



**TOGETHER**  
*for a sustainable future*

## OCCASION

This publication has been made available to the public on the occasion of the 50<sup>th</sup> anniversary of the United Nations Industrial Development Organisation.



**TOGETHER**  
*for a sustainable future*

## DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

## FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

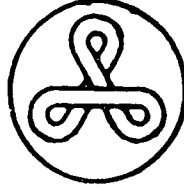
## CONTACT

Please contact [publications@unido.org](mailto:publications@unido.org) for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at [www.unido.org](http://www.unido.org)

22995

M. SHANKO & Co.  
UNIPACO.



شركة مروان شنكو وشركاه  
يونيباكو

Our Ref. : ..... رفس  
Yr Ref. : ..... رقمكم  
Date : ..... تاريخ

TO: UNIDO  
General service Branch  
Division of Administration  
Attention Mr. Kolovskov . Contracts officer.

Date: May 20, 2004

Reference : MP/SYR/02/158  
Subject: Final progress report

Dear Sir:

On the above mentioned contract, please find attached the final report prepared by our company, and the certificate of conformity from the Civil Defense Dept. of Aleppo.

We confirm that the site is prepared and ready for the installation of production equipment and safety systems.

In addition to what is mentioned in the report, we would like to inform you that about 90% of the construction activities are already done, and the remaining activities are progressing satisfactorily. Its supervision is taken care by our technical services.

We would appreciate if, in conformity with the terms of the contract, you give instruction to release the final payment after approval of our report.

Thank you very much

Director

M.SHANKO



شركة مروان شنكو وشركاه

س.ت. ٩٨٠٩ حلب ص.ب. ٩٢٠٣



Sworn Translator

Mohamed Inayat Grouni

English – Arabic

الترجمان المحلف  
محمد عنایت كروني  
إنكليزي - عربي

Aleppo-Syria-P.OBox:511.Telfax:5551892.  
E-mail :grouni-m@maktoob.com

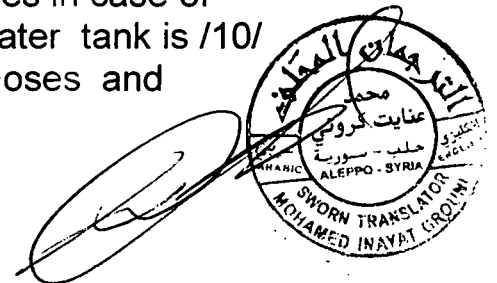
Syrian Arab Republic  
Ministry of Defense  
General directorate of civil Defense  
Civil Defense Dept. of Aleppo  
Operations Dept.

To whom It May Concern

The Company of Marwan ShanKo and partners has applied to us on the 6<sup>th</sup> of Jan. 2004 to conduct check up on the alarm system , extinguisher system and the protection system in their industrial establishment for the production of disposable lunch plastics located at Azaz high way . Hayan .

On the 10<sup>th</sup> of Jan. 2004 we conducted the needed checkup .

- 1- The Butane Gas tank found to be in an isolated area from the rest of the buildings under steel umbrella protected from sun shine with water sprinklers to cool the tanks with the safety valves needed according to the international specifications .
- 2- It is found that /12/ smoke internal detector sensors distributed properly in the production sections and the ware houses linked to Auto alarm panel and /2/ detector sensors for gas linked to a separate warning panel .
- 3- There are water sprinklers properly distributed in the rolls storing warehouse and in the production area linked to two water pumps of /4/ HP . One is functioning as principal and the second as reserve . the sprinklers line's valves lines electrically opens with reserve manual valves in case of power failure of electricity .the volume of water tank is /10/ cubic meter and there are cabins of hydra hoses and



extinguishing hoses equipped with a nozzle head of length /25/ m. of /4/ units distributed properly in the production and the storing area with the protective masks from the gas and smoke .

4- There are extinguishing equipments distributed in the factory of /21/ devices as following :

- 1- Powder device of /50/ Kg. /3/ in number
- 2- Powder device of /6/ Kg. / 6/ in number
- 3 – CO2 Gas device of /12/ Kg. /4/ in number
- 4- CO2 gas device of /6/ Kg. /3/ in number
- 5-Powder device of /2/ /5/ in number

5- There are three effective ventilation systems in the factory sections .

/ Production and ware houses /

6-there are exhausts fans of /5/ in number for air installed on the windows in the final production section .

Finally, the protection system approved at Marwan Shanko and partners is acceptable and deemed to be all systems and devices in the site suitable .

It is to assure to the competent officials in the said company the exigency of conducting periodical tests and required maintenance to get sure of the effectiveness of the systems and the way of exploiting them perfectly .

Liet. Col. Ammar Mallouhi  
 Director of civil defense of  
 (seal & signature)

Aleppo , 15<sup>th</sup> of Jan. 2004

---

True and correct Translation .  
 Aleppo, January 24 2004

Sworn-in translator,  
M.IO.Grouni

A handwritten signature in black ink is written over a circular official stamp. The stamp contains the name 'محمّد عنایت مروني' (Mohammed Aynat Marouni) in Arabic at the top, and 'ENAYAT MAROUNI' in English in the middle. Below the name, it says 'LEPPO - SYRIA'. At the bottom of the stamp, it reads 'SWORN TRANSLATOR' and 'MOHAMMED INAYET GROUNI'.

الجمهورية العربية السورية  
وزارة الدفاع  
المديرية العامة للدفاع المدني  
مديرية الدفاع المدني بحلب  
دائرة العمليات

## إلى من يهمه الأمر

تقدمت إلينا شركة مروان شنكو وشركاء بتاريخ ٢٠٠٤/١/٦ لإجراء كشف تفقدي على نظام الإنذار وأجهزة الإطفاء و الحماية في منشاتهم الصناعية لإنتاج العبوات البلاستيكية استعمال مرة واحدة الكائنة في طريق اعزاز / حيان /  
وبتاريخ ٢٠٠٤/١/١٠ قمنا بإجراء الكشف اللازم وتبين مايلي:

١- وجود خزان غاز البوتان في منطقة معزولة عن باقي المباني تحت مظلة معدنية واقية من أشعة الشمس مع وجود مرشات مائية لتبريد الخزان ووجود صمامات الأمان المطلوبة وفق المواصفات العالمية

٢- تم ملاحظة /١٢/ حساس دخاني موزعة بشكل جيد في أقسام الإنتاج و المستودعات مرتبطة بلوحة إنذار أوتوماتيكية و كذلك /٤/ حساسات للغاز مرتبطة بلوحة إنذار منفصلة

٣- يوجد مرشات للماء موزعة بشكل جيد في مستودع تخزين اللفات و مستودع الإنتاج مرتبطة بمضخة ماء بقوة /٤/ حصان عدد /٢/ واحدة تعمل أساسية و الثانية احتياط تفتح صمامات هذه الخطوط كهربائياً مع وجود صمامات يدوية احتياطية في حال انقطاع الكهرباء حجم خزان الماء /١٠/ متر مكعب وكذلك توجد خزائن و كذلك توجد خزائن لخراطيم الإطفاء مجهزة بقاذف بطول /٢٥/ متر عدد /٤/ موزعة بشكل جيد في صالة الإنتاج و التخزين مع أقتعة واقية من الغاز و الدخان

٤- يوجد أجهزة إطفاء موزعة ضمن المعمل عدد /٢١/ جهاز وفق مايلي :

- ١- جهاز بودرة سعة /٥٠/ كغ عدد /٣/
- ٢- جهاز بودرة سعة /٦/ كغ عدد /٦/
- ٣- جهاز غاز  $CO_2$  سعة /١٢/ كغ عدد /٤/
- ٤- جهاز غاز  $CO_2$  سعة /٦/ كغ عدد /٣/
- ٥- جهاز بودرة سعة /٢/ كغ عدد /٥/

٥ - يوجد ثلاثة أنظمة تهوية فعالة في أقسام المعمل/ الإنتاج و المستودعات /

٦- يوجد شرفات عدد ٥/ للهواء مركبة على النوافذ في قسم الإنتاج النهائي

وبالنتيجة فإن نظام الحماية المعتمد في شركة مروان شنكو وشركاء مقبولة وتعتبر كافة الأنظمة و الأجهزة الموجودة في الموقع مناسبة ويجب التأكيد على المسؤولين في الشركة المذكورة عن ضرورة إجراء الاختبارات الدورية و الصيانة اللازمة للتأكد من فعالية هذه الأنظمة واستثمارها بالشكل الأمثل .

المقدم عمار ملوحي  
مدير الدفاع المدني بحلب



١٥ كانون الثاني ٢٠٠٤

## INDEX

<i>Content</i>	<i>page</i>
Comments	4
Butane, storage and handling equipments	5
Low pressure pump	7
High pressure pump house	8
Extrusion of EPS foam	10
Storage of intermediate and finished goods	12
Thermoforming hall	13
Waste handling, storage and recycling hall	14
Factory ventilation	15
Gas detection	17
Safety, rules, training and procedures	18
Electric equipment and zone classification	20
FIRE, extinguishers, sprinklers and other items	21
Smoked detectors	24
Anti-static equipment	24
Diagram N° 1	25
Diagram N° 2 y N° 2A	26
Diagram A	28
Diagram B	29
Diagram C	30
Hood system - Photo	31
Attachment I	32
Attachment II -- Purchase order N° 150004977Y	33
I Jhaiav S A	

**Comments as regards the facilities installed.**

**1.- Butane storage and handling Equipment**

**1<sup>a</sup>- Tank storage**

Items	Recommended	Installed
1- Static earthing between road tanker and fixed tank	Yes	Yes
2- Multi-port relief valve assembly with vent tubes complete with rain caps	Two	One(1) (a)
3- Tanker Sprinkler / drench system	Yes	Yes
4 - Excess flow valve located at draw-off point from the tanker	Yes	Yes
5- Emergency shut-off valve Inter-linker to the factory protection Interlocks	Yes	No (2) (a)
6- Excess flow valve located at draw-off point from the tank to the low pressure Pumps	Yes	Yes
7.- Tank level indication ( non-electric)	Yes	Yes
8- Tank pressure indication	Yes	Yes
9- Tank contents temperature indication	Yes	Yes
10- Wire mesh fence	Yes	No (3) (a)

**(a) S&P responsibility**

Note 1: Install two Relief valves with an opening above the present ceiling.

Note 2: S&P Co. does not want to have any factory protection interlocks. It is hereby recommended to install an Emergency shut-off valve connected to the manual Shut down button.

Note 3: It is hereby recommended to install a gate of Wire Mesh Fence at the front.

***These are all the recommendations that should be applied so as to meet 100% of the Terms of References.***



**Basic Recommendations:**

To install the following:

- 1- Another Relief Valve, mounted on a "T", over the present connection and extend the pipeline so that the gas can have a way out in case it has to be operated. (a)
- 2- Protect the exit of rain water; this may be done using rain cups (a)  
(the bottom of a plastic bottle over the exit.)
- 3- Install a Wire Mesh fence gate.(a)
- 4- Erect more signs indicating Danger and No Smoking.(a)
- 5- Install an Emergency shut-off valve, connected to the manual Shut down button. Such button should be placed in the Extrusion room.(a)

**(a) S&P responsibility**

## 2 – Low pressure Pump ( L.P.P.)

Items	Recommended	Installed
1 - To build a L.P.P. room	Yes	No (a)
2 - Type of electrical supply in the L.P.P. room	Explosion Proof	No (1) (a)
3- Suction pipeline	Carbon Steel	Rubber (a)
4- Relief valve pipeline	Carbon steel	Rubber (a)
5 -Motor drive electrical connection	Explosion Proof	No (a)
6 –Type of motor drive	Explosion Proof	Explosion Proof

### (a) S&P responsibility

Note 1: Improve the wires connection to the motor. (a)

### Basic Recommendations:

- 1- Change rubber hoses for carbon steel in: (a)
  - 1.1 Connection of the suction line with the L.P.P. (a)
  - 1.2 Relief valve pipeline (a9)

2- Build a room separate from any other activity. Today it is installed in a maintenance workshop. (a)

### (a) S&P responsibility

### 3.- High Pressure Pump house

Items	Recommended Installed	Installed
1- The H.P.P. building would be located outside but adjacent to the main factory	Yes	No(1) (a)
2- Install low level louvered wall vents	Yes	No (a)
3- Install a ventilation fan supplying outside non-hazardous air to the inside TOP of the room which forces out any gas to the wall.	Yes	No ( 2) (a)
4 - Type of motor drive electrical connection.	Explosion proof	No (a)
5 - Install an alarm to the ventilation fan stoppage in. H.P.P.	Yes	No (a)
6 - Install an automatic FIRE extinguisher.	Yes	No (a)
7- Install one gas detector near the floor.	Yes	Yes ( 3) (a)
8- All electrical switches must be mounted outside on the wall.	Yes	No (a)
9 - The stop/start button of the H.P.P. will be at the main Extrusion Line Control Panel.	Yes	No (a)
10 - The pipe work to the Extrusion Line must be high integrity Stainless Steel.	Yes	Yes (a)
11 - The pipe work installation must be visible & well marked above ground ( 3 meters high), well supported and protected from any possible damaging.	Yes	No (4) (a)
12 - Since the pump is of the manual adjustable diaphragm pump type it is recommended that NO controls be located inside the factory, except for the Start/Stop winches installed on the Extrusion Line control cabinet.	Yes	Yes (a)
13- High pressure gas supply shut-off fail valve to be remotely activated and connected to the Interlocking safety systems.	Yes	No ( 5) (a)
14 - High pressure relief valve set at 5000 psi relieving back to the supply tank via dedicated pipeline.	Yes	No ( 6) (a)
15 - Shut down interlocks from gas detection system and Extrusion line safety.	Yes	No ( 5) (a)
16- Two CO <sub>2</sub> fire extinguishers must be mounted inside the room.	Yes	Yes

(a) S&P responsibility

Note 1: At present it is located in a room where maintenance work is carried out.

Note 2: It has an aspirator fan at floor level with a motor. Non Explosion Proof.

Note 3: Lower the gas detector at floor level.

Note 4: At present it is in a trencher, below the floor level and the connection to the extrudes is without any kind of protection.

Note 5: S & P Co is not willing to have any Interlocking Safety Systems.

Note 6: At present, it airs to the atmosphere, above the room ceiling of the H.P.P.

### **Basic Recommendations:**

- 1- Build walls inside the existing room. See proposal in Diagrams – A. (a)
- 2- Improve the pipe work installation, see item 11.
- 3- The present fan is installed on the wall at the floor level. Such fan should be used to inject non-hazardous air to the inside TOP of the room which forces out and gas to the wall and door low level louvered. Build a duct to inject air to the wall opposite the door and to the Low Louvered wall. See Diagrams – A. (a)
- 4- Install all electric switches outside the H.P.P room. The lights must be explosion proof (a)
- 5- Install an Automatic FIRE extinguisher. (a)
- 6- Lower the gas detector at floor level. (a)
- 7- Install the Stop/Start of the H.P.P. It will be at the main Extrusion Line Control Panel. (a)
- 8- Install an Alarm that indicates when the fan has stopped. Such fan must be always at work while the H.P.P. is in operation. (a)
- 9- The pipe work must be installed in a visible and well marked place above ground (3 meters high), well supported and protected from any possible damage.(a)
10. In the wall facing southwards, build the door and install a low level louvered in the door and adjacent wall. Diagrams A. (a9)
- 11.- Modify all the electric connections to the bomb motors as a Tube Explosion Proof. (a)

### **(a) S&P responsibility**

#### 4-Extrusion of EPS Foam

Items	Recommended Installed	Installed
1 - Fire Prof. doors must be installed between the extrusion hall and the storage of Intermediate products. See Diagram N° 1.	Yes	No ( 1) (a)
2 -No scrap should be stored in the vicinity of the extrusion equipment.	Yes	Yes (a)
3- Interlock extrusion line system.	Yes	No (2) (a)
4- Ventilate instrument control cabinet with fresh air in the bottom and out at the top.	Yes	No (a)
5 - Locally ventilated with vacuum the feed zone, gas injection point, screen changer and the die area.	Yes	No (3) (a)
6 - Ventilate the extrusion hall at least 10 times per hour in addition to the local extraction points ( item 5)	Yes	No ( 4) (b)
7- Provide for natural ventilation for whole extrusion hall, by installing low level louvered Vents	Yes	No ( 5) (a)
8 – Fit gas detection sensors.	Yes	Yes ( 6)
9 – Fit anti-static equipment on pull roll systems as well as in the stands.	Yes	No (a)
10. Install FIRE extinguishers.	Yes	Yes
11 - The butane foam extrusion hall must NOT be used as a Raw Material Store.	Yes	Yes
12- To install extraction ducts in Extrusion hall.	Yes	Yes (7)
13 - Forced ventilation in Extrusion hall with specific inlet from the roof down to the floor .	Yes	No (8 )( a)
14- To change the metal lids en las trenchers below the floor level for other lids with wholes or wire mesh.	yes	NO (a)
15 - To install a general Manual SHUT OFF button in Extrusion Hall.	Yes	Yes
16 - Motor drivers of Existent Extruder.	See ( 9)	See ( 9)
18- The flow of air in the fan ducts must be monitored and an alarm must be set off.	Yes	No (a)
19 - To install fire emergency exit – Diagram 1	Yes	No(10) (a)
20- To install stagnant lights.	Yes	No(11) (a)

#### (a) S&P responsibility

Note 1. The present doors between the Extrusion hall and the adjacent rooms are not FIRE Proof and therefore they MUST be changed.

Note 2. Interlock extrusion line system. S&P. Co. does not want any Interlock system. (a)

Note 3. See Diagram B and Photo attached.

Note 4. At present there is only one air extraction system. The suction louvers on the walls are placed too high. They should be lowered to 5 cm. near the floor level. **(b)**

Note 5. Provide for natural ventilation for the whole extrusion hall by installing low level louvered vents. S&P. Co. does not want to install low level louvered vents for different reasons. They say the gates remain open during the operation. **(a)**

Note 6. Fit gas detectors. Lower the present detectors to 5/10 cm. near the floor level. **(b)**

Note 6: See Note 4.

Note 7. See Basic Recommendations.

Note 8. See Basic Recommendations

Note 9. See Attachment I

Note 10. See Diagram 1

Note 11. Ventilate the rest: see Chapter -- Ventilation

### **Basic recommendations**

- 1- Motor drivers of the present extruder. See Attachment I. **(a)**
- 2- Make all the gates FIRE Proof. – Diagram 1. **(a)**
- 3- Build the EMERGENCY FIRE exit according to Diagram 1. **(a)**
- 4- Change the lights to dust/watertight lights **(a)**
- 5- Ventilate the instrument control cabinet with fresh air in the bottom and out at the top. **(a)**
- 6- Locally ventilate with a vacuum in the die area. See Diagram C. **(a)**
- 7- Lower the present butane gas detector to 5/10 cm from the floor level. **(b)**
- 8- Install fans to inject non-hazardous air to the hall through the upper part. **(a)**
- 9- Change the metal lids in the trenchers of air, water and butane gas pipelines, for another lid with holes, similar to a wire fence. **(a)**
- 10- The air suction grilles on the walls are too high. They should be lowered to 5 cm. near the floor level. **(b)**

**(a) S&P responsibility      (b) Syrian Coil Firm S.C. responsibility**

## 5 - Storage of Intermediate and Finished goods

Items	Recommended Installed	Installed
1 - To install smoked detector, linked to the central fire alarm system	Yes	Yes
2 - To install the water sprinkler system	Yes	Yes
3- To install extraction ducts in the Storage of Intermediate & Finished Goods.	Yes	Yes ( 1)
4 - No gas detector are recommended for this hall.	Yes	Yes
5 – Forced ventilation in Extrusion hall with specific Inlet from the roof down to the floor	yes	No (a)
6 - To nstall fire proof doors – See Diagram 1	Yes	No (2) (a)
7- To install emergency fire doors	Yes	Yes
8- Forklift to be a diesel type for safety reasons.	Yes	Yes
9- The rolls of butane extruded EPS must be stored in such a manner that the rolls do not interfere with the ventilation.	Yes	Yes
10- All butane foamed extruded products must be aged / mature, for butane release, at least 10 days, before it is transported off-site.	Yes	Yes
11-Install one foam fire extinguisher.	Yes	Yes
12- Install four handled CO <sub>2</sub> fire extinguishers.	Yes	Yes

### (a) S&P responsibility

Note 1- Lower the present ducts to 5 cm. near the floor level.

Note 2- Be verified by S&P Co.

### Basic recommendations:

1. To install fans in order to force ventilation in the Storage of Intermediate and finished goods. (a ) (b)

2. Install FIRE Proof Doors. (a)

3. Install EMERGENCY FIRE exits - See Diagrams 2 (a)

(a) S&P responsibility (b) Syrian Coil Firm S.C. responsibility

## 6-Thermoforming hall

Items	Recommended	Installed
1 - No methane burning for heating purposes must be allowed in this hall.	Yes	Yes
2 - To install extraction fans.	Yes	Yes (1)
3- Install anti-static equipment.	Yes	yes
4 - To install emergency FIRE exits.	Yes	No (a)
5- Fire fighting equipment to be installed.	Yes	Yes
6 - Fire extinguishers to be installed.	Yes	Yes

(a) S&P responsibility

Note 1. Lower the present extraction fans to 20 cm. near the floor level.

### Basic Recommendations:

1. Install the Emergency FIRE exits. See Diagram 1.(a)
2. Lower the present extraction fans to 20 cm. near the floor level (b)

(a) S&P responsibility

(b) Syrian Coil Firm S.C. responsibility



## 7- Waste handling, storage and recycling hall.

This area is inside the Thermoforming hall and it should be located in a separate room.

	Recommended	Installed
1 - The waste must be stored in open wire cages, for at least 24 h., before it is macerated in a grinder.	Yes	NO(1)(a)
2 - To install forced ventilation from roof down to floor Level.	Yes	No (a)(b)
3 - To install low level louvered vents in all outside walls.	Yes	No (a)
4 - To install emergency FIRE exits.	Yes	No (a)
5 - To install water sprinklers inside the silos.	Yes	No (a)
6 - To install infrared smoke detector.	Yes	No (a)
7- To install three handheld FIRE extinguishers.	Yes	Yes
8 - To install force extract from underneath to remove the air / butane mixture.	Yes	No (2)

### (a) S&P responsibility

Note 1. At present, the scrap is stored in open recipients with the walls all closed and the product is grinded immediately after it comes out of the thermoforming machine.

Note2. The area is widely open and the workers can get away from it easily.

### Basic Recommendations:

1. Change the recipients where the scrap is stored before its treatment. (a)
2. Look for a place where to store the scrap for 24 h. before processing it. (a)
 

There are two types of scrap:

  - a) The one obtained upon extrusion operation. Such scrap should be stored for a minimum period of 10 days.
  - b) The one obtained in the Thermoforming process. This should be stored according to Point 1 and let it settle for 24hs.
3. Lower the extraction fan on the wall to the floor level. (b)
4. Install water sprinklers in the storage silos of treated scrap. (b)

### (a) S&P responsibility

### (b) Syrian Coil Firm S.C. responsibility

## 8 - Factory Ventilation

Items	Recommended Installed	Installed
1 - Advise on the ventilation requirements in order to obtain adequate ventilation in the working environment below the T.L.V. (threshold limit value) of butane. This could normally be expected to be achieved by 10 air changes per hour.	Yes	No ( 1) (b)
2 - To install, where it is possible, natural ventilation level by installation of low level louvered vents.	Yes	No ( 2)(a)
3 - To ensure that the gas butane concentrations stay below the T.L.V.	Yes	No (a) (b)
4 - The natural ventilation should be supplemented with forced air in order to sweep across the floor towards the floor vents.	Yes	No ( 3) (a)
5 - To install a fan in the High Pressure Pump to supply fresh air into the hall.	Yes	No (4)(a)
6 - Extrusion hall, to install hoods for Local Extraction points, as follow: 6.1 – Extrusion line die head 6.2 - Screen changer 6.3 -Gas injection point 6.4 – Material feed port	Yes	No (a)
7 – Extrusion and Storage intermediate a finished goods halls to install low level louvers in all External walls.	Yes	No (5)(a)
8 – Extrusion hall: Control instrument Panel: to install non-hazardous air into the bottom of cabinet. and out at the top, in order to prevent butane accumulation in this cabinet	Yes	No(a)

(a) S&P responsibility

(b) Syrian Coil Firm S.C. responsibility

Note 1. S&P Co. does not make any calculation in order to check the air flow.

Note 2. S&P Co. does not want to install any low level louvered vent.

Note 3. There are old centrifugal fans and ducts that can be adapted.

Note 4. Presently it has, only , an extraction fan.

Note 5: S&P is not willing to install any type of Low level louvers vents.

### Basic Recommendations:

1. Leave the suction ducts system with its fans . Motor Driver must be Explosion Proof. (b)
2. Lower the ducts mounted on the walls to 5 cm. near the floor level. At present they are 30 / 40 cm high from the floor level. (b)
3. Check if the motors are Explosion Proof. As specified in the Purchase Order N° 15000497Y of UNIDO. See attachment II. (a) (b)
4. Use three centrifugal fans and their ducts to inject fresh air to the Extrusion Hall. The motors, as they are not in contact with the butane gas, they can be open IF the fans are centrifugal ones.(a)
5. Idem for Storage of intermediate products hall. (a)
- 6- To install hoods for Local Extraction in Extrusion line die head ( at least (a) – See photograph

(a) S&P responsibility

(b) Syrian Coil Firm S.C. responsibility

### Comments

Low Level Louvers in all external walls Natural ventilation at 10 times per hour. If there is an electricity power failure, all activities in this room are stopped and it is only the freshly extruded product which must be ventilated with natural ventilation.

Forced ventilation in extrusion hall with specific inlet from the roof down to the floor. Diagram 2. Fan N° 1. The air comes in through eight inlets on the ceiling and it is sucked up by the axial fans placed on the walls at floor level. In this particular case, the current suck-up instalation which is placed at 5 cm from the floor, will be used. In this way, a positive air flow is achieved with very low possibilities of having a short circuit.

These fans should run continuously and should not be shut-down during normal operation. Air inlet should come from uncontaminated areas, like for instance the roof area, but not where excessive heat build-up is experienced.

This air should then "sweep" across the floor towards the opposite wall and then out through the low level louvered vents and the axial fans, which are installed at floor level.

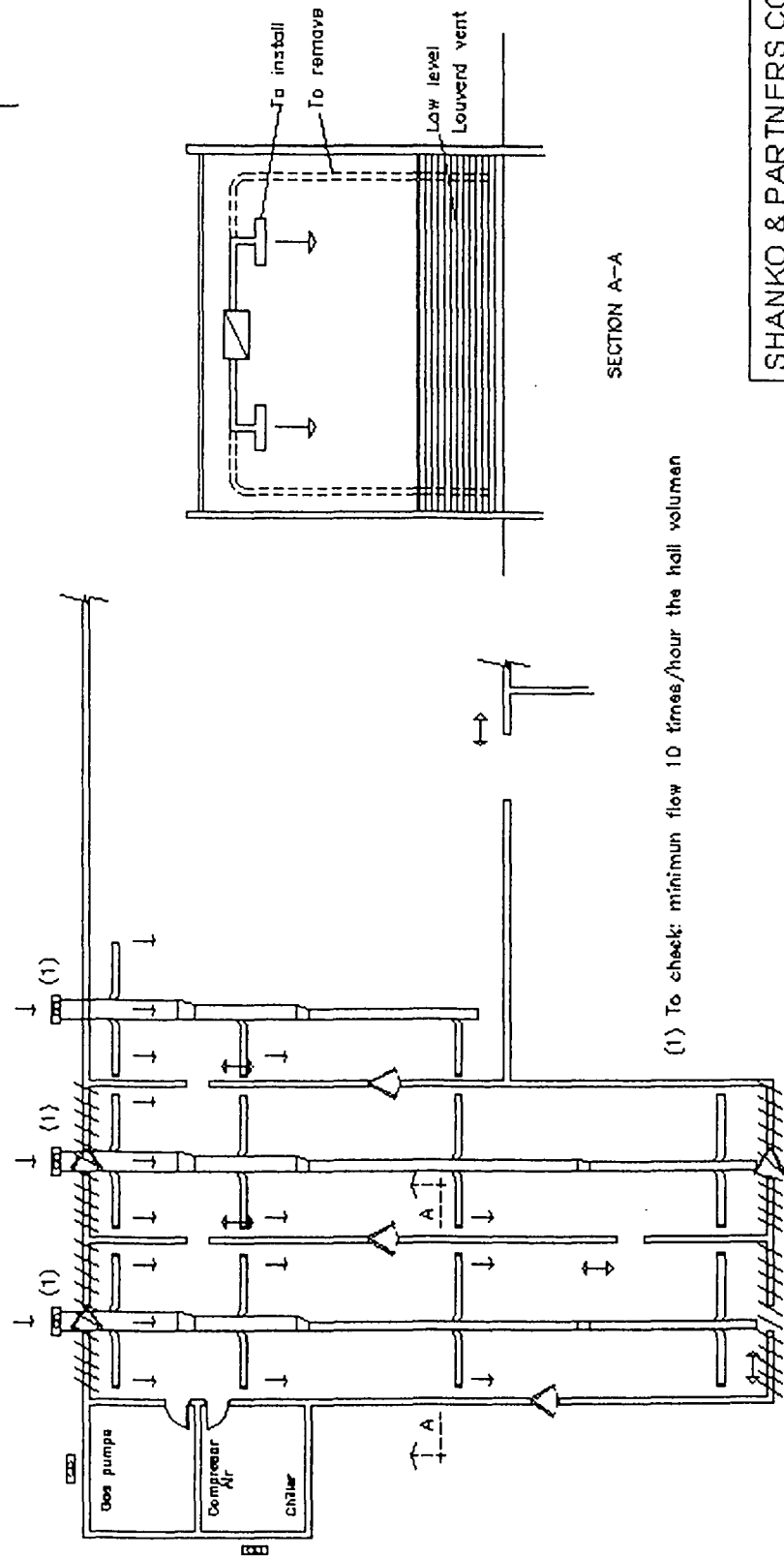
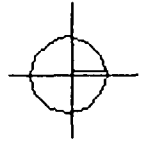
In this particular case, as there are not low level louvered vents, the axial fans are essential. In a well ventilated EPS factory, butane levels in air above 100 ppm should not be exceeded and certainly the T.L.V. (threshold limit value) of 600ppm should not be approached in the general working environment.

Also, the butane levels must not, in any specific local area, reach 20% of the L.E.L.(lower explosive limit)equivalent to 3600ppm.

The extraction hoods should measure about 0.75 by 1.0 meters and the extraction capability must be assessed by the ventilation engineer. The hoods must be situated above the specified points. See photograph.

**All our recommendations on ventilation are based in S & P's desire of avoiding TO INSTALL LOW LEVEL LOUVERED VENTS, WHICH ARE ABSOLUTELY FUNDAMENTAL FOR A GOOD VENTILATION of the rooms.**

DIAGRAM 00: Forced ventilation in extrusion hall and others , with the existing ducts and fan



SECTION A-A

(1) To check: minimum flow 10 times/hour the hall volumen

SHANKO & PARTNERS CO  
ALLEPO SYRIA

Feb - 2004

**9 -Gas detection**

Items	Recommended	Installed
1 - Gas supply tank. The detector will be installed protected from rainwater and the tank water drenching.	Yes	No (a)
2 - High pressure Pump room.	Yes	Yes ( 1)
3 - Extrusion line	Yes	Yes ( 1)
4 - No gas detection required in the following halls: Waste handling storage and recycling hall Intermediate and finished Goods store	Yes	Yes

(a) S&P responsibility

Note 1. Lower the present detectors to the floor level. (a)

## 10 -Safety rules, training and procedures

**This issue is very important in order to change the personnel's way of thinking as they are used to working with a non-explosion gas and this is a significant topic to be taken into account.**

Any factory converting to a hydrocarbon blowing agent must re-appraise its normal procedures and formalise the same. This area does not involve capital expenditure, but is vitally important for a continued safe working environment. The following should be recommended:

- 10.1. Prior to any trials or conversion work, formalise a procedure for "what to do if highlighting WHO is in charge. During trials it is often valuable to have a non-involved person nominated to ensure that safe practices are followed. Additionally, a nominated person should be responsible for the gas storage system.
- 10.2. Write formal procedure for:
  - 10.2.1. Butane tanker unloading.
  - 10.2.2. Gas storage tank maintenance procedures for routine work (permit to work) and statutory inspections.
  - 10.2.3. System audits - "You know how it should work and did on day one, but does it still?" An independent 6 monthly review is necessary.
  - 10.2.4. What to do in the event of a minor fire and what to do in the event of a major fire.
  - 10.2.5. Gas system isolation and shut-down.
- 10.3. Install a fire alarm system with assembly points and a method of monitoring who is working in the factory at any particular time. This MUST include contractors and visitors.
- 10.4. Formally co-ordinate the factory-fire plan with the local authorities, so that in the event of the fire alarm being set off the local fire brigade should know gas tank isolation procedures.
- 10.5. Formalise system for checking all fire precautions:
  - 10.5.1. Gas detectors still alarming at correct level.
  - 10.5.2. Fire extinguishers all in correct locations and filled.
  - 10.5.3. Smoke detectors in working condition.
  - 10.5.4. Water ring main and sprinkler system and water hoses in working condition.
- 10.6. All factory operators should be taught and practice how to approach small and large fires and how to shut down and isolate the gas tank system in an emergency.
- 10.7. Welding and brazing work should be the subject of a formal permit to work procedure. No angle grinding should ever be allowed near (within 20 meters) foamed material no matter how old the foamed product.

*Fire.Cont.*

- 10.8. Contractors and site visitors should be given a copy of site rules and be asked to sign acceptance of no smoking, no naked flames rules. Visitors and contractors should be "dematched". All cigarette lighters should also be removed.
- 10.9. Smoking areas should be clearly identified and new "No Smoking" signs erected in no smoking areas. Anyone caught smoking outside designated areas should be subject to immediate disciplinary procedure.
- 10.10 Create nominated storage areas for any dangerous substances that can react with hydrocarbons (butane) e.g. oxygen.
- 10.11. Scrap storage should be in designated areas, kept to a minimum and stored in open portable wire mesh cages
- 10.12. A list of general safety rules should be drawn up and clearly displayed. This list to contain items such as:-
  - 10.12.1. No Smoking Areas.
  - 10.12.2. Checking on and off site.
  - 10.12.3. Nominated person for gas alarm investigation per shift.
  - 10.12.4. Nominated person for safety of gas tank system and pumps.
  - 10.12.5. Welding rules.
  - 10.12.6. Scrap granulation and storage.
- 10.13. Factory Housekeeping.

It is normal, in a factory about to use a hydrocarbon blowing agent, to remove from the production area all unnecessary flammable materials such as wood, sawdust, oil, paint, etc.

Additionally, it is sensible to check that in the event of a fire an unimpeded passage exists to all exit doors. Hence, it is helpful to remove any non-flammable unnecessary items from the production area. The result is a somewhat bare-looking factory, but in the event of a fire, people can get quickly to or away from it.

Machinery configuration should be examined to ensure that no "dead ends" or narrow passageways are created.

*Fire.Cont.*

Scrap is the greatest daily hazard and accumulations of scrap must be contained in well ventilated mesh portable cages. It is worthwhile appointing a shift operator as the "scrap monitor". This person is responsible for the overview of the scrap situation with the necessary authority to stop production if scrap levels rise to an unacceptable level.

Scrap storage and handling probably presents the greatest single hazard in SHANKO & PARTNER CO. Factory. All others are automatically controlled. Untidy accumulated scrap can spread fires between production units.

10.14. Signs should be purchased for:-

- 10.14.1. Emergency fire exits.
- 10.14.2. Gas detector locations.
- 10.14.3. Restricted areas.
- 10.14.4. Gas system isolation points..
- 101.4.5. No Smoking.

Pipe work needs to be colour coded in line with international standards and a clear distinction of flow and return lines need to be made. It is useful to indicate on pipe work, the direction of flow. It is normal to keep compressed air lines separate from gas pipe runs and piped or stored oxygen must not be anywhere in the gas pipes, pumps or tanks.



## 11 - Electric equipment and zone classification

See recommendation of electric equipment types in each of the areas indicated above.

- All the electric equipment in close proximity area around the gas tank should be specified to flame Proof standards-
- The high pressure pump house, all the electrical equipment must be Explosion Proof.

**12 - FIRE extinguishers , sprinklers and others items**

**Comments.**

1- THE LOCATION OF ALL FIRE FIGHTING EQUIPMENT TO BE USED BY THE PERSONNEL SHOULD NOT BE PLACED TOO CLOSE TO THE AREA WHERE A FIRE IS EXPECTED. THE REASON BEING THAT IN CASE OF A FIRE THE FIRE FIGHTER WOULD HAVE TO APPROACH TIHE FIRE WITHOUT A FIRE EXTINGUISHER IN ORDER TO REACH THE FIRE EXTINGUISHER. THE HIGH PRESSURE FIRE EXTINGUISHER CANISTER COULD ALSO EXPLODE WHEN EXPOSED TO THE EXCESSIVE HEAT OF THE MATERIAL BURNING.

1- Important recommendation: draw up, AS SOON AS POSSIBLE, A PLAN OF CONTINGENCIES stating the role of each supervisor and personnel of the plant in case of a fire, that is what each person is supposed to do when the fire alarm goes off. Such plan should be read once a month to all the personnel and several clear copies should be displayed in key places inside the plant.

2- Improve and increase the amount of signs indicating potential dangers.

3- Increase the capacity of FIRE water Tank . Actually is too small

4- Connect the electric generator directly to the fire water bombs and replacement water bombs to the storage tank. IT IS DONE.

Items	Recommended	Installed
1 - Water fire tank capacity of 10.000 litres, could be no enough. Analyze the possibility of increasing the reserve of water	Yes	No (a)
2- the main water pipe line of 2 plg looks enough Have it verified by an expert.	Yes	Diameter too small(a)
3 - FIRE Hydrant ring main with FIRE hoses must be installed, in the following places: 3-1-Two in extrusion line 3-2- One in Waste storage and Recycling Hall 3-3-Two in Intermediate and finished goods store	Yes Yes Yes	Yes Yes Yes
4 - Butane tank drenching system	Yes	Yes
5 - Sprinklers with automatic activation are required in the following areas:		
5-1- Waste handling, storage and Recycling Hall	Yes	No (a) (b)
5-2- Inside Flake silos in waste, Handling Storage and Recycling Store	Yes	No

5-3 - Intermediate and Finished Goods store	Yes	No
5-4 - Automatic activated dry powder units mounted over the following areas:		
High pressure pump in High pressure Pump room	Yes	No
Extrusion line screen changer and the die area	Yes	No
6 - Handheld portable trigger operated 5 kg CO <sub>2</sub> extinguishers in the areas-	Yes	Yes
7- Larger 300 Kg. foam or powder fire extinguishers in:		
One Foam: Butane gas tank	Yes	Yes
One Dry powder: Extrusion line winders	Yes	Yes
One Foam: Intermediate and Finished Goods stores	Yes	Yes
8 - Fire alarm buttons, in the following areas		
Gas tank	Yes	To be verified (a)
High pressure pump room	Yes	Yes
Extrusion hall	Yes	Yes
Thermoforming hall	Yes	Yes
Intermediate & finished Goods store	Yes	Yes
Waste storage area	Yes	To be verified (a)
Offices	Yes	To be verified
All emergency exits not in daily use	Yes	To be verified (a)

**Basic Recommendations:**

- 1- Increase the FIRE water capacity. (a)
- 2- Check the diameter of the main pipe line of FIRE water again. It looks to be too small. (a)
- 3- Install automatic activated dry powder units mounted over the following areas (a)
  - High pressure pump in the H.P.P. room.
  - Extrusion line screen changer and the die area.

### 13- Smoke detectors

In Intermediate and finished goods stores.	Yes	Yes
Office area.	Yes	No (a)
Waste storage/Recycling area.	Yes	No (a)
In Intermediate and finished goods stores.	Yes	Yes

#### Basic recommendations:

1- To install Smoke detector in:

Office area  
Waste storage/recycling area

(a) S & P responsibility

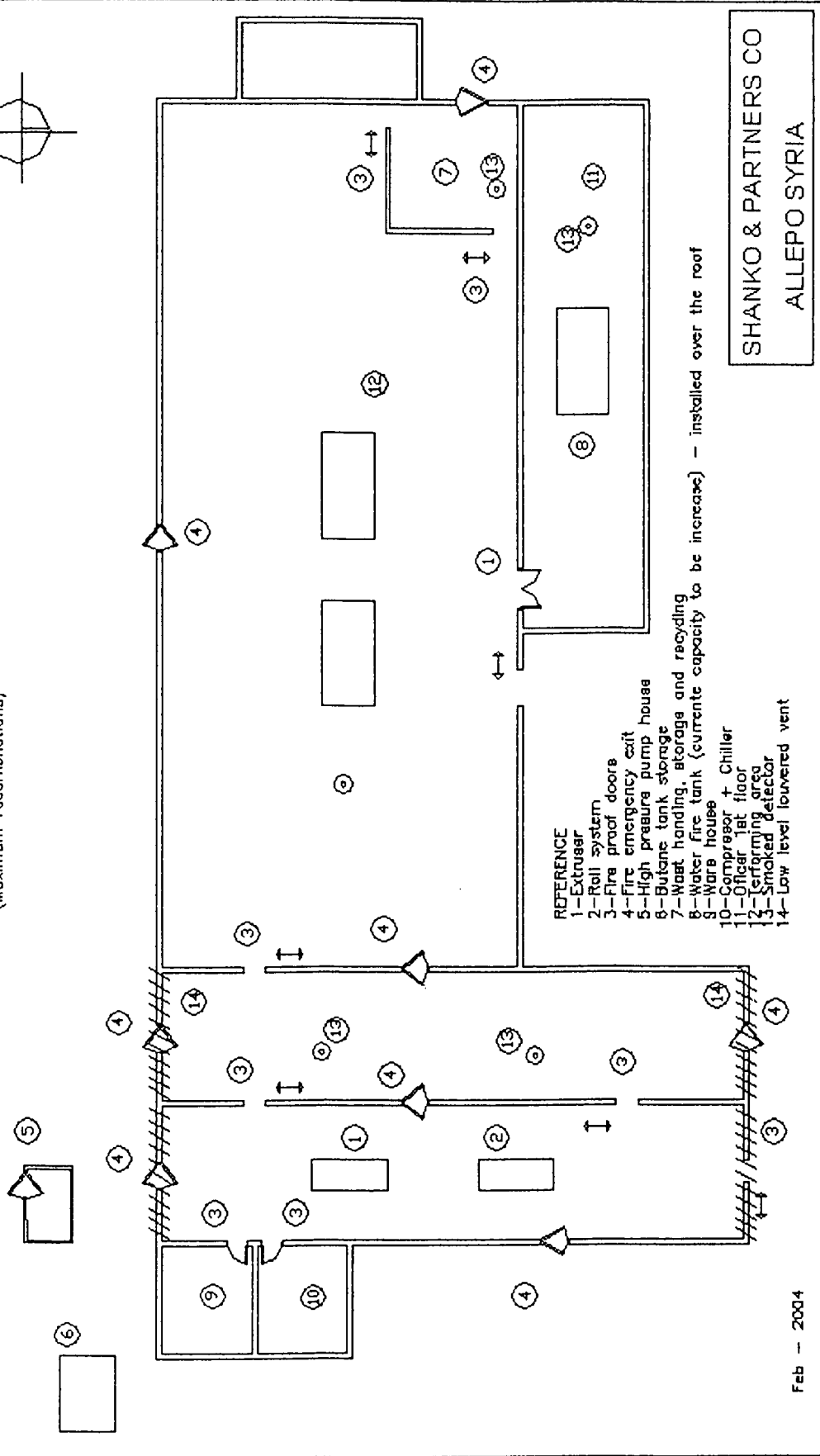
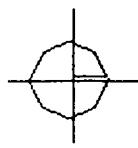
### 14- Anti-static equipment

Extrusion line pull-off unit Two anti-static	Yes	No (a)
Extrusion line Winder unit three anti-static	Yes	Yes
Thermoform area Two anti-static	Yes	Yes

(a) S& P responsibility

DIAGRAM 1: General site Lay-out indicating civil construction and installation

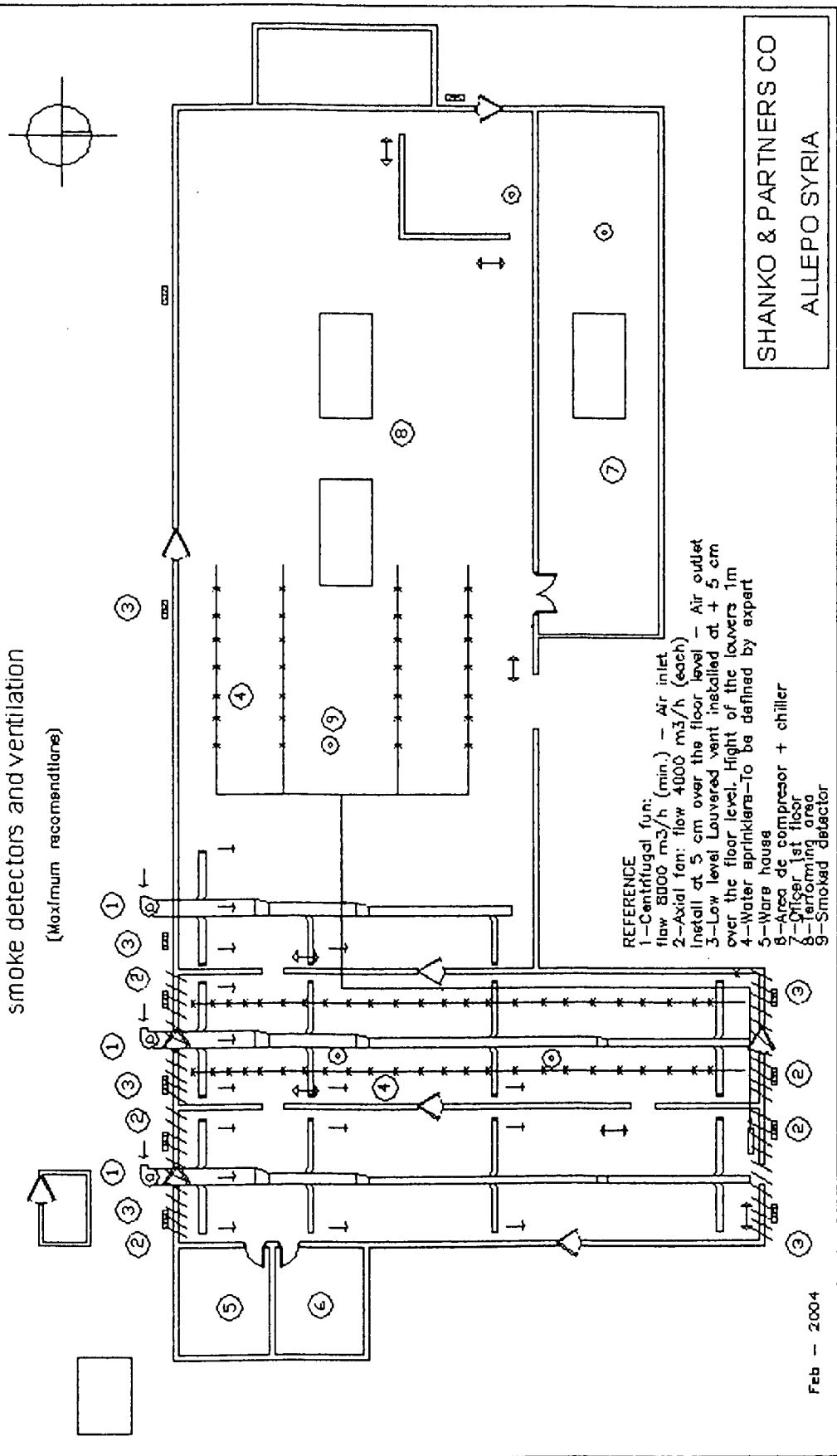
(Maximum recommendations)



SHANKO & PARTNERS CO  
ALLEPO SYRIA

Feb - 2004

DIAGRAM 2: General site Lay-out indicating extrusion line position water sprinklers, smoke detectors and ventilation  
(Maximum recommendations)



SHANKO & PARTNERS CO  
ALLEPO SYRIA

Feb - 2004

DIAGRAM 2 A: Extrusion hall and storage of intermediate goods - Forced ventilation

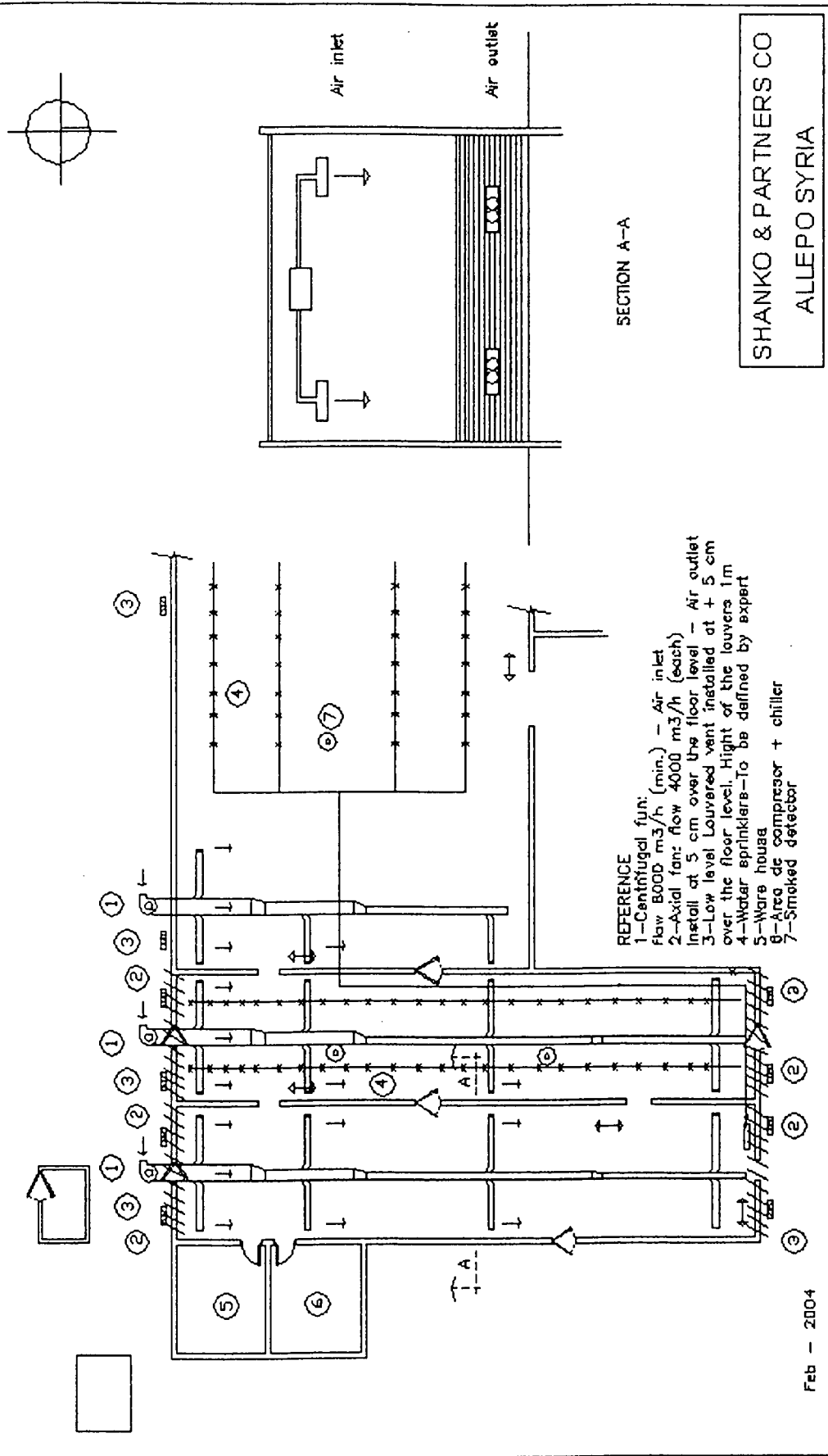
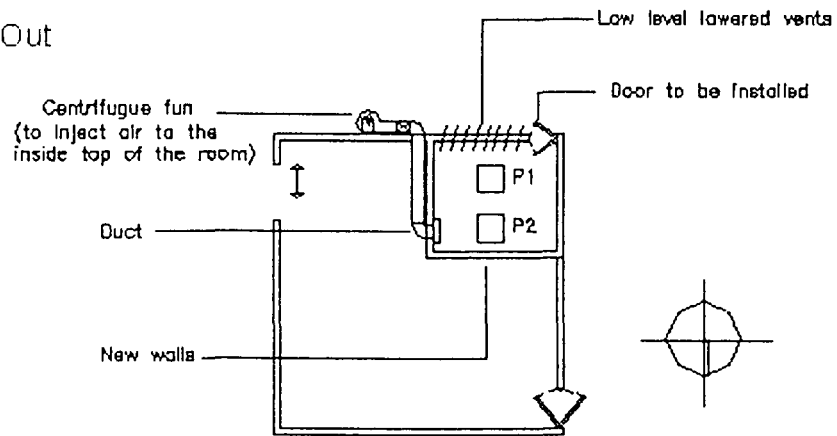


DIAGRAM - A

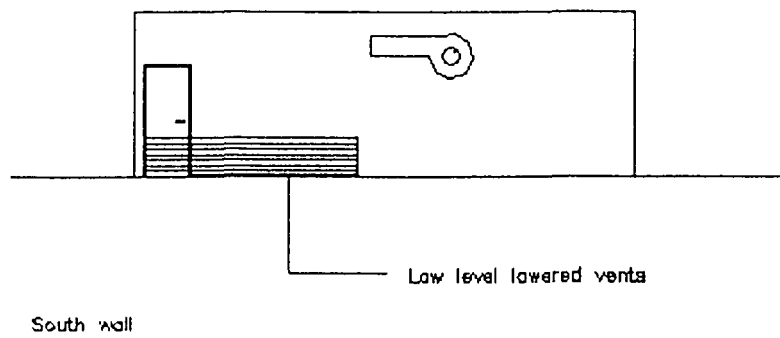
High Pressure pump house (existent)

Basic recommendation (without measurements)

A - Lay Out



B - View A - A



SHANKO & PARTNERS CO  
ALLEPO SYRIA

Feb - 2004



DIAGRAM - B

Local extraction point (extruder)  
Basic recommendation (without measurements)

REFERENCE

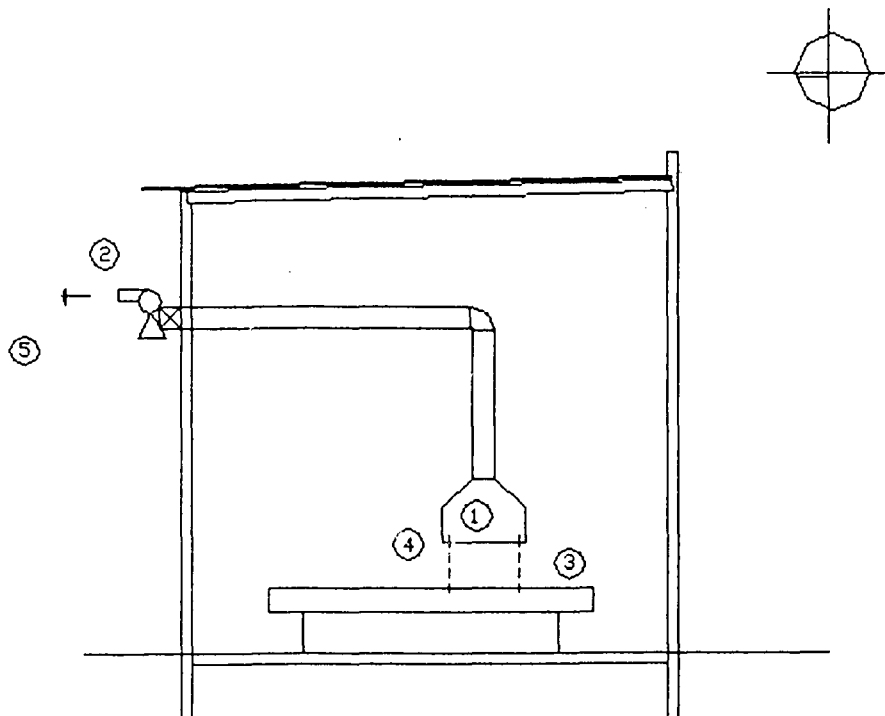
1-Extraction Hood

2-Extraction fan

3-Acrylic windows

4-This distance must allow operator access to the normal operating areas

Air flow= 4000 Nm<sup>3</sup>/h or higher

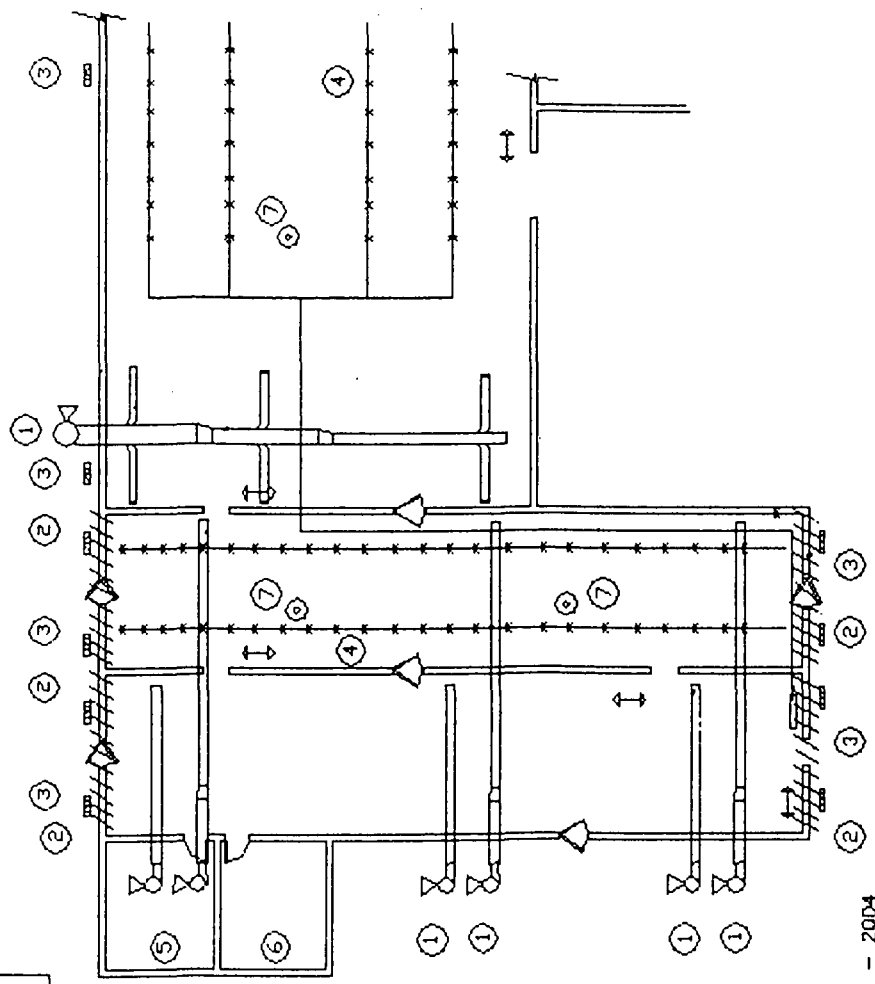
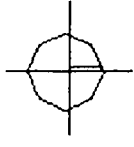


SHANKO & PARTNERS CO  
ALLEPO SYRIA

Feb - 2004

DIAGRAM - C

Forced ventilation in extrusion hall with specific intel from the roof down to the floor  
(Tentative)



- REFERENCE
- 1-Existant centrifugal fans flow 8000 m<sup>3</sup>/h (min.)
  - 2-Axial fan: flow 4000 m<sup>3</sup>/h (each) install at 5 cm over the floor level
  - 3-Low level Louvered vent installed at + 5 cm over the floor level. Height of the louvers 1m
  - 4-Water sprinklers-To be defined by expert
  - 5-Ware houses
  - 6-Area de compressor + chiller
  - 7-Smoked detector

SHANKO & PARTNERS CO  
ALLEPO SYRIA

Feb - 2004

## S & P -Attachment I -

### Existents Extruder and other equipments drivers

The extruder electrical drivers and other existing equipments in the Extrusion hall, are not explosion proof, that is why they are a source of potential danger in case of a butane gas leak.

Therefore, it is recommended:

1 - To install all the existing equipments in the Extrusion hall at about 30/40 cms from the floor level. As Butane gas is heavier than the air, it will always go downwards to the floor.

2 - If Item 1 could not be done, the electrical drivers should be shut up inside a metallic box and fresh air should be thrown inside it, from the bottom and an air exit should be left in the upper part of the box.

