirt, dust or debris. Allow it to relax sufficiently. For best results, installation of the pad should occur during the warmest part of the day. Installing the walkway in colder temperatures can cause the sheet to expand later and cause buckling. Cut the material into manageable lengths (maximum 3 m) and place the TPO Eco Walkway Pad over the TPO Roofing System with the textured side up.

Heat weld the perimeters of each Walkway Pad section to the ARDEX TPO roof membrane using techniques similar to splicing of the ARDEX TPO Roofing System membrane panels. Different welding settings might be required because of the thickness of the Walkway Pad. Special attention must be given when welding occurs over roof membrane seams, to assure that a proper weld is achieved, and no damage to the membrane seams occurs. The perimeter should be heat welded in 600 mm long sections, allowing for a 200 mm space between sections.

Temporary closure

Temporary closures can prevent moisture from damaging the completed section of the new installation but are the responsibility of the roofing contractor. Flashings, Terminations and temporary closures must be completed to provide a watertight condition at the end of each working day.

Mark the free edge of the uncompleted section on the substrate. Fold the membrane back a minimum of 200 mm. Use a chalkline to mark a straight line on the substrate 100 mm within the first marks. Apply a bead of general purpose sealant over the chalkline at a rate of 3 lin.m./tube. Let the membrane fall freely into the general purpose sealant and install some temporary ballast to put the seam under continuous compression. The next working day, use a chalkline to trim a portion of 200 mm at the end of the membrane.

4. PRODUCT DATA SHEETS

ARDEX has developed a complete range of roofing products, including TPO membranes, flashings, adhesives, sealants, cleaning agents, fasteners and a variety of other roofing related products to build up homogeneous TPO Roofing Systems. Each component has been carefully selected to offer the performance required by the specifications, while being compatible with the various roofing designs outlined in this document.

This chapter contains information with regard to the following ARDEX products:

TPO Membrane and Flashings

ARDEX WPM 615 – TPO Roofing Membrane	p. 4.3
ARDEX WPM 623 – TPO Flashing	p. 4.5
ARDEX TPO Inside/Outside Corner	p. 4.6
ARDEX TPO Universal and Large Pipe Flashing	p. 4.7
ARDEX TPO Eco Walkway Pad	p. 4.8
ARDEX TPO QuickSeam Flashing	p. 4.9

Adhesives

ARDEX WPM 642 – Water Based Bonding Adhesive	p. 4.10
--	---------

Sealants

ARDEX WPM 651 – TPO Cut Edge Sealant	p. 4.12
ARDEX WPM 657 – TPO General Purpose Sealant	p. 4.13
ARDEX WPM 659 – TPO Pourable Sealer	p. 4.14

Fasteners and Accessories

ARDEX All Purpose Fasteners	p. 4.15
ARDEX HD Seam Plates	p. 4.16
ARDEX Pressure Seal	p. 4.17

The designer and contractor may refer to this section for information with regard to the individual components: installation, coverage rate, basic physical properties, packaging, shelf life, storage conditions and safety precautions. In addition to these components, other products and accessories not supplied by ARDEX will have to be used in conjunction with the ARDEX Roofing Systems such as structural decking, thermal insulation, fasteners, edging profiles, drain outlets, etc. It is the responsibility of the respective suppliers of these products as to their suitability for any particular purpose.

At the same time, it is recommended that the designer and/or contractor consults ARDEX on a job to job basis, when using non-ARDEX products that are not in compliance with the specifications outlined in this document.

ARDEX WPM 615 – TPO Roofing Membrane

1. Description

ARDEX WPM 615 TPO is a flexible Thermoplastic PolyOlefin roofing membrane made from the incorporation of a ethylene propylene rubber into a polypropylene matrix and produced with a polyester weft inserted reinforcement.

2. Preparation

Roofing structure needs to be stable enough to support the temporary loading. Substrates need to be clean, smooth, dry and free of sharp edges, loose or foreign materials, oil, grease and other materials that may damage the membrane. All surface voids greater than 5mm wide shall be properly filled with an acceptable fill material.

3. Application

Place the membrane panel over the substrate and allow it to relax for approximately 30 minutes before seaming or flashing. Membranes are overlapped (side laps and end laps) in accordance with the installation instructions and details. Seams are heat-welded.

4. Coverage

The dimensions of the membrane are calculated to cover the substrate, including seam overlaps (75 mm for standard seams – 150 mm for seams with mechanical anchoring in the seam) and upstands. Provide an additional length (150mm) at upstands for easy manipulation.

5. Characteristics

Physical	<ul style="list-style-type: none"> • Excellent durability and tear and puncture resistance • High chemical, (micro)bacterial, UV and weathering resistance • No plasticizers or chlorinated ingredients • Avoid contact with oil and petroleum based products, grease and hot bitumen 																																												
Technical	<table border="1"> <thead> <tr> <th>Property</th> <th>Test Method</th> <th>Typical Value</th> </tr> </thead> <tbody> <tr> <td>• Watertightness</td> <td>EN 1928 (A)</td> <td>pass</td> </tr> <tr> <td>• Tensile strength (both directions)</td> <td>EN 12311-2</td> <td>≥ 800 MPa</td> </tr> <tr> <td>• Elongation at reinforcement break</td> <td>EN 12311-2</td> <td>≥ 20%</td> </tr> <tr> <td>• Resistance to static loading (EPS & concrete)</td> <td>EN 12730 (B)</td> <td>≥ 25 kg</td> </tr> <tr> <td>• Resistance to impact (EPS & concrete)</td> <td>EN 12691</td> <td>≥ 10 mm</td> </tr> <tr> <td>• Tear resistance L / T</td> <td>EN 12310-2</td> <td>≥ 400 / 400 N</td> </tr> <tr> <td>• Joint peel resistance</td> <td>EN 12316-2</td> <td>≥ 100 N/50 mm</td> </tr> <tr> <td>• Joint shear resistance</td> <td>EN 12317-2</td> <td>≥ 800 N/50 mm</td> </tr> <tr> <td>• UV exposure</td> <td>EN 1297</td> <td>pass</td> </tr> <tr> <td>• Foldability at low temperature</td> <td>EN 495-5</td> <td>≥ -45 °C</td> </tr> <tr> <td>• External fire performance</td> <td>EN 13501-5</td> <td>B_{ROOF}(t1)</td> </tr> <tr> <td>• Reaction to fire</td> <td>EN 13501-1</td> <td>E</td> </tr> <tr> <td>• Root resistance</td> <td>prEN 13948</td> <td>pass</td> </tr> </tbody> </table>	Property	Test Method	Typical Value	• Watertightness	EN 1928 (A)	pass	• Tensile strength (both directions)	EN 12311-2	≥ 800 MPa	• Elongation at reinforcement break	EN 12311-2	≥ 20%	• Resistance to static loading (EPS & concrete)	EN 12730 (B)	≥ 25 kg	• Resistance to impact (EPS & concrete)	EN 12691	≥ 10 mm	• Tear resistance L / T	EN 12310-2	≥ 400 / 400 N	• Joint peel resistance	EN 12316-2	≥ 100 N/50 mm	• Joint shear resistance	EN 12317-2	≥ 800 N/50 mm	• UV exposure	EN 1297	pass	• Foldability at low temperature	EN 495-5	≥ -45 °C	• External fire performance	EN 13501-5	B _{ROOF} (t1)	• Reaction to fire	EN 13501-1	E	• Root resistance	prEN 13948	pass		
Property	Test Method	Typical Value																																											
• Watertightness	EN 1928 (A)	pass																																											
• Tensile strength (both directions)	EN 12311-2	≥ 800 MPa																																											
• Elongation at reinforcement break	EN 12311-2	≥ 20%																																											
• Resistance to static loading (EPS & concrete)	EN 12730 (B)	≥ 25 kg																																											
• Resistance to impact (EPS & concrete)	EN 12691	≥ 10 mm																																											
• Tear resistance L / T	EN 12310-2	≥ 400 / 400 N																																											
• Joint peel resistance	EN 12316-2	≥ 100 N/50 mm																																											
• Joint shear resistance	EN 12317-2	≥ 800 N/50 mm																																											
• UV exposure	EN 1297	pass																																											
• Foldability at low temperature	EN 495-5	≥ -45 °C																																											
• External fire performance	EN 13501-5	B _{ROOF} (t1)																																											
• Reaction to fire	EN 13501-1	E																																											
• Root resistance	prEN 13948	pass																																											

Note: For latest updates and additional info, please consult our website at www.ardex.com. Testing results and/or copies of Approval Documents for above - mentioned membranes are available upon request.



4. PRODUCT DATA SHEETS

6. Packaging/Storage/Shelf Life

Thickness (mm)	Width (m)	Length (m)	Weight (kg/m ²)
1.5	2.00	30.5	1.54

Storage: Store away from sources of puncture and physical damage. Store away from ignition sources and open flame.

Shelf Life: Unlimited.

7. Precautions

Exercise caution when lifting, moving, transporting, storing or handling membrane rolls to avoid sources of punctures and possible physical damage.

Contact ARDEX Technical Services Department for specific recommendations regarding chemical or waste product compatibility with ARDEX WPM 615 TPO Membrane.

ARDEX WPM 623 – TPO Flashing

1. Description

ARDEX WPM 623 TPO Flashing is a non-reinforced thermoplastic polyolefin membrane designed to be used in roofing applications where ARDEX pre-molded TPO accessory products are not appropriate.

2. Preparation

Substrates must be clean, dry, smooth, free of sharp edges, fins, loose or foreign materials, oil, grease, and other materials which may damage the membrane. All rough surfaces which could damage the membrane shall be repaired prior to installing the membrane, as specified. All surface voids greater than 5 mm wide shall be properly filled with an acceptable fill material.

3. Application

Install the ARDEX WPM 623 TPO Unsupported Flashing material with the appropriate heat welding equipment in accordance with current ARDEX TPO specifications, details and workmanship requirements.

4. Coverage

The dimensions of the ARDEX WPM 623 Unsupported Flashing depend on the detail to be flashed. Refer to the ARDEX specifications and details for specific information.

5. Characteristics

Physical	• Material	Thermoplastic Polyolefin (TPO)	
	• Colour	White or gray	
Technical	Property	Test Method	Typical Value
	• Membrane Thickness	ASTM D-638	1.52 mm +/- 10%
	• Tensile Strength	ASTM D-638	12.3 MPa
	• Elongation at Break	ASTM D-638	750% min.
	• Tearing Strength	ASTM 1004 (Die C)	71 N
	Properties After Heat Aging (166 hours at 115°C)		
	• Tensile Strength	ASTM D-638	10.7 MPa
	• Elongation at Break	ASTM D-638	650% min.
	• Tearing Strength	ASTM 1004 (Die C)	53 N

6. Packaging/Storage/Shelf Life

Packaging: 0.61 m x 15.25 m roll.

Storage: Store material in its original unopened packaging away from sources of physical damage or chemical contamination.

Shelf life: Unlimited.

7. Precautions

Exercise caution when lifting, moving, transporting, storing or handling membrane rolls to avoid sources of punctures and possible physical damage.

Contact ARDEX Technical Department for specific recommendations regarding chemical or waste product compatibility with ARDEX TPO Membrane.



4. PRODUCT DATA SHEETS

ARDEX TPO Inside/Outside Corner

1. Description

ARDEX TPO Inside/Outside Corners are made from a flexible non-reinforced thermoplastic polyolefin membrane and are specifically designed to be used in roofing applications for flashing inside and outside corners on curbs, parapets and scuppers. They may also be used as a square tube flashing by using four outside corners. ARDEX TPO Inside/Outside Corners come pre-cut into individual corners for ease of application.

2. Preparation

Prepare ARDEX TPO Inside/Outside Corner areas by removing all dirt and debris from the membrane surface.

3. Application

Round off all corners prior to heat welding in place. Install the ARDEX TPO Inside/Outside Corner with the appropriate heat welding equipment in accordance with current ARDEX TPO specifications, details and workmanship requirements. Care should be given during the heat welding process in order to prevent heat build up that could burn or damage the TPO molded corner.

4. Coverage

1 piece per outside or inside corner.

5. Characteristics

Physical	• Material	Thermoplastic Polyolefin (TPO)	
	• Colour	White or gray	
	• Overall Size	228 mm x 228 mm	
	• Corner Size	76 mm x 76 mm x 82 mm with 12.7 mm radius on all edges of the raised corner	
Technical	Property	Test Method	Typical Value
	• Membrane Thickness	ASTM D-638	1.14 min.
	• Tensile Strength	ASTM D-638	12.3 MPa
	• Elongation at Break	ASTM D-638	750% min.
	• Tearing Strength	ASTM 1004 (Die C)	49 N
	Properties After Heat Aging (166 hours at 115°C)		
	• Tensile Strength	ASTM D-638	12.8 MPa
	• Elongation at Break	ASTM D-638	650% min.
	• Tearing Strength	ASTM 1004 (Die C)	40 N

6. Packaging/Storage/Shelf Life

Packaging: 20 pre-cut corners per carton.

Storage: Store material in its original unopened packaging away from sources of physical damage or chemical contamination.

Shelf life: Unlimited.

7. Precautions

Exercise caution when lifting, moving, transporting, storing or handling ARDEX TPO Inside/Outside Corners to avoid sources of punctures, physical damage or chemical contamination. Refer to Material Safety Data Sheets for all applicable components of ARDEX TPO Systems.

ARDEX TPO Universal and Large Pipe Flashing

1. Description

ARDEX TPO Pipe Flashings are specifically designed to be used in roofing applications for flashing of round penetrations. Each pipe boot will fit various penetrations and shall be cut at the correct place to insure a tight fit before installation.

2. Preparation

Penetration shall be clean of prior flashings or foreign material.

3. Application

Select the pipe boot size that corresponds to the outside diameter of the penetration to be flashed. Cut out a circle on the outside of a level ring of the pipe boot that is smaller than the penetration.

Cut the extra material from the pipe boot base around the indented circle. Heat weld the boot into place and install the clamp and sealant per current ARDEX TPO specifications.

4. Coverage

1 piece per penetration.

5. Characteristics

Physical	<ul style="list-style-type: none"> • Material Thermoplastic Polyolefin (TPO) • Colour White or gray • Sizes Universal (25.4 mm to 152.4 mm) Large (101.6 mm to 203.2 mm)
-----------------	---

6. Packaging/Storage/Shelf Life

Pipe Boot Size	O/D of Penetration	Pieces per Carton
Universal	25.4 mm to 152.4 mm	10
Large	101.6 mm to 203.2 mm	10

NOTE: Clamps are included (All stainless steel - quick release – worm gear type).

Storage: Store material in its original unopened packaging away from sources of physical damage or chemical contamination.

Shelf life: Unlimited.

7. Precautions

Exercise caution when lifting, moving, transporting, storing or handling ARDEX TPO Small and Large Pipe Flashing to avoid sources of punctures, physical damage or chemical contamination.

Refer to Material Safety Data Sheets for all applicable components of ARDEX TPO Systems.



4. PRODUCT DATA SHEETS

ARDEX TPO Eco Walkway Pad

1. Description

The ARDEX TPO Eco Walkway Pad is a non-reinforced walkway composed of recycled TPO and EPDM. The pad has a slip-resistant Deep Levant textured surface and a smooth bottom surface.

The walkway pad is required in areas where necessary rooftop traffic will occur to help protect the roofing system from unnecessary damage as follows: at all access points (ladders, hatches, doorways, etc.) to the roof, as a walkway system on roofs subjected to traffic more frequently than once per month.

2. Preparation

Prior to heat welding the walkway pad to the ARDEX TPO Roofing System, the membrane needs to be clean and free of dirt, dust or debris. Allow it to relax sufficiently. For best results, installation of the pad should occur during the warmest part of the day. Installing the walkway in colder temperatures can cause the sheet to expand later and cause buckling. Cut the material into manageable lengths (maximum 3m) and place the ARDEX TPO Eco Walkway Pad over the TPO Roofing System with the textured side up.

3. Application

Heat weld the perimeters of each Walkway Pad section to the ARDEX TPO roof membrane using techniques similar to splicing of the ARDEX TPO Roofing System membrane panels. The perimeter should be heat welded in 600 mm long sections, allowing for a 200 mm space between sections. Different welding settings might be required because of the thickness of the Walkway Pad. Special attention must be given when welding occurs over roof membrane seams, to assure that a proper weld is achieved, and no damage to the membrane seams occurs.

4. Coverage

In accordance with length of detail.

5. Characteristics

Technical	<ul style="list-style-type: none"> • Base • Colour • Solids • State • Thickness • Brittleness temperature 	<ul style="list-style-type: none"> Rubber polymers dark gray 100 % Cured 3.8 mm -40 °C
------------------	---	--

6. Packaging/Storage/Shelf Life

Packaging: 0.76 m wide by 12.2 m long rolls. Roll Weight: 33.6 kg.

Storage: Store material in its original unopened packaging away from sources of physical damage or chemical contamination.

Shelf life: Unlimited.

7. Precautions

Refer to Material Safety Data Sheet.

Do not expose walkway material to any open flames or ignition sources.

ARDEX TPO QuickSeam Flashing

1. Description

ARDEX TPO QuickSeam Flashing is a non-reinforced thermoplastic polyolefin membrane laminated to a white cured seaming tape. ARDEX TPO QuickSeam Flashing is used for flashing metal roof edging profiles and other details as indicated in the specifications and details.

2. Preparation

ARDEX TPO surfaces and metal substrates must be prepared with TPO QuickPrime, using a QuickScrubber or QuickScrubber Plus tool. Use of other products is not allowed. Restore the product to room temperature prior to use if exposed to temperatures below 15°C for prolonged periods.

3. Application

Install the ARDEX TPO QuickSeam Flashing material in accordance with current ARDEX TPO specifications, details and workmanship requirements. Do not use the product for 3-dimensional details or details where the product will have to be stretched.

4. Coverage

In accordance with the length of the detail. Refer to the ARDEX specifications and details for specific information.

5. Characteristics

Physical	<ul style="list-style-type: none"> • Excellent moisture resistance • Excellent resistance to heat • Excellent green tack 		
Technical	Tape	TPO Flashing	
<ul style="list-style-type: none"> • Base • Colour • Solids • Specific weight • Thickness • Width 	<ul style="list-style-type: none"> • rubber polymer • white • 100 % • 0.98 • 0.89 mm • 146 mm 	<ul style="list-style-type: none"> • TPO • White or gray • 100 % • 1.15 • 0.76 mm • 140 mm 	

6. Packaging/Storage/Shelf Life

Packaging : 0.14 m x 30.5 m roll, 2 rolls per carton.

Storage: store material in its original unopened packaging at temperatures between 15°C and 25°C away from sources of physical damage or chemical contamination. Do not store in direct sunlight or at temperatures above 25°C.

Shelf life: 6 to 9 months can be expected when stored at 15°C to 25°C in original unopened containers indoors. Shelf life will be shortened if exposed to elevated temperatures.

7. Precaution

Refer to Material Safety Data Sheets. Exercise caution when lifting, moving, transporting, storing or handling membrane rolls to avoid sources of punctures and possible physical damage.



ARDEX WPM 642 – Water Based Bonding Adhesive

1. Description

ARDEX WPM 642 Water Based Adhesive is a contact adhesive designed specifically for bonding ARDEX WPM 615 TPO membranes to approved insulations in addition to wood, metal, masonry, and other acceptable substrates.

2. Preparation

Surfaces on or against which ARDEX WPM 642 are to be applied must be clean, smooth, dry, free from sharp edges, loose and foreign materials, oil, grease and other contaminants. Sweep the mating surface of the membrane with a stiff broom to remove excess dusting agent, if present, or other contaminants from the mating surface. Ambient temperatures shall be 4.4°C and rising. Do not attempt to use ARDEX WPM 642 when there is a possibility of freezing temperatures within 48 hours after application.

3. Application

Stir the adhesive thoroughly before and during use. Apply ARDEX WPM 642 at about the same time to both the exposed underside of the sheet and the substrate to which it will be adhered to allow approximately the same drying time.

Apply ARDEX WPM 642 with a solvent resistant paint roller and roll the adhesive on both mating surfaces. Apply ARDEX WPM 642 evenly to avoid globs and puddles of adhesive. ARDEX WPM 642 may also be spray-applied, followed by back rolling to ensure 100% coverage by the bonding adhesive. Take care not to apply bonding adhesive over an area that will later be cleaned and spliced to another sheet or flashing.

Allow bonding adhesive to flash off until tacky. Touch the bonding adhesive surface with a clean, dry finger to be certain the adhesive does not stick or string. As you are touching the adhesive, push straight down to check for stringing, also push forward on the adhesive at an angle to ensure that the adhesive is ready throughout its thickness. If either motion exposes wet or stringy adhesive when finger is lifted, it is not ready for mating.

In addition ARDEX WPM 642 will change from gray to dark translucent colour as the carrier evaporates. Flash off time will vary depending on the substrate temperatures and ambient air conditions.

When the bonding adhesive is ready to be mated, start at the fold and roll the previously coated substrate slowly and evenly to minimise wrinkles. To ensure proper adhesion, compress the bonded portion of the sheet to the substrate with a stiff push broom or heavy roller such as a linoleum roller.

4. Coverage

Coverage rates depend on the smoothness of substrate and method of application.

Standard Application Method: 2.45–3.07m² per Litre (nominal) both surfaces (roller application).

Some insulation surfaces are more uneven and porous and may result in a lower coverage rate while smooth, less porous facers may result in higher coverage rates. Rates are based on roller application to both mating surfaces. When sprayed and back-rolled, the rate may be slightly higher than when rolled only.

4. PRODUCT DATA SHEETS

5. Characteristics (similar layout as to manual)

Physical	<ul style="list-style-type: none"> • Excellent resistance to ageing. • Good resistance to heat, cold. • Excellent tack time for versatility • Outstanding adhesion to approved substrates for maximum performance
Technical	<ul style="list-style-type: none"> • Base Acrylic • Colour Gray (when first applied) Dark Translucent (when carrier evaporates) • Solids 62.59% (min) • Specific Gravity 16,000 ± 3,000 centipoise, R.V.F. Brookfield #4 Spindle @ 10rpm • Weight 1.05kg/L • S.G. 1.05 (nominal) • V.O.C. content 18g/L

6. Packaging/Storage/Shelf Life

Packaging: 18.9L pail

Storage: Store in original unopened containers at temperatures between 15.6°C – 26.7°C.
If exposed to lower temperatures, restore to room temperature prior to use. Do not allow to freeze.

Shelf Life: 12 months if stored in above-mentioned conditions. Shelf life will be shortened if exposed to elevated temperatures for a prolonged period of time.



4. PRODUCT DATA SHEETS

ARDEX WPM 651 – TPO Cut Edge Sealant

1. Description

ARDEX WPM 651 TPO Cut Edge Sealant is a polymer based sealant used to seal all cut edges of ARDEX WPM 615 TPO membrane where the polyester reinforcement is exposed. It is available in white and grey.

2. Preparation

Surfaces that ARDEX WPM 651 TPO Cut Edge Sealant is to be applied must be clean, dry, free from loose and foreign materials, oil and grease. Clean the area of the seam, if contaminated, with a ARDEX approved membrane wash prior to treating the edge with ARDEX WPM 651 Cut Edge Sealant. Restore the sealant to room temperature prior to use, if exposed to temperatures lower than 15°C for a prolonged period.

3. Application

Wait until the welded seam is cool to the touch before applying ARDEX WPM 651 Cut Edge Sealant.

Transfer ARDEX WPM 651 Cut Edge Sealant from the one gallon can into the squeeze bottle provided using the attached spout. Trim the tip of the bottle off to provide approximately a 3.2 mm (1/8") diameter opening.

Apply approximately a 3.2 mm (1/8") to 6.4 mm (1/4") diameter bead of sealant to all cut edges of ARDEX TPO Membranes with exposed reinforcement.

4. Coverage

Coverage rate of: 3.2 mm diameter bead: 457 m with a 3.78 Litre can.
6.4 mm diameter bead: 122 m with a 3.78 Litre can.

5. Characteristics

Physical	<ul style="list-style-type: none"> • Excellent resistance to ozone, ultraviolet and general weathering • Excellent resistance to heat, cold and water • Excellent adhesion to ARDEX TPO sheet
Technical	<ul style="list-style-type: none"> • Base Synthetic Rubber Polymers • Colour White and Gray • Solvents Aromatic and Aliphatic • Viscosity 2,000 – 3,000 cps • Specific Gravity 952 • Flash Point 26 °C • V.O.C. content 734g/l

6. Packaging/Storage/Shelf Life

Packaging: 7.5 litre with 4 bottles per carton.

Storage: Store in original unopened containers at temperatures between 15°C and 25°C until ready for use.

Shelf life: 12 months, when stored in above-mentioned conditions. If exposed to lower temperatures, restore to room temperature prior to use. Shelf life will be shortened if exposed to elevated temperatures for a prolonged period of time.

7. Precautions

Refer to Material Safety Data Sheet.

Flammable. Keep away from fire and open flames during storage and use. Do not smoke when using. Avoid contact with skin. Use only in well ventilated areas. For professional use only. Keep out of reach of children. Recommended cleaner is rubbing alcohol followed by soap and water.

ARDEX WPM 657 – TPO General Purpose Sealant

1. Description

ARDEX WPM 657 TPO General Purpose Sealant is a high quality sealant with excellent adhesion to a variety of surfaces, and for use in conjunction with ARDEX TPO Systems as a Termination Bar Caulk, and TPO Cut Edge/ Seam Edge treatment, where required by ARDEX details.

2. Preparation

Surfaces to receive ARDEX WPM 657 TPO General Purpose Sealant must be clean, dry, sound, frost free, and grease free. When cleaning substrates to receive ARDEX WPM 657 TPO General Purpose Sealant, detergent or soap and water treatments are not recommended. Solvent cleanings are recommended to clean protective films, oils, etc.

3. Application

ARDEX WPM 657 TPO General Purpose Sealant is designed to be applied with an ordinary caulking gun. Cut nozzle to desired bead size and apply sealant, making sure that the sealant is in good contact with all sides of the joint. Tooling of ARDEX WPM 657 General Purpose Sealant is not required.

4. Coverage*

For continuous bead of 6 mm x 6 mm:183 m per carton.

* Estimated coverage rates.

5. Characteristics

Physical	<ul style="list-style-type: none"> • Excellent resistance to ozone, ultraviolet and general weathering • Excellent resistance to heat, cold and water. • Excellent adhesion to ARDEX TPO sheet
Technical	<ul style="list-style-type: none"> • Base EPDM Rubber • Colour White • Solids 80% (nominal) • Specific Gravity 1.40 – 1.46 • V.O.C. content Less than 250 g/l

6. Packaging/Storage/Shelf Life

Packaging: 25 cartridges per carton.

Storage: Store in original sealed container at temperatures between 15° C and 25° C.

Shelf Life: 12 months, when stored in above –mentioned conditions. Shelf life will be shortened if exposed to elevated temperatures.

7. Precautions

Refer to Material Safety Data Sheet.

Wear eye protection. Use only in well ventilated areas. Do not contaminate with foreign materials. For professional use only. Keep out of reach of children. Thinning is not allowed. Recommended cleaner is xylene or acetone before sealant cures. After sealant is cured, it can be removed by abrasion or mechanical means. Wear protective gloves when using.



4. PRODUCT DATA SHEETS

ARDEX WPM 659 – TPO Pourable Sealer

1. Description

ARDEX WPM 659 TPO Pourable Sealer is a two component sealer designed to create a watertight seal around small pipe penetrations, clusters of pipes, I-beams etc. in a penetration pocket detail.

2. Preparation

Surfaces on which ARDEX WPM 659 Pourable Sealer is to be applied must be clean, dry, and free from loose and foreign materials, oil, grease, water and other contaminants. Restore ARDEX WPM 659 Pourable Sealer to room temperature prior to use, if exposed to lower temperatures (< 15°C) for a prolonged period.

3. Application

After preparation of the penetration pocket per ARDEX details, pour Part B into Part A and mix thoroughly using a drill with a mixing blade. Mix until the Part A material is uniformly black in colour. If material contains gray streaks, then mixing should continue. Mix so that material on the bottom and sides of the can is fully circulated and mixed. Carefully pour the thoroughly mixed ARDEX WPM 659 Pourable Sealer into the penetration pocket. Fill penetration pocket so as to allow shedding of water from the actual penetration.

4. Coverage

Use 1 mixture of part A and part B to fill up a volume of 3375 cm³ (e.g. 1 time 15x15x15 cm³ or 3 times 15x15x5 cm³). Minimum thickness applied is 50 mm. Thinning is not allowed.

5. Characteristics

Technical		
	• Base	Polyurethane
	• Colour	Black (mixed) / Part A: light gray / Part B: black
	• Solvents	none
	• Solids (%)	100
	• Viscosity (cp)	Part A: 250.000-325.000 / Part B: thin, free flowing
	• Specific Gravity	Part A: 1.25 / Part B: 1.14
	• Flash point (°C)	Part A: 185 / Part B: 218
	• Pot life	Max. 30 minutes – mixed at 22°C

6. Packaging/Storage/Shelf Life

Packaging: 4 x 3.78 Litre/carton.

Storage: Cool and dry. Store material in original unopened packaging. Keep the material out of direct sunlight until ready for application.

Shelf life: 12 months, when stored in above-mentioned conditions. Shelf life will be reduced if exposed to high temperatures.

7. Precautions

Refer to Material Safety Data Sheets.

Keep away from fire and open flame during storage and use. Do not smoke when using. For professional use only. Use only in well ventilated areas. Avoid contact with skin and eyes. ARDEX WPM 659 Pourable Sealer is extremely difficult to remove. Disposable gloves are recommended when mixing and dispensing Pourable Sealer. Eye protection must be worn during mixing and installation. Avoid moisture contamination. Contact with water can generate explosive pressure in a closed container. Recommended cleaners are mineral spirits, naphtha or kerosene.

ARDEX All Purpose Fastener

1. Description

ARDEX All Purpose Fasteners are specifically designed for mechanical attachment of the ARDEX TPO membrane and roofing insulation (using acceptable insulation fastening plates) to steel, plywood and timber decks.

2. Preparation

Substrate must be sound and dry. For some substrates ARDEX will require a pull-out test prior to installation. Refer to the chapter System Design for additional information.

3. Application

Threads must engage the decking material per ARDEX specifications. Install fasteners with low speed hammer drill. Use #3 hardened Phillips bit to drive fasteners. Do not over- or under-drive fasteners. Fasteners should typically penetrate through steel decks a minimum of 19 mm; into or through wooden decks a minimum of 25 mm.

4. Coverage

The quantity of fasteners should be in compliance with wind design requirements.

5. Characteristics

Technical		
• Material	SAE 1022, Heat treated steel	
• Colour	red	
• Thread size (mm)	6.0	
• Threads/inch	13	
• Head	#3 Phillips drive	
• Typical pull-out	1800 N in 0.75mm steel deck	
• Corrosion	electro deposition (E-coat)	

6. Packaging/Storage/Shelf Life

Item	Screw Length (mm)	Screw length (")	Thread Length (mm)	Pieces/pail
00	32	1 1/4	Full	1000

Storage: Dry and clean.

Shelf life: Unlimited.

7. Precautions

Eye protection is recommended during installation.



4. PRODUCT DATA SHEETS

ARDEX HD Seam Plate

1. Description

ARDEX HD Seam Plates are specifically designed to be used for the attachment of ARDEX TPO membranes to approved substrates in conjunction with ARDEX All Purpose Fasteners.

2. Preparation

ARDEX HD Seam Plate can only be used to fasten the ARDEX TPO membrane. They are not to be used for insulation attachment or attachment of non-reinforced flashing.

3. Application

Position the HD Seam Plates as specified in the installation instructions and attach them to the substrate using the appropriate fastener.

4. Coverage

In compliance with the requirements.

5. Characteristics

Physical	<ul style="list-style-type: none">• Plates are circular shaped, 60.3 mm diameter• Plates have 4 inner and 4 outer Eyehook extensions for additional holding power
Technical	<ul style="list-style-type: none">• Material Galvalume – Sheet Steel (AZ50 or AZ55)• Material thickness 0.94 mm• Hole diameter 6.73 mm ± 0.076 mm• Pull through resistance 317.5 N from center hole• Corrosion resistance < 15% red rust in 15 Kesternich cycles

6. Packaging/Storage/Shelf Life

Packaging: 1000 pcs/pail.

Storage: Dry and clean.

Shelf life: Unlimited.

7. Precautions

Eye protection is recommended during installation.

ARDEX Pressure Seal

1. Description

ARDEX Pressure Seal is designed for termination of ARDEX TPO membrane against smooth walls in all roofing systems.

2. Preparation

Substrate must be sound, smooth, dry and free from dust, dirt, oil and other contaminants prior to installation. Wall areas above Pressure Seal must be waterproof.

When site cutting is necessary, remove any burrs from the bar and clean up shavings, etc. that may occur from cutting.

3. Application

Install a general purpose sealant behind top of flashing. Anchor the Pressure Seal through the pre-punched holes with an acceptable fastener at a rate to maintain a good, tight compression to the wall against the general purpose sealant. Remove excess flashing material above the bar and install General Purpose Sealant into the channel. Consult ARDEX specifications and details for specifics.

4. Coverage

In accordance with the length of the detail.

5. Characteristics

Technical		
	• Material	corrosion-resistant aluminum
	• Length (m)	3.10
	• Width (mm)	35
	• Thickness (mm)	2.2

6. Packaging/Storage/Shelf Life

Packaging: 25 in a pack. (77.5m).

Storage: Store in original unopened container protected from the weather.

Shelf life: Unlimited.

