行政院及所屬各機關出國報告

（出國類別：實習）

縮短停電延緊線作業工法及航空警示設計

服務機關：台電輸工處
出國人 職　　稱：電機工程師
姓　　名：葉明志
出國地區：義大利、法國
出國日期：91年11月24日~91年12月7日
報告日期：92年 1月28日

G3/c09105729

行政院及所屬各機關出國報告提要

出國報告名稱：縮短停電延緊線作業工法及航空警示設計

頁數 89 含附件：☑是□否

出國計畫主辦機關/聯絡人/電話

出國人員姓名/服務機關/單位/職稱/電話

葉明志/台灣電力公司/輸變電工程處/電機工程師/02-23229826

出國類別：□1 考察□2 進修□3 研究☑4 實習□5 其他

出國期間：91 年 11 月 24 日~91 年 12 月 7 日　　出國地區：義大利、法國

報告日期：92 年 1 月 27 日

分類號/目

關鍵詞： 1.架線設備 2.架線工法 3.架空線路航空警示設施

內容摘要：(二百至三百字)

1.無自走功能之架線設備具有重量與拉力比值低，體積較小之特色。並附有(1)電子式控制盤面，可以有線或無線電遙控操作；(2)延線張力紀錄裝置，可紀錄延線時張力等參數。利用同時具備拉線及放線功能之拉線放線機，可應用於活線進行地線更換為 OPGW 作業。

2.法國 EDF 電力公司輸電線路支持物高度 45 公尺以下及以上之航空警示燈及警示球設計原則介紹。

3.法國 OBSTA 公司低、中、高亮度航空警示燈產品介紹。

4.台電公司輸電線路低、中、高亮度警示燈及直徑 60 公分警示球設計原則。

5.架空線路低亮度警示燈之太陽發電系統探討。

本文電子檔已傳至出國報告資訊網（http：//report.gsn.gov.tw）

出國報告內容

壹、出國緣起

一、任務

縮短停電延緊線作業工法及航空警示設計。

二、說明

(一)輸電線路更新及擴充之延緊線工程往往必須停電作業，以確保施工人員之安全，但長時間停電施工往往造成用戶不便與損失，部份高科技廠商用戶安排停電施工困難；為解決此種困境以及提高延緊線施工作業效率，兼顧施工人員安全，有必要赴先進國家研習多回線線路單邊回線停電作業及縮短停電延緊線作業時間之施工工法。

1. 研習輸電線路縮短停電延緊線作業時間之工法及技術。

2. 搜集先進國家使用之新型架線設備之型錄及資料。

(二)近年來政府逐漸開放天空，並沿高速公路規劃多條直昇機及輕航機航道，因其飛航器飛航高度較低，地面上之構造物必須配合裝設各種航空警示設施，以保障飛航安全及避免危害地面上之構造物，本公司架空輸電線路遍布全台灣，鐵塔構造高突出地表面，為保護飛航及線路供電安全，有必要派員赴歐美先進國家研習架空線路航空障礙燈、球設置之相關設計及裝置技術。縮短停電延緊線作業工法及航空警示設計。

1. 研習架空線路航空障礙警示設施之種類及作法。

2. 研習航空障礙警示設施之設計風壓及支持物設計技術。

3. 研習架空線路航空障礙警示設施之施工技術。

出國行程表

起迄日期	前往機構	前往國家 城市名稱	詳細工作內容
1) 91.11.24 ~ 91.11.25			往程 (台北 - 義大利-米蘭)
2) 91.11.26 ~ 91.11.29	義大利 TESMEC 公司	義大利米蘭	研習縮短停電 延緊線作業工法
3) 91.11.29 ~ 91.11.29			中間行程 (義大利-米蘭 -法國-巴黎)
4) 91.11.30 ~ 91.12.03	法國 OBSTA 公司	法國巴黎	研習航空警示設施 之設計與裝置技術
5) 91.12.04 ~ 91.12.05	法國 EDF 電力公司	法國巴黎	研習航空警示設施 之設計與裝置技術
6) 91.12.06 ~ 91.12.07			返程 (法國-巴黎 - 台北)

貳、研習內容

一、Part A：研習縮短停電延緊線作業工法，義大利 TESMEC 公司實習。

(一)義大利 TESMEC 公司

1. TESMEC 公司創立於 1958 年，1960 年開始生產油壓拉線機(Puller)、放線機(Tensioner)等架線設備及架線所需工具。其中 Curno 廠主要為產品之研發及設計、零組件生產，Endine 廠為設備組裝。

(1)拉線機噸級從 5KN 至 200KN，適合拉 1 條或 2 條獨立繩索，線徑可達 24mm(1 英吋)，拉線機型式主要可分為：

A. ARS200：重量 500Kg，最大拉力 15KN，適合拉 1 條繩索。

B. ARS301：重量 700Kg，最大拉力 25KN，適合拉 1 條繩索。

C. ARS400：重量 1,800Kg，最大拉力 40KN，適合拉 1 條繩索，OPGW 架線。

D. ARS500：重量 3,000Kg，最大拉力 80KN，適合拉 1 條繩索，複導體線路。

E. ARB501：重量 4,500Kg，最大拉力 80KN，適合拉 1 條或 2 條獨立繩索，複導體線路。

F. ARB600：重量 7,000Kg，最大拉力 150KN，適合拉 1 條或 2 條獨立繩索，四導體線路。

G. ARS700：重量 5,600Kg，最大拉力 160KN，適合拉 1 條繩索，四導體線路。

H. ARS701：重量 5,600Kg，最大拉力 180KN，適合拉 1 條繩索，四導體線路。

I. ARB702：重量 9,850Kg，最大拉力 180KN，適合拉 1 條或 2 條獨立繩索，中國大陸地區多使用此機型。

J. ARS800：重量 7,000Kg，最大拉力 200KN，適合拉 1 條繩索，四導體線路。

圖一　　TESMEC 拉線機

(2)放線機噸級從 25KN 至 180KN，適合拉 1 條、2 條、3 條或 4 條獨立電線，電線線徑可達 52mm(2 英吋)，放線機之張力線軸為尼龍(Nylon)製溝槽，溝槽尼龍為條狀或片狀可更換式。放線機型式主要可分為：

A. FRS300：重量 1,000Kg，最大張力 25KN，適合延放 1 條繩索或導線。

B. FRS301：重量 1,950Kg，最大張力 25KN，適合延放 1 條繩索或導線，OPGW 延線適用。

C. FRS400：重量 1,900Kg，最大張力 40KN，適合延放 1 條、2 條繩索或複導體線路。

D. FRS500：重量 2,400Kg，最大張力 75KN，適合延放 1 條、2 條繩索或複導體線路。

E. FRB501：重量 4,600Kg，最大張力 75KN，適合延放 1 條、2 條繩索或複導體線路，兩組軸輪完全獨立控制，中國大陸地區多使用此機型。

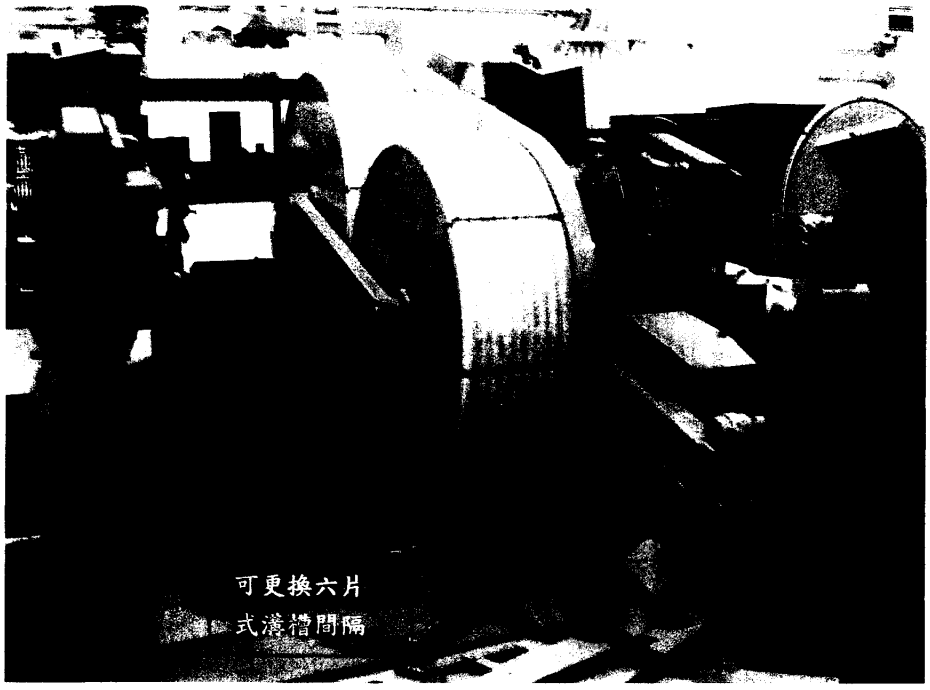
F. FRB600：重量 7,500Kg，最大張力 2*75KN，適合延放 1 條、2 條、3 條、4 條繩索或四導體線路，兩組軸輪完全獨立控制。

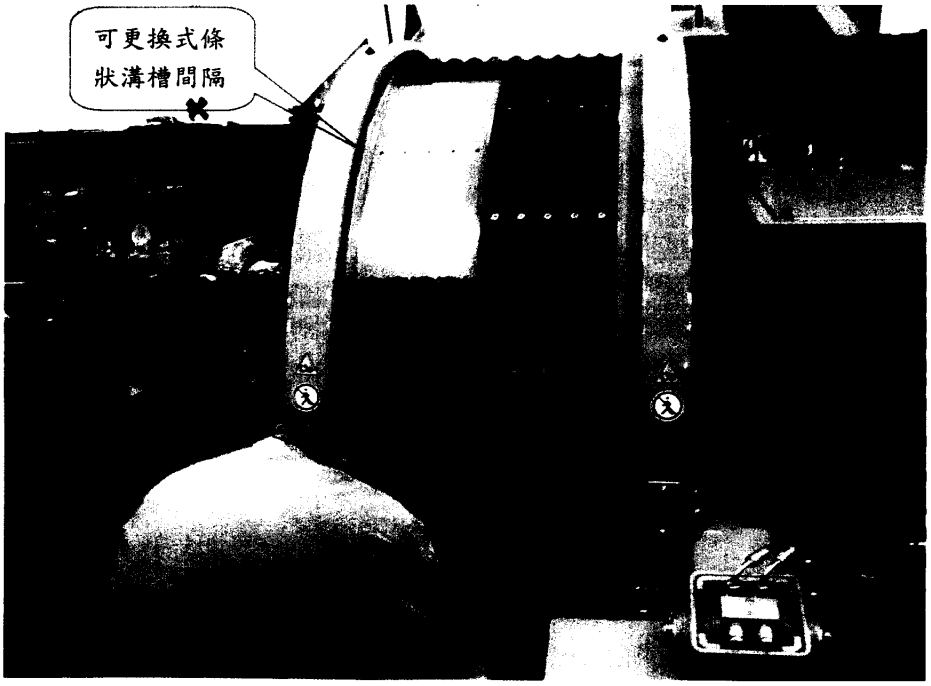
G. FRQ601：重量 10,000Kg，最大張力 2*75 或 4*37.5KN，適合延放 1 條、2 條、3 條、4 條繩索或四導體線路，四組軸輪完全獨立控制。

H. FRQ700：重量 13,000Kg，最大張力 2*80 或 4*40KN，適合延放 1 條、2 條、3 條、4 條繩索或四導體線路，四組軸輪完全獨立控制。

I. FRQ702：重量 10,500Kg，最大張力 2*90 或 4*45KN，適合延放 1 條、2 條、3 條、4 條繩索或四導體線路，四組軸輪完全獨立控制。

圖二　　TESMEC 放線機





(3)拉線放線機(Puller-Tensioner)，同時具備拉線及放線功能，噸級從25KN至200KN，適合拉1條、2條、3條或4條獨立電線，線徑可達52mm(2英吋)，張力線軸為鋼製溝槽，拉線放線機型式主要可分為：

A. AFS301：重量2,300Kg，最大張力25KN，適合架設1條繩索或導線(OPGW)。

B. AFS400：重量2,500Kg，最大張力40KN，適合架設1條、2條繩索或複導體線路。

C. AFB401：重量3,400Kg，最大張力1*40KN或2*20KN，適合架設1條、2條繩索或複導體線路，兩組軸輪完全獨立控制。

D. AFS500：重量4,000Kg，最大張力90KN，適合架設1條、2條繩索或複導體線路。

E. AFB501：重量5,000Kg，最大張力1*90KN或2*45KN，適合架設1條、2條繩索或複導體線路，兩組軸輪完全獨立控制。

F. AFB600：重量12,500Kg，最大張力1*150KN或2*75KN，適合架設1條、2條、3條、4條繩索或四導體線路，兩組軸輪完全獨立控制。

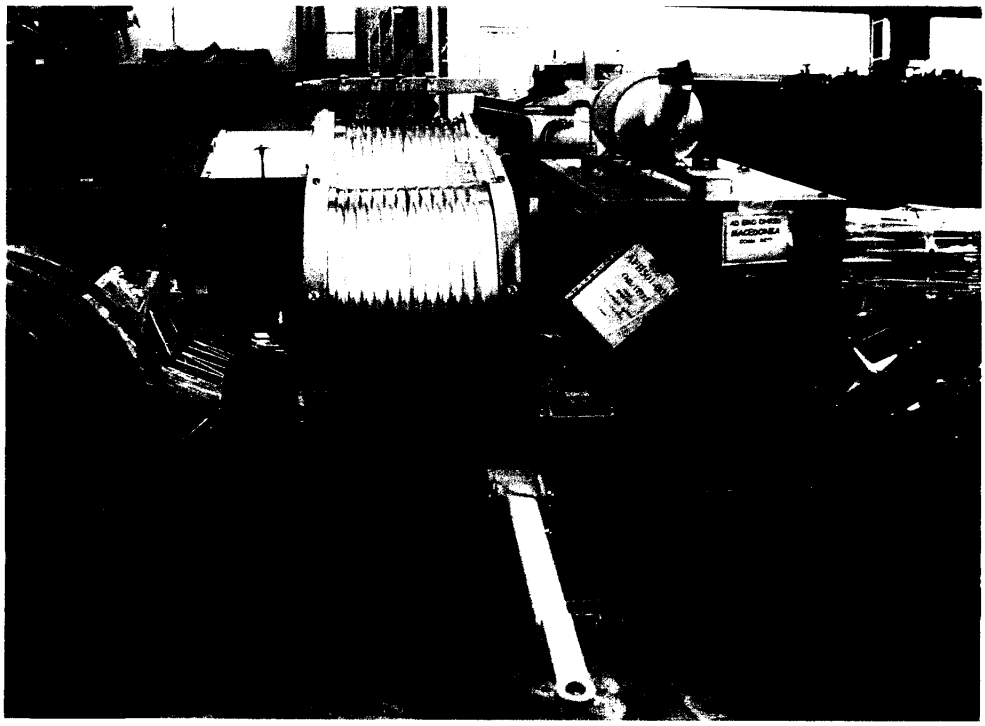
G. AFQ700：重量14,500Kg，最大張力1*160KN、2*80或4*40KN，適合架設1條、2條、3條、4條繩索或四導體線路，四組軸輪完全獨立控制。

H. AFQ800：重量16,000Kg，最大張力3*63或4*48KN，適合架設1條、2條、3條、4條繩索或四導體線路，四組軸輪完全獨立控制。

I. AFQ702：重量20,000Kg，最大張力1*180KN、2*90KN

或 4*45KN，適合架設 1 條、2 條、3 條、4 條繩索或四導體線路，四組軸輪完全獨立控制，附自走車功能。

圖三　　TESMEC 拉線放線機



(4)TESMEC 公司生產架線工具包括各式滑車(直昇機架線用滑車)、壓縮機、捲揚機、吊金工法器材、台棒等架空線路所需各項工具，種類相當齊全。

(5)該公司亦生產地質雷達探測器(Geo Radar Detector)，可從事地下管路之探測工作。

2. TESMEC 公司架線設備適合本公司使用之型式為：

(1)甲案

A. OPGW 延線

a. 拉線機：ARS400*1，重量 1,800Kg，最大拉力 40KN。

b. 放線機：FRS400*1，重量 1,900Kg，最大張力 40KN。

B. 四導體線路延線

a. 拉線機：ARB600*1，重量 7,000Kg，最大拉力 150KN。

b. 放線機：FRB600*1，重量 7,500Kg，最大張力 2*75KN。

(2)乙案

A. OPGW 延線

a. 拉線放線機:AFS400*2，重量 2,500Kg，最大張力 40KN。

B. 四導體線路延線

a. 拉線放線機：AFB600*2，重量 12,500Kg，最大張力 1*150KN 或 2*75KN。

3. TESMEC 公司產品主要特色為：

(1)架線設備：

A. 重量(尺寸)與拉力(張力)之比值低，與同等噸級之其他廠牌架線設備比較，體積較小；適用於崎嶇山地，拉、

放線場場地狹小之架線作業。

B. 電子式控制盤面，可以有線或無線電遙控裝置(Radio Remote Control)，操作人員可離開架線設備操作，提升人員安全，增加操作時附近環境視野，並可於送電中進行 OPGW 抽換作業。

C. 附有延線張力紀錄裝置(Recorder)，可紀錄須較小延線張力導線(如複合光纖地線 OPGW)之延線張力等參數，避免損傷導線及內部光纖。

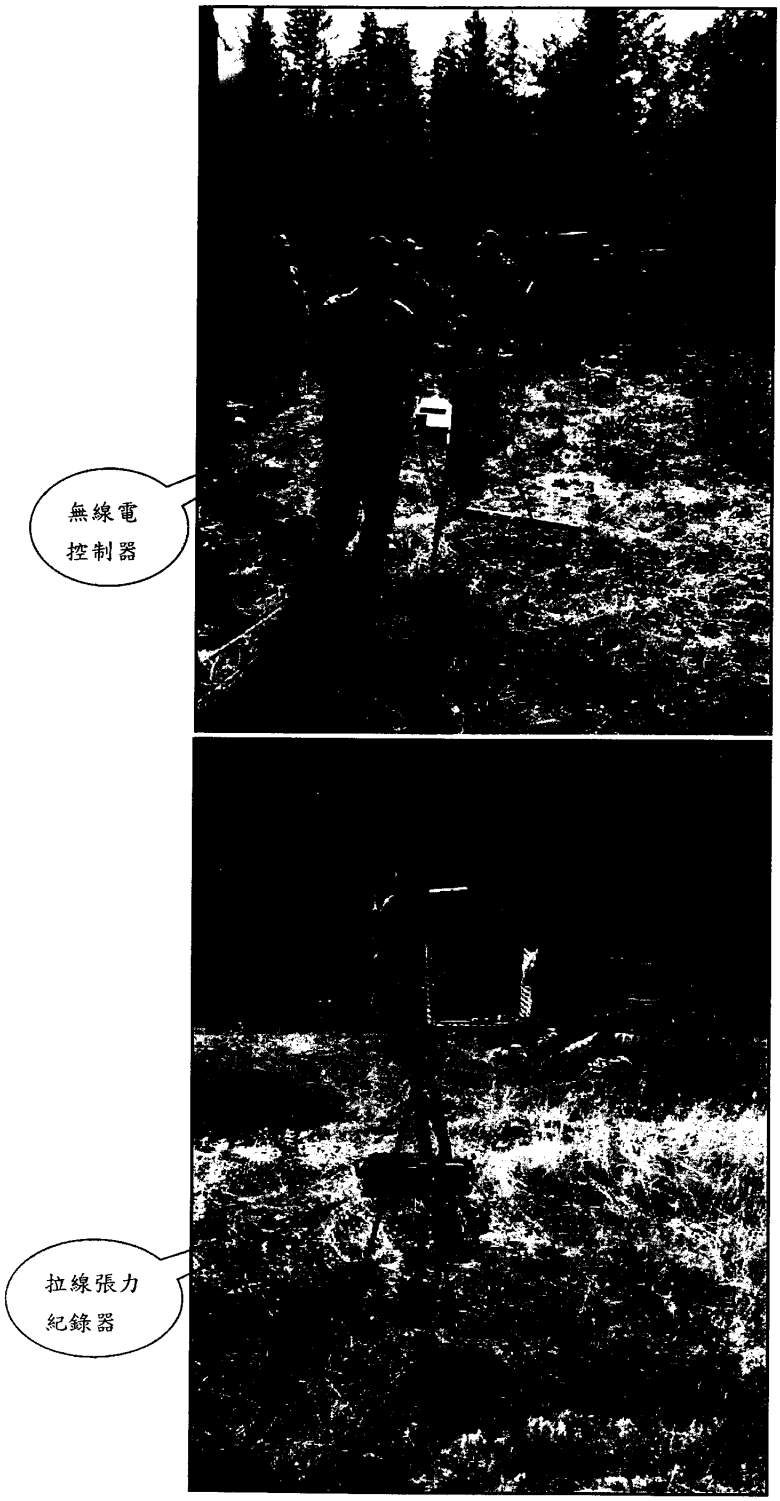
D. 架線設備設置單點吊勾，供吊掛裝卸之用，本身不具備自走車功能，移動時可用卡車裝載或拖拉，不須投資自走車相關設備，對於移動現場較不頻繁之長區間架線影響不大，較為經濟。

E. 拉線放線機(Puller-Tensioner)，可同時具備拉線及放線功能，可節省移動放線場、拉線場機具時間，其張力線軸為光滑耐磨之鋼製溝槽，本身不受拉線鋼索損傷，亦不損傷電線。

(2)延線時於放線場進行接線，為避免接線套管通過滑車時變形彎曲，可於套管處加裝保護套；如遇大角度鐵塔，可裝設雙滑車；滑車因須通過加裝保護套之接線套管，故須較大直徑之溝槽。

(3)該公司生產之防扭轉鋼索，每股鋼線由眾多細鋼線絞合而成，每股鋼線再正反向交錯絞合。因此各股鋼線承受之拉力較為平均，鋼索強度大，線徑較小，柔軟易於彎曲，不易糾纏。

圖四　TESMEC 架線設備之無線電控制及拉線張力紀錄器



4.TESMEC 公司架線設備活線施工方法

(1)一般將傳統地線更換為 OPGW 作業，線路必須停電；在某些無法停電，必須於送電中活線進行 OPGW 抽換作業。

(2)TESMEC 公司提出活線進行地線更換為 OPGW 作業工法，並以其生產之架線設備，於加拿大 1 公里多長(約 4 座鐵塔)之線路，實際進行展示抽換作業。TESMEC 公司提出工法為：

A.使用兩部拉線放線機，拉線拉力及放線張力設定完成後，由單一人員於適當距安全離外進行控制。

B.放線場、拉線場兩端及各鐵塔滑車處皆將電線接地，拉線放線機危險區域內以圍籬圍住，在危險區域外以無線電遙控裝置進行操作，確保人員作業安全。

C.拉線鋼索及 OPGW 必須通過鐵塔塔體內部，以與送電中之電線保持安全距離。

D.本工法簡報圖片說明資料請參考(附件一)。

二、Part B：研習航空警示設施之設計與裝置技術，法國 OBSTA 公司及法國 EDF 電力公司實習

(一)法國 EDF 電力公司

1. 航空警示設施設計準則

(1)配合民航單位指定之飛航路線，位於航道下之輸電線路依 ICAO 標準裝設航空警示設施。

A. 輸電鐵塔以紅、白色油漆標記。

B. 輸電鐵塔高度 H<45 公尺：

a. 地線間隔約 30 公尺裝設 1 只直徑 60 公分警示球，警示球之顏色為一紅一白間隔裝設。

b. 上層導線間隔約 60~70 公尺裝設 1 只感應式低亮度警示燈(Balisor)。

C. 輸電鐵塔高度 H≧45 公尺：

a. 依上述方式地線裝設警示球、導線裝設感應式低亮度警示燈。

b. 鐵塔頂端裝設可供 360 度環視之低亮度警示燈，電源以市電或太陽能供應。

(2)法國設計原則說明

A. 於市電供應困難之地區，鐵塔之低亮度警示燈採用太陽能燈具。

B. 除風力發電機外，電力公司之輸電線路並無裝設中亮度警示燈之案例。

C. 輸電線路同時於地線裝設警示球、上層導線裝設感應式低亮度警示燈及鐵塔頂端裝設低亮度警示燈，以取代於

鐵塔頂端裝設中亮度警示燈，是考量經濟因素。

D. 警示球之材質為多氨基化合物(Polyamide)，可抗紫外線以延長老化時間，重量約為 3.4 公斤。

2. 法國輸電線路現況說明

(1)法國輸電電壓等級為 400KV、225KV、90KV、63KV。

(2)輸電線路採用鍍鋅鐵塔，鋼材海邊鹽份腐蝕並不嚴重，使用約 10 年才須油漆防鏽。

(3)鐵塔號碼牌鋁板座固定於離地約 1 公尺之主柱材上，各回線牌再以錨釘固定於鋁板座上。

(4)輸電線路之鐵塔及礙子連之設計配合活線作業之需要，並進行活線作業相關工法研究。法國輸電線路多為單回線水平排列，可於線下以絕緣繩索進行導線警示燈裝設。

(二)法國 OBSTA 公司

1. 低亮度警示燈

(1)OBSTA 公司之低亮度警示燈設計採用氖氣冷陰極放電燈(Neon cold cathode discharge light)，依填充氣體不同可產生紅、藍、綠等顏色。燈管與轉換器基座之連結分為固定式及可分離式，可分離式之價格比固定式高約 20%，但採購數量大時差異不多；警示燈附有突波保護（Surge arrester）裝置。

(2)耐久性試驗：自 1994 年起，通電點亮 12 小時關閉 12 小時為週期，至目前並無異狀。

(3)防水性試驗：自 2001 年 7 月起，針對可分離式低亮度警示燈以通電點亮 12 小時關閉 12 小時為週期，至目前並無異狀。

(4)型式及規格(低亮度B型)：

A. 市電(AC)電源

a. OBSTA HISTIM 230V No. 13150，符合ICAO規定，HISTIM含轉換器(Converter)及燈具本身，燈具使用氖氣冷陰極放電燈。

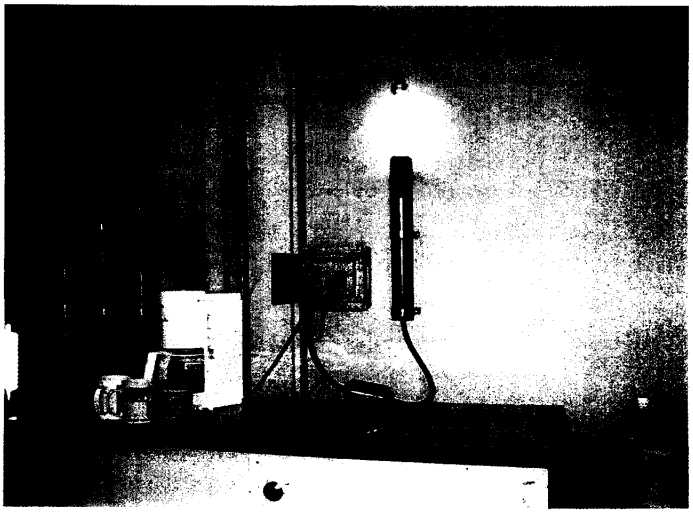
b. 亮度大於32燭光，壽命大於100,000小時，消耗功率45W。

B. 太陽能發電系統

a. HISTIM 12V No. 13114，符合ICAO規定，燈具使用氖氣冷陰極放電燈，亮度大於32燭光，壽命大於100,000小時，消耗功率24W。

b. 採用75W之單結晶(Monocrystaline)技術太陽電池板(Solar panel)，搭配12VDC 80AH低自行放電Thixotropic Gelled型免保養電池，電池至少能提供5無日照天數自動運作。充電放電控制器須有短路開路保護、內部溫度補償、動態過充電保護、自動電壓調合、過充電保護、作業狀況診斷及等太陽電池薄暮低電壓指示燈功能。

圖五　OBSTA低亮度B型警示燈



2. 中亮度警示燈

(1)OBSTA 公司之中亮度 B 型警示燈每組燈具內包含 3 支氙氣燈管，每支燈管可提供 120 度水平可視角度，一座鐵塔只須裝設 1 組燈具便可提供 360 度環視。

(2)使用太陽能電源時，鐵塔上須裝設平台，以固定太陽能板及電池。

(3)中亮度 C 型警示燈目前正開發以氖氣冷陰極放電燈，預計 92 年中推出相關產品。

(4)中亮度 A 型警示燈之型式及規格：

A. 市電(AC)電源

a. OBSTA MI2004 230V No. 13618，符合 ICAO 規定，為白色每分鐘閃爍 20~60 次。

b. 亮度為白色日間 20,000 燭光，夜間為 2,000 燭光，氙氣燈管之壽命約為 2 年(每天使用 24 小時)。

B. 太陽能發電系統

a. MI2007 24V No. 13623，符合 ICAO 規定，為白色每分鐘閃爍 21 次，以節省電能。日間亮度 20,000 燭光，消耗功率 70W，夜間亮度 2,000 燭光，消耗功率 25W。

b. 採用 750Wp 太陽能發電系統，由 10 組 75Wp 之太陽電池板組成；電池容量採用 460Ah 12V 鉛酸電池，電池運至接近現場再充入內溶液。控制器容量為 24V 20A，附突波保護裝置。

(5)中亮度 B 型警示燈之型式及規格：

A. 市電(AC)電源

a. OBSTA MI2001 230V No. 13620，符合 ICAO 規定，為紅色每分鐘閃爍 20~60 次。

b. 亮度為紅色夜間 2,000 燭光，氙氣燈管之壽命約為 4 年(每天使用 12 小時)，消耗功率 70W，燈具外罩使用透明之 Polycarbonate 材質。

B. 太陽能發電系統

a. MI2008 24V No. 13619，符合 ICAO 規定，為紅色每分鐘閃爍 21 次，以節省電能。夜間亮度 2,000 燭光，消耗功率 70W。

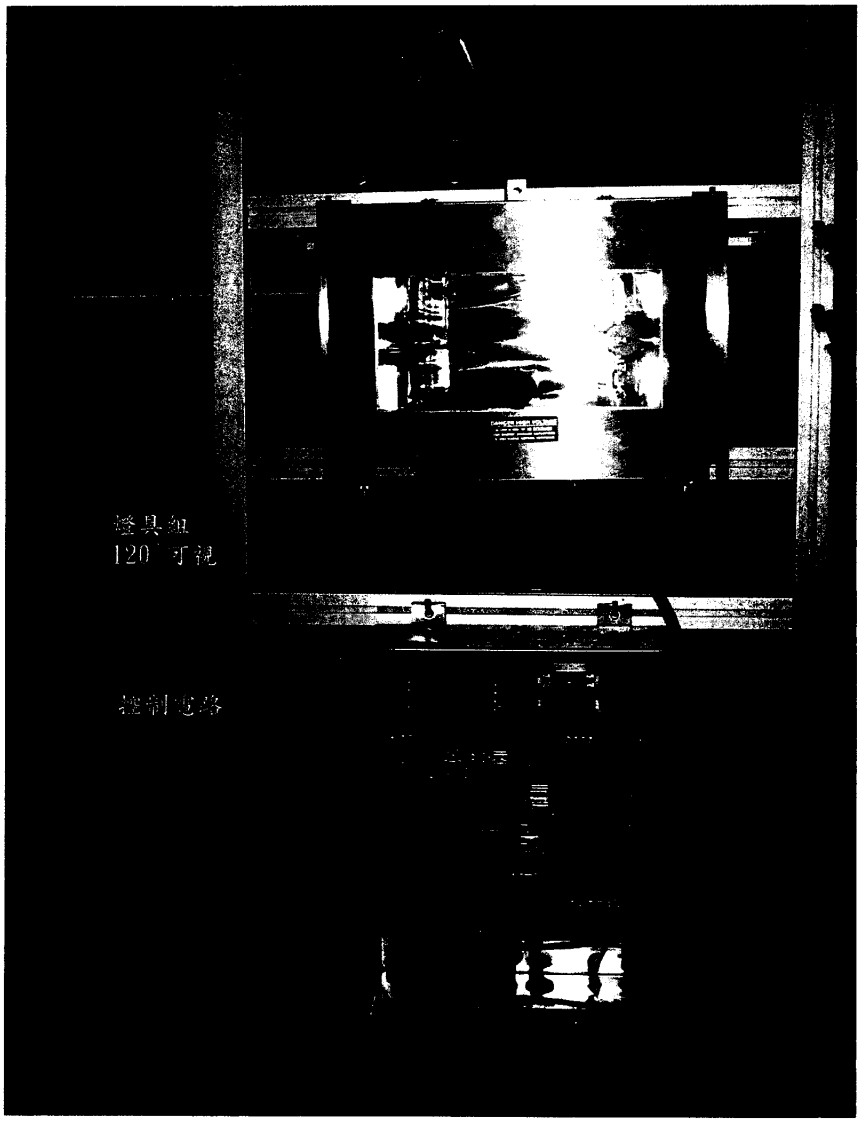
b. 採用 450Wp 太陽能發電系統，由 6 組 75Wp 之太陽電池板組成；電池容量採用 300Ah 12V 鉛酸電池，電池運至接近現場再充入內溶液。控制器容量為 24V 12A，附突波保護裝置。

圖六　　OBSTA 中亮度 B 型警示燈

3.高亮度警示燈

(1)OBSTA 公司之高亮度警示燈每組燈具可提供 120 度水平可視角度，一座鐵塔須裝設 3 組燈具以提供 360 度環視，燈管之壽命約為 2 年。

圖七　　OBSTA 高亮度 A 型警示燈



4. 警示燈電源供應方式

亮度及型式	230V AC	110V AC	12V DC	24V DC	48V DC
低亮度 A及B型	○	○	○	○	○
中亮度 A及B型	○	○		○	
中亮度C型	○				
高亮度	○	○			

5. 施工方式

(1)低亮度警示燈之閃光燈具裝設於鐵塔頂端，太陽電池板、蓄電池及控制設備裝設於鐵塔較低塔身處之固定平台，固定平台及整個安裝工作外包給工程公司設計施工。

(2)每座鐵塔之警示燈安裝時間約須4名工作人員，2~3工作天。

6. 建議維護週期-中亮度警示燈

(1)閃光燈具(Flash head)

檢查項目	檢查時間	檢查方式	合格標準	處置方式
電線固定裝置	每年	螺絲鎖緊		
滲水情況	每年	目 視	無水份蓄積	尋找滲水處
鏽蝕情況	每年	目 視	無過度鏽蝕	更換故障零件

安全裝置	每年	S1 測試	K1:interlock relay 正常動作	更換故障零件
閃光燈泡	每兩年	更 換		

(2)電源供應裝置(Power supply)

檢查項目	檢查時間	檢查方式	合格標準	處置方式
電線固定裝置	每年	螺絲鎖緊		
滲水情況	每年	目 視	無水份蓄積	尋找滲水處
鏽蝕情況	每年	目 視	無過度鏽蝕	更換故障零件
安全裝置	每年	S1 測試	K1:interlock relay 正常動作	更換故障零件
電容器	每兩年	容量測試	±10%	更換故障零件
電容器	每十年	更 換		

7. OBSTA 公司銷售資料

各種型式之航空警示燈產品相當齊全，年銷售額約 7,000 組，其中包含：

(1)感應式低亮度警示燈(Balisor)2,500 組。

(2)低亮度警示燈 4,300 組，其中 2,000 組使用太陽能電源。

(3)中亮度警示燈 180 組，包含 A、B 及 C 型。

(4)高亮度警示燈 20 組。

8. OBSTA 公司產品特點及建議

(1)航空警示設施相關產品皆符合國際民航組織(ICAO)、歐洲標準(EN)及法國標準(NF)，並符合電器產品之 UL、CE 有關安全性及電磁場相關規定。

(2)警示燈裝設突波吸收器(Surge arrester)，以保護免於異常電壓破壞。

(3)提供自動監視警示燈裝正常運作之信號輸出。

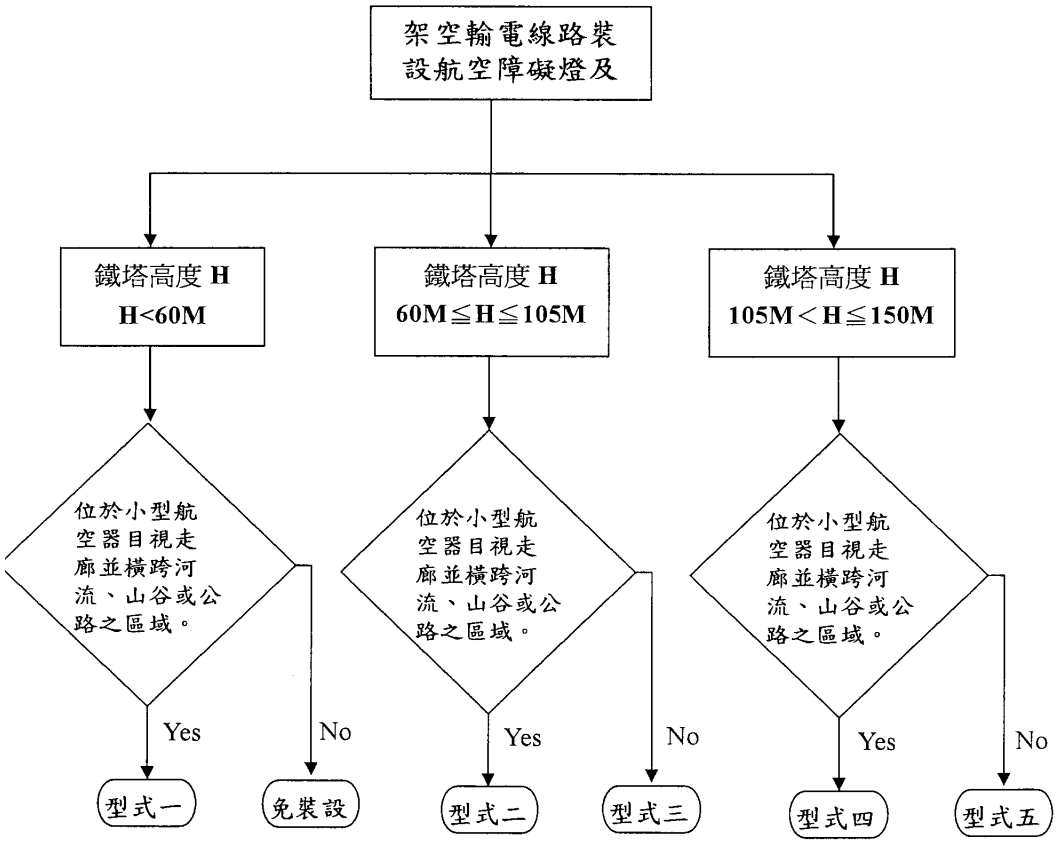
(4)警示燈提供之發光強度(CD)須為有效值(RMS)，非最大值(Peak value)。

(5)白熾燈、LED 及 OBSTA 放電燈之比較：

Lamp Type	**Typical lifetime**	**Climatic sensibility**	**Electro-magnetic sensibility**	**Luminous Intensity**
Incandescent lamp	Approx. 1000 to 4000 hours	Yes (vibration, humidity	No	Remains constant and homogeneous
LED lamp	Based on MTBF only	Yes (temperature, sun)	Yes (the led is a semi-conductor)	Significant drop after a few years only
The OBSTA (CLAUDE) discharge lamp	100 000 hours. Proven lifetime(*)	No (100% glass)	No (the neon is not reactive)	Remains constant and homogeneous

三、本公司警示燈及警示球設計

(一)警示設施設計準則



型式一：於鐵塔頂部裝置一盞 360°環視 B 型低亮度障礙燈＋地線球狀標記＋鐵塔油漆。

型式二：可採用下列其中一種 Mode 裝設。

Mode1：A 型中亮度障礙燈＋地線球狀標記＋鐵塔油漆。(建議選定)

Mode2：B 型中亮度障礙燈＋中間層燈(B 型低亮度[H/2])＋地線球狀標記＋鐵塔油漆。

Mode3：C 型中亮度障礙燈＋中間層燈(C 型中亮度[H/2])＋地線球狀標記＋鐵塔油漆。

型式三：可採用下列其中一種 Mode 裝設。

Mode1：A 型中亮度障礙燈＋鐵塔油漆。(建議選定)

Mode2：B 型中亮度障礙燈＋中間層燈(B 型低亮度[H/2])＋鐵塔油漆。

Mode3：C 型中亮度障礙燈＋中間層燈(C 型中亮度[H/2])＋鐵塔油漆。

型式四：可採用下列其中一種 Mode 裝設。

Mode1：A 型中亮度障礙燈＋中間層燈(A 型中亮度[H/2])＋地線球狀標記＋鐵塔油漆。(建議選定)

Mode2：B 型中亮度障礙燈＋中間層燈(B 型中亮度[H/2]、B 型低亮度[H/4、3H/4])＋地線球狀標記＋鐵塔油漆。

Mode3:C 型中亮度障礙燈＋中間層燈(C 型中亮度[H/4、H/2、3H/4])＋地線球狀標記＋鐵塔油漆。

型式五：可採用下列其中一種 Mode 裝設

Mode1：A 型中亮度障礙燈＋中間層燈(A 型中亮度[H/2])＋鐵塔油漆。(建議選定)

Mode2：B 型中亮度障礙燈＋中間層燈(B 型中亮度[H/2]、B 型低亮度[H/4、3H/4])＋鐵塔油漆。

Mode3:C 型中亮度障礙燈＋中間層燈(C 型中亮度[H/4、H/2、3H/4])＋鐵塔油漆。

型式六：位於小型航空器目視走廊，並橫跨河流、山谷或公路之架空輸電線路(CASE1、CASE2、CASE4)，若有無法於地線裝置球狀標記時，使用此設置型式： B 型高亮度障礙燈裝置三層(頂層、中間層、底層)。

(二)航空警示球

1.檢討條件

(1)警示球：ϕ600mm，重量 10.0Kg，風力係數 C=0.6，裝置距離 S≦30M。

(2)地線：19No.8ACW(C=40%)，D=16.307MM，Wc=0.7436Kg/M，風力係數 C=1.05，破壞強度 9,700Kg，H1=4600Kg，H2=1,940Kg。

(3)風速：基準速度壓 Qo=300(Kg/M^2)，陣風 70.7(M/Sec)。

(4)鐵塔：塔型 DH60，跨距 300M，Hc2=68.7M，Hg=86M，警示球裝置數量 9 個。

2.地線風壓荷重及負載係數

(1)風壓荷重計算

地 線 ：$W_{WG}=Qo*(86/10)^{1/6\ 2}*D*10^{-3}*C$

$=300*1.415*16.307*10^{-3}*1.05$

$=7.27$ Kg/M

警示球：$W_{WB}=Qo*(86/10)^{1/6\ 2}*D*10^{-3}*C$

$=300*1.415*0.283*0.6$

$=72.0$ Kg

(2)負載係數

$q=[(Wc+Wwb)^2+(Wwc+Wwwb)^2)]^{1/2}/Wc$

Wc：電線重量　　Wwb：警示球重量

Wwc：電線風壓荷重　Wwwb：警示球風壓荷重

表 1 19No.8ACW 風壓荷重及負載係數

單位長所受風壓荷重(kg/m)		負載係數	
無警示球	加警示球	無警示球	加警示球
7.27	9.67	9.8	13.08

3.警示球設置規則

(1)球狀標記應加貼環形交叉之反光條。

(2)警示球裝設時採交替之白/紅色，兩端應為紅色。如警示球少於四個，則所有警示球應採紅色。

(3)位於小型航空器目視走廊並橫跨河流、山谷或公路之架空纜線及支撐塔架，經評估有影響飛航安全者，無論塔架突出所在地表或水面之高度，纜線應裝置警示球標記（如技術上不可行時，則該塔架於日間應使用 B 型高亮度障礙燈），以利辨識纜線之存在。

(4)如流籠纜繩或纜車鋼索無法於作業纜線上裝置警示球，在不影響纜線作業安全之原則下，可於作業纜線鄰近處加裝乙條接近等高之纜線，專供警示球裝置使用，或檢具其它可行替代方式，經報請民航主管機關同意後，得以替代方式辦理。

(5)鐵塔跨距 S，裝置間隔 d=30m，裝置數量 n ，離鐵塔兩側裝置間隔 d1=d2= [S-(n-1)*30]/2 ≦ 30m。

(6)警示球須設置於地線，設置前須檢討是否超出鐵塔設計荷重，若鐵塔構件材料強度不足者須予補強。

(7)警示球直徑 D=60 公分，風力係數取 0.6。

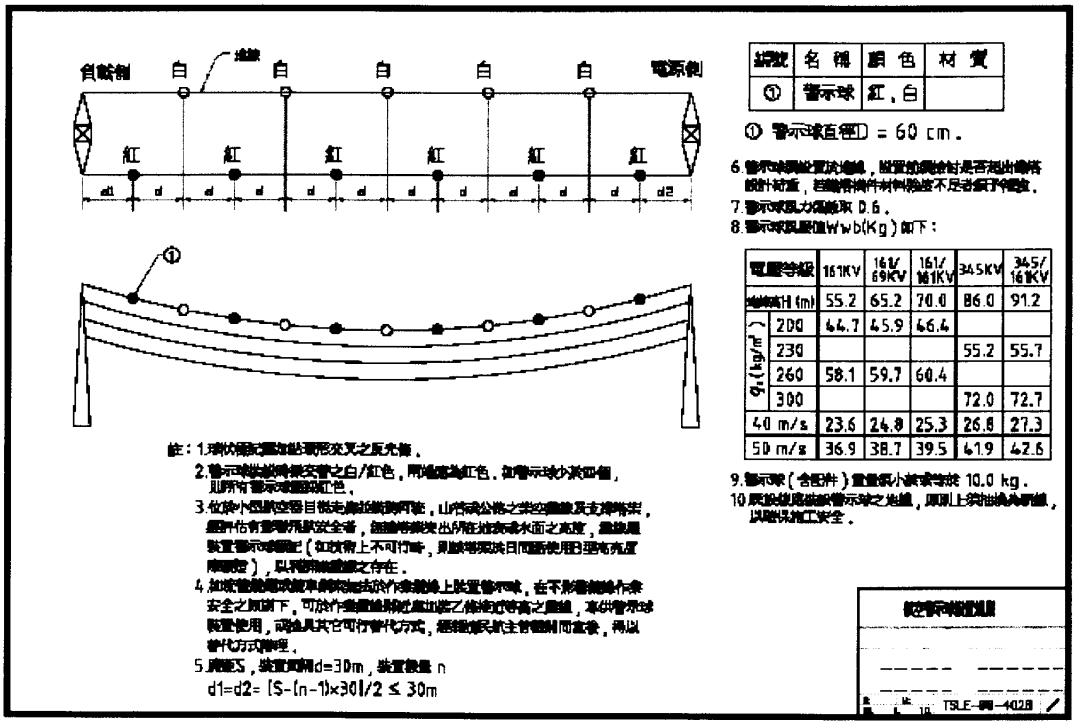
(8)警示球風壓值 Wwb(Kg) 如下：

電壓等級		161KV	161/69KV	161/161KV	345KV	345/161KV
地線高(m)		55.2	65.2	70.0	86.0	91.2
Q_0 (kg/m^2)	200	44.7	45.9	46.4		
	230				55.2	55.7
	260	58.1	59.7	60.4		
	300				72.0	72.7
40 m/s		23.6	24.8	25.3	26.8	27.3
50 m/s		36.9	38.7	39.5	41.9	42.6

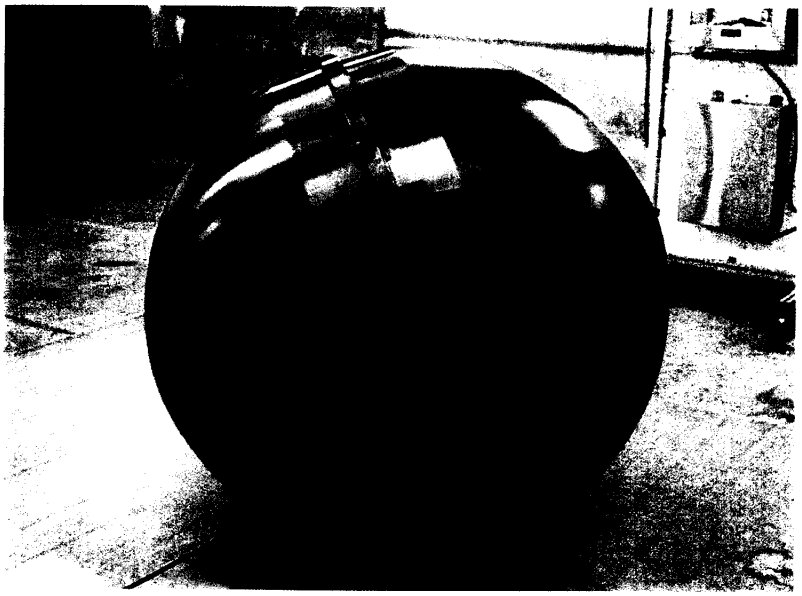
(9)警示球（含配件）重量須小於或等於 10.0 kg。

(10)既設線路裝設警示球之地線，原則上須抽換為新線，以確保施工安全。

圖八　航空警示球設置規則



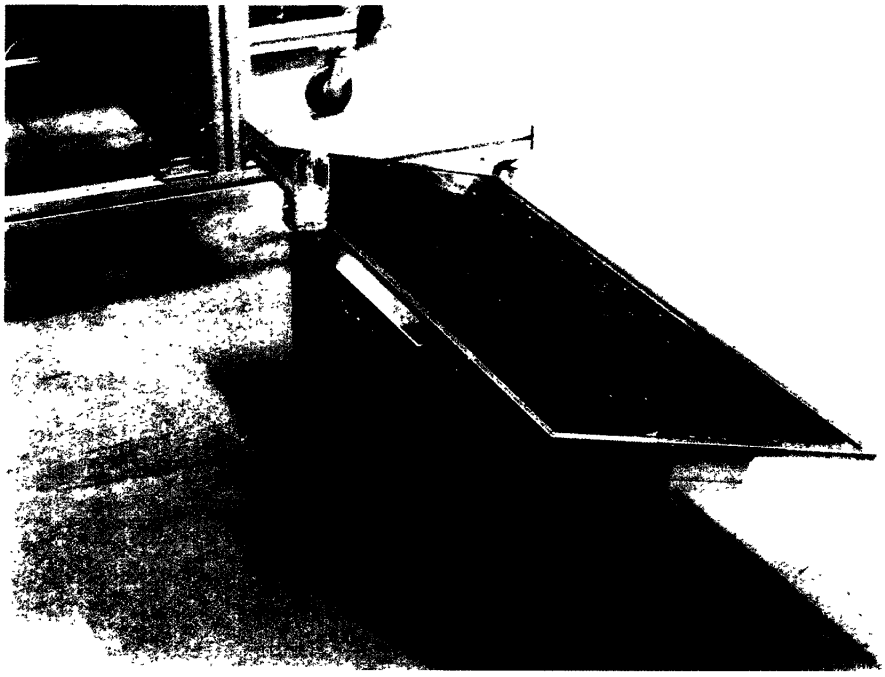
圖九　　紅色航空警示球(直徑 60 公分)



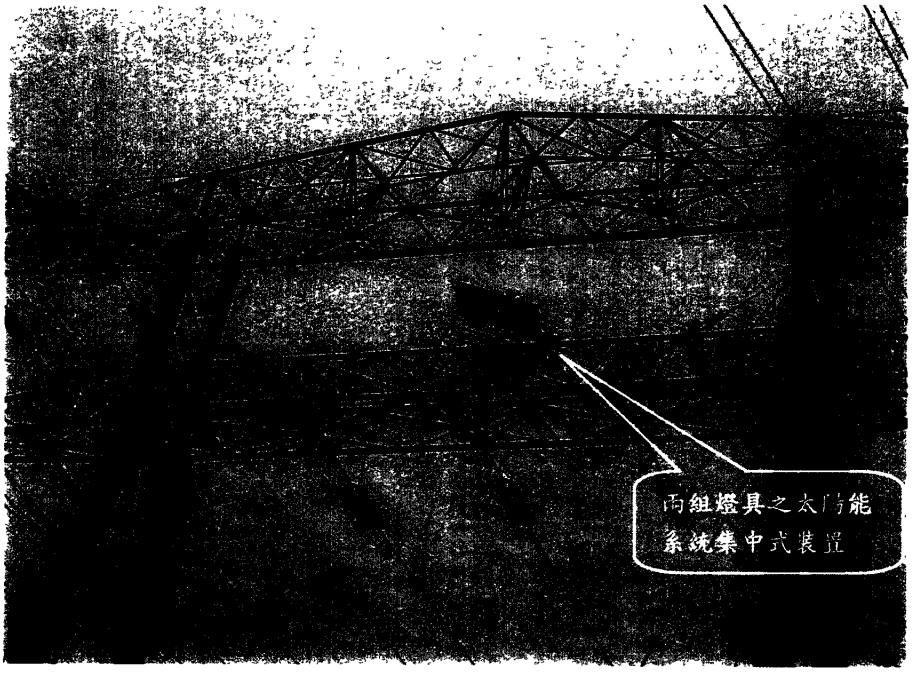
圖十　　航空警示球現場裝設圖

(紅、白色間隔，裝設於二條地線上)

圖十一　太陽能低亮度A型航空警示燈（12燭光）

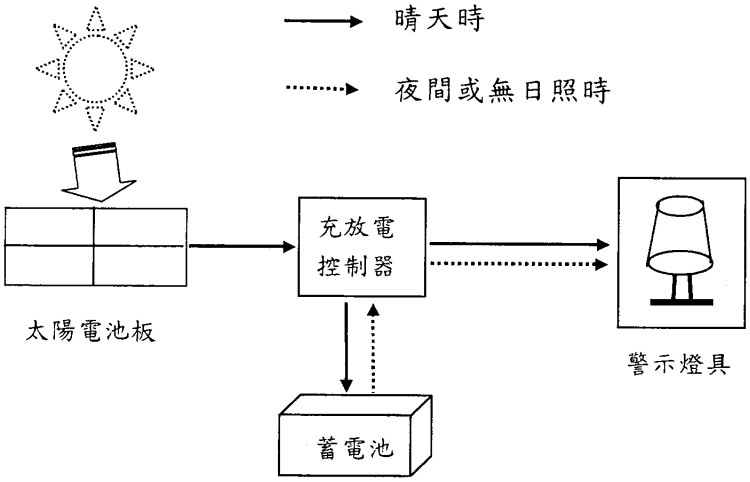


圖十二　太陽能低亮度B型航空警示燈現場裝設圖(32燭光)
（225KV五回線線路，下層導線高度約40M）



(三)低亮度警示燈之太陽發電系統

1.太陽發電系統方塊圖



2.太陽電池

(1)台灣日射量

A.日射量為太陽發電系統能源取得的來源，日照量越充沛、日射率高及日射時數越長，太陽能源對太陽發電系統的熱源供應越穩定；此外，空氣中落塵少，風速低，集熱器熱對流損失較低，集熱器面蓋透光率易維持較佳狀況，維護頻率亦可減少，下表為台灣北中南三大地區的日照量、氣溫及集熱器單位面積全年最大累積吸收能源分析。

		台北	台中	高雄
水平日射量(KW/m^2/day)		0.29	0.36	0.41
大氣溫度(°C)		22.5	22.9	24.8
單位面積全年最大累積吸收能量(GJ/m^2/yr)	平板式	4.26	5.37	6.20
	真空管式	4.25	5.19	5.90

(2)太陽電池種類

太陽電池種類		半導體材料	市場模組 轉換效率
矽	結晶矽	單結晶(晶圓型)	10~14%
		多結晶	9~12%
	非晶矽	a-S, a-SiO, a-SiGe	6~9%
化合物 半導體	2 元素	GaAs(晶圓型)	GaAs 18~30%
		CdS, CdTee 薄膜型	10~12%
	3 元素	CuInSe2(薄膜型)	10~12%
有機半導體			1%以下

(3)太陽電池模板測試證明

A. 每片模板需有 I-V 測試資料，包括：最大輸出功率(Pmax)、開路電壓(Voc)、短路電流(Isc)、操作電壓(Vop)、操作電流(Iop)；測試標準(Standard condition) ASTM E892，光強度(1000W/m^2)，溫度 25°C。

B. 可靠性及穩定性測試，測試標準至少包括下列之一：

a. 陸上使用(一般地區)：IEC-61215、IEC-61646、UL-1703、IEEE-1262。

b. 海洋上或濱海地區：IEC-61701、ASTM1597。

c. 測試認證單位：European Solar Test Installation (ESTI) Laboratory、Underwriters Laboratories、Photovoltaic Testing Laboratory at Arizona State University (PTL-ASU)、TUV 或其他獲得中華民國實驗室認證體系及其相互承認的其他認證體系認可之太陽電池模板測試認證單位。

C. PV module 保證使用期限：對所有太陽電池模板，其最大輸出功率(Pmax)在 10 年內不得小於額定功率(Rated Power)之 85%。

3 蓄電池的種類有：鉛酸電池、鎳鎘電池、鎳氫電池、鋰電池等。

若考慮電氣性能、成本、尺寸、重量、壽命、維護性、安全性、回收性等條件之後做綜合性判斷，以太陽能發電系統應用而言，大多數都採用鉛酸電池。

4.太陽能發電系統容量估算

參考經濟部能源委員會及工研院材料所之太陽光電發電示範系統推廣計畫資料，估算本系統之太陽電池板及蓄電池容量如下：

(1)電力需求

低亮度 B 型警示燈(DC)消耗功率依各廠商使用燈具(一般為放電管或 LED)及設計有所不同，本系統以消耗功率 24W 來估算。

太陽發電系統發電量=消耗功率 24W*12Hour=288 Wh/day

設置容量=太陽發電系統發電量/日照時間/綜合係數

=288Wh/day / 3.84h/day / 0.70

=107.1 W

日照時間：取每天 3.84 小時

綜合係數：溫度變化、污損、線損、Inverter 效率+蓄電池充放電補償

平時為 0.65~0.8，取 0.70

太陽電池板容量 ≧ 110 W

(2)蓄電池需求容量估算

12V 蓄電池需求容量=電力需求*無日照天數*補償係數

=288Wh/day * 5 day * 1.45 / 12V

=2,088Wh / 12V

=174 Ah

無日照天數：以5天估算

補償係數：蓄電池內阻抗、放電停止電壓、電壓降低補償，取1.45

蓄電池容量 ≧ 175 Ah (12V)

5 裝置方式

太陽能發電系統裝置方式可分為集中式及分散式。

(1)集中式：架空鐵塔各層警示燈之太陽電池板及蓄電池集中裝置於一處，太陽電池板面積及蓄電池體積較大，承受風壓大；燈具電源線路雷擊感應電壓大，須裝設相關保護設施。

(2)分散式：架空鐵塔各層警示燈之太陽電池板及蓄電池分散裝置於各層，太陽電池板面積及蓄電池體積較小，承受風壓較小；燈具裝設高度較高。

參、感想與建議

一、感想

(一)本次出國遠赴歐洲之義大利及法國能夠順利成行，除了要感謝各級長官之大力支持外，也要感謝國外廠家，如義大利 TESMEC 公司及法國 OBSTA 公司協助。雖然 11 月份歐洲國家已進入寒冬且陰雨的季節，無法同旅遊旺季四月至九月般氣候宜人吸引觀光客，但是對於初次領略歐洲風貌，典雅且具歷史的建築，浪漫且風景優美的觀光景點，讓人印象深刻。在參觀義大利及法國工廠體會到，其工廠規模、員工數量及產量並不大，但掌握技術層次及產品附加價值較高，因而創造高競爭力及高利潤，再加上行銷能力強，公司皆能維持營運成長。近年來國家經貿政策與歐洲經貿往來日趨密切，本公司架空線路器材採購案，已有多項由歐洲廠商得標承製，因此有更多機會接觸不同設計觀念及技術層面，對於提升本公司採購器材品質，有相當助益。

(二)法國輸電線路多屬水平排列方式，鐵塔高度較低，故其輸電線路航空警示設施大都裝設導線感應式警示燈(Balisor)，加上地線之警示球；鐵塔高度超過 45 公尺，則再加裝低亮度 B 型警示燈；並無裝設中亮度以上警示燈之案例，與我國民航局頒布之規範有所不同。歐洲國家產品之設計整體性、施工便利性及技術優越性，有很多值得我國採用借鏡之處，但歐洲之大陸氣候及環境條件等與台灣海島型氣候大不相同，設計及技術值得本公司參考，而無法參照使用。

二、建議事項

(一)本公司目前使用之架線設備主要為自走式之拉線車、放線車及副線車，型式與義大利產品不同，義大利產品不具自走相關設備，而由卡車裝載或拖拉，與同等噸級之其他廠牌架線設備比較，體積較小；電子式控制單元，可以無線電遙控操作控制；可加裝延

線張力紀錄裝置等特點；生產拉線放線機，可同時具備拉線及放線功能。其產品具有上述多項特性，對於本公司崎嶇山地拉放線場場地狹小及其他特殊限制之架線作業，有相當助益，建議於本公司架線設備汰換時，可採購試用此型式設備。

(二)法國低亮度警示燈採用氖氣冷陰極放電(Neon)方式發光，產品具有良好的耐候性，長期亮度穩定，壽命長達 100,000 小時，維護容易，已經長期使用驗證等特色。警示球材質為多氨基化合物，具有重量輕及抗紫外線老化等特點，本公司輸電線路將裝設航空警示設施，該國產品將可予納入採用。

(三)中亮度警示燈因消耗電能較大，若使用太陽能發電系統為電源，太陽電池板面積及蓄電池之體積將很龐大，鐵塔承受風壓將大幅增加，考量裝設整體成本及施工複雜性，建議中亮度警示燈電源以配電線供應為主，太陽能發電系統使用於配電線不易到達處之低亮度警示燈。

(四)警示球之施設可以直昇機或人力裝設，若以人力於既設地線上裝設警示球，易因地線老舊及潛藏損壞等因素，危害施工人員安全，建議既設線路警示球之施設，地線應更換為新線，以確保施工安全。

(五)早期施設之鐵塔，並未考慮地線裝設警示球增加之荷重，建議既設線路裝設警示球時，設置前須檢討是否超出鐵塔設計荷重，若鐵塔構件材料強度不足者須予補強。

(六)為配合民航局 92.8.2 頒布「航空障礙物標誌與障礙燈設置規範」，供電處及本處架空線路須裝設航空警示設施，以上設施事項，建議納入本公司輸電線路航空警示設施設計準則，以為辦理依據。

肆、附件

一、TESMEC 公司之地線更換為 OPGW 活線作業工法簡報

二、法國 OBSTA 航空警示設施型錄資料。

附件一

IREQ DEMO

Organizer: GLR - Tesme

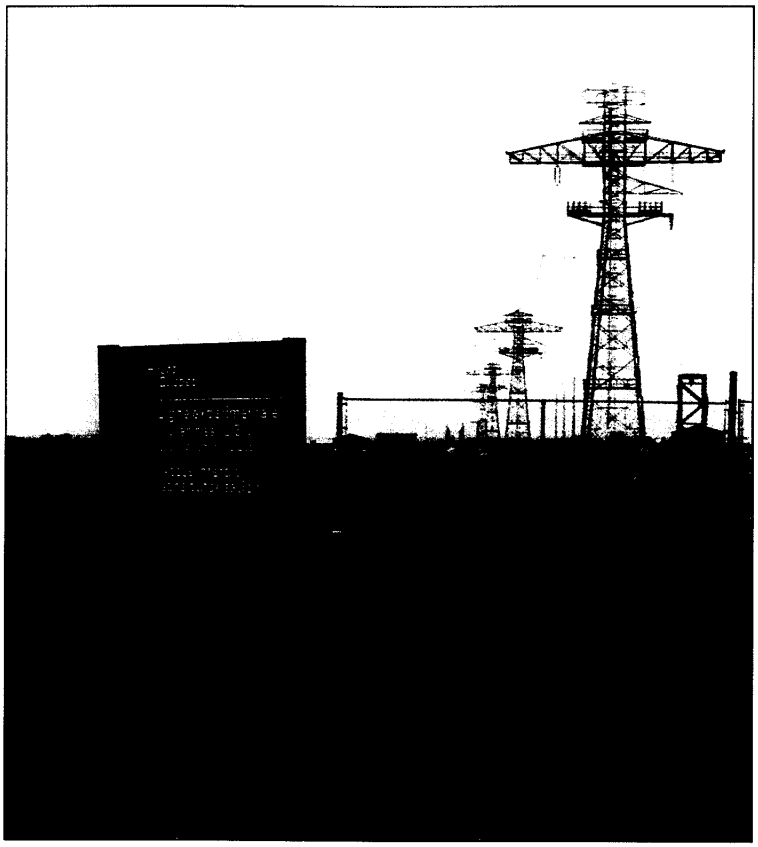
Guest: Alcan

TESMEC Stringing Equipment

•Puller-Tensioner	2	AFS 400
•Radio control	2	AXH 007
•Electronic recording	2	DLR150
•Reel elevator	1	CVI 600 + CDR002 + TIH 001+ TUT 003
•Reel winders	1	RVA001 + TUT 003
•Antitwist rope	4	FUX 013 of 1600m with spliced eyes ALF 002
•Detachable reel	3	BOF 050

Contractor: GLR Client: ALCAN Technical Partner: TESMEC

IREQ Demo Site presentation



Contractor: GLR Client: ALCAN Technical Partner: TESMEC

Equipment layout in a hazardous area

Contractor: GLR Client: ALCAN Technical Partner: TESMEC

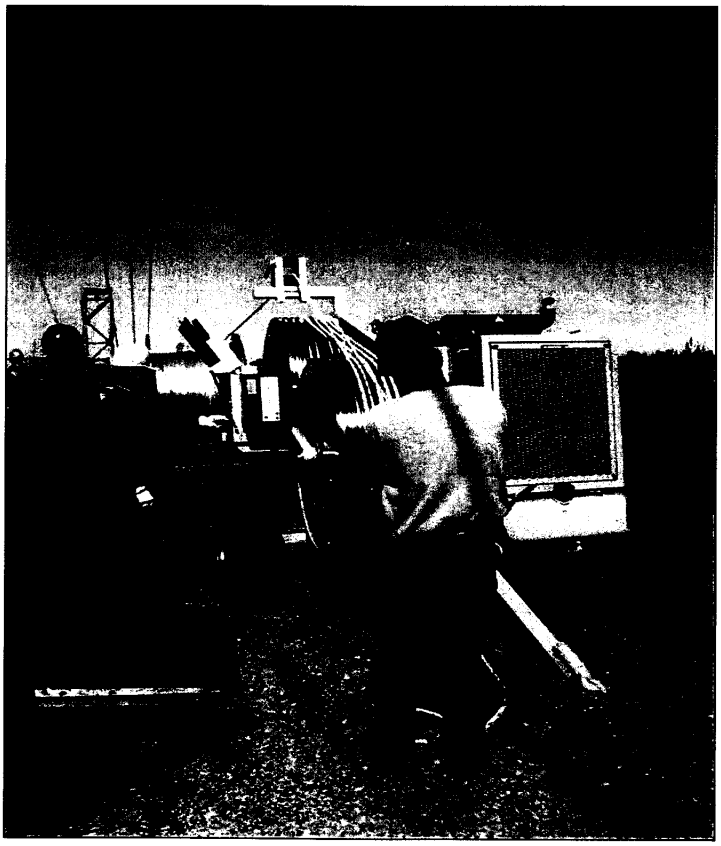
Equipment layout in a hazardous area

Contractor: GLR Client: ALCAN Technical Partner: TESMEC

Stringing operations Demo

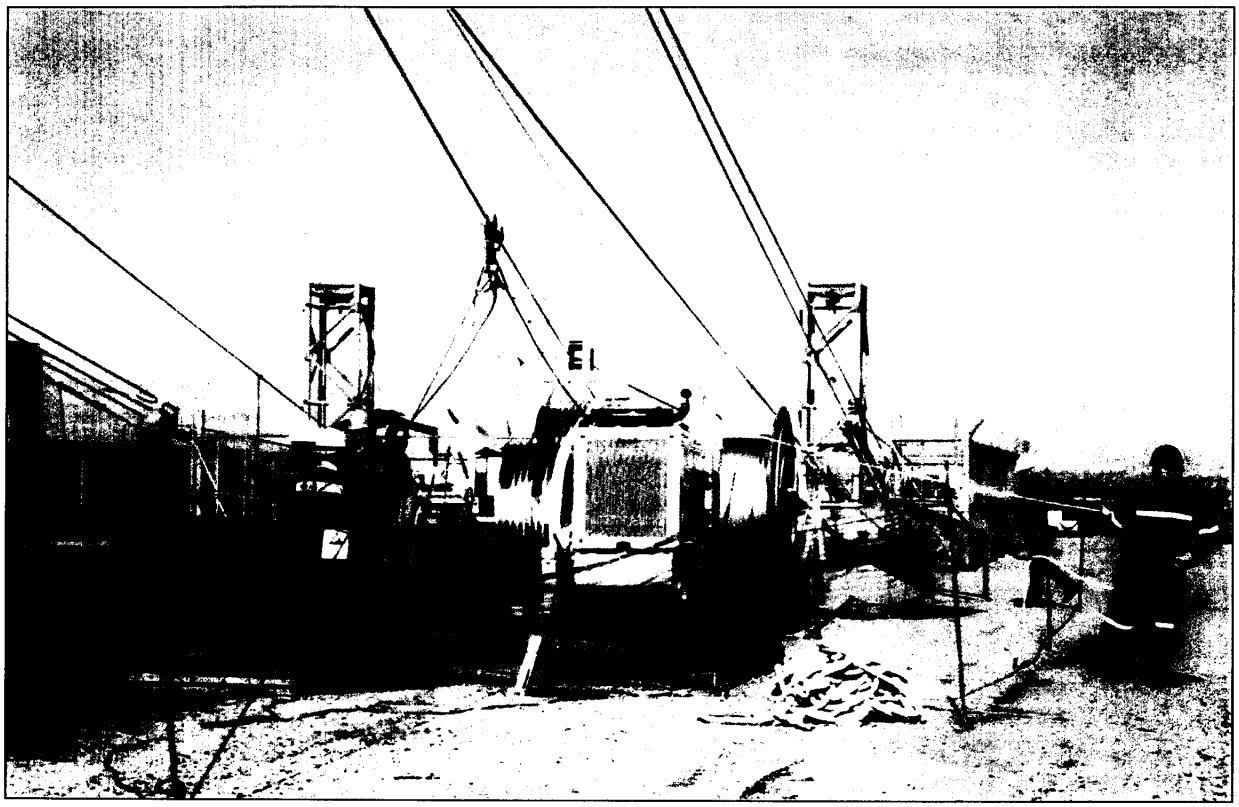
Contractor: GLR Client: ALCAN Technical Partner: TESMEC

Equipment layout in a hazardous area



Contractor: GLR Client: ALCAN Technical Partner: TESMEC

Equipment layout in a hazardous area



Contractor: GLR Client: ALCAN Technical Partner: TESMEC

Stringing operations Demo

Contractor: GLR Client: ALCAN Technical Partner: TESMEC

Stringing operations Demo

Contractor: GLR Client: ALCAN Technical Partner: TESMEC

Radio control and pull recording unit

Contractor: GLR Client: ALCAN Technical Partner: TESMEC

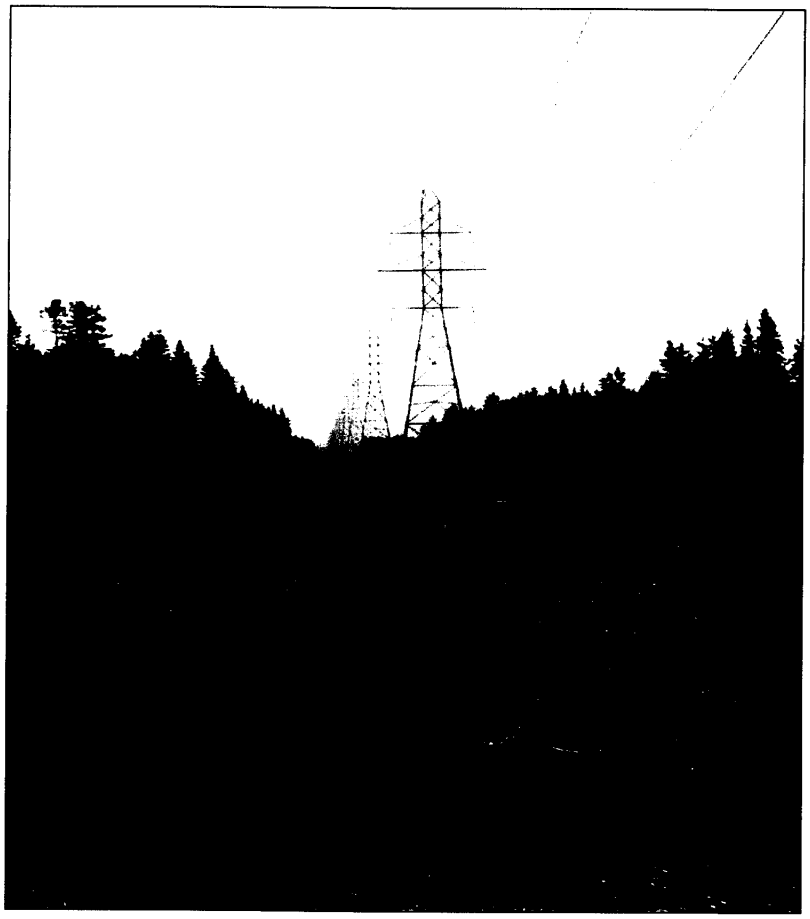
RECONDUCTORING of OPGW with a "Live " Line

Contractor: GLR
Client: ALCAN

Tesmec machines and tools

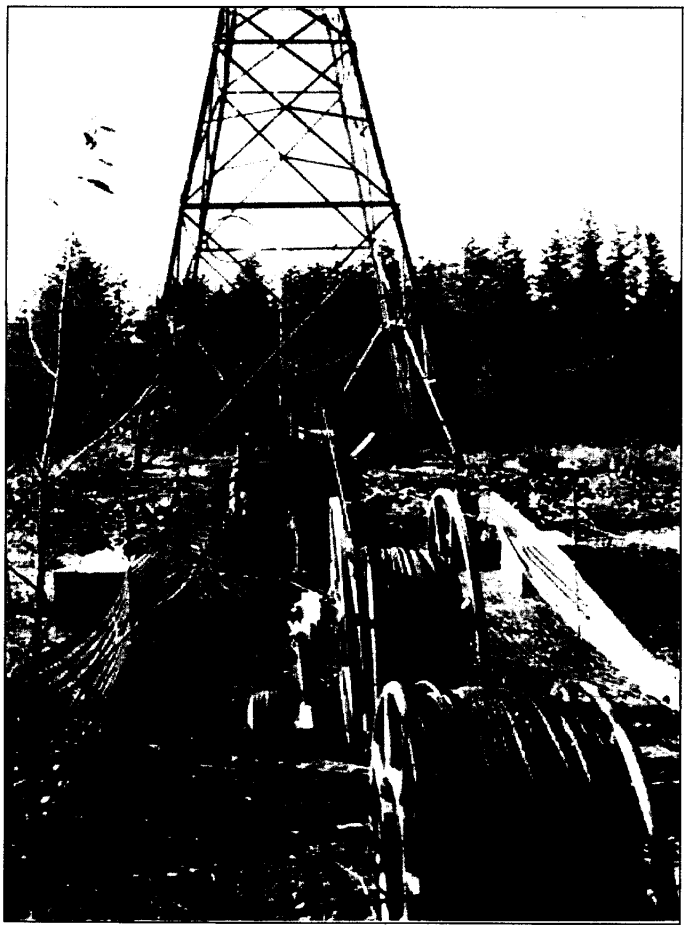
Contractor: GLR Client: ALCAN Technical Partner: TESMEC

Double circuit single conductor 161 KV



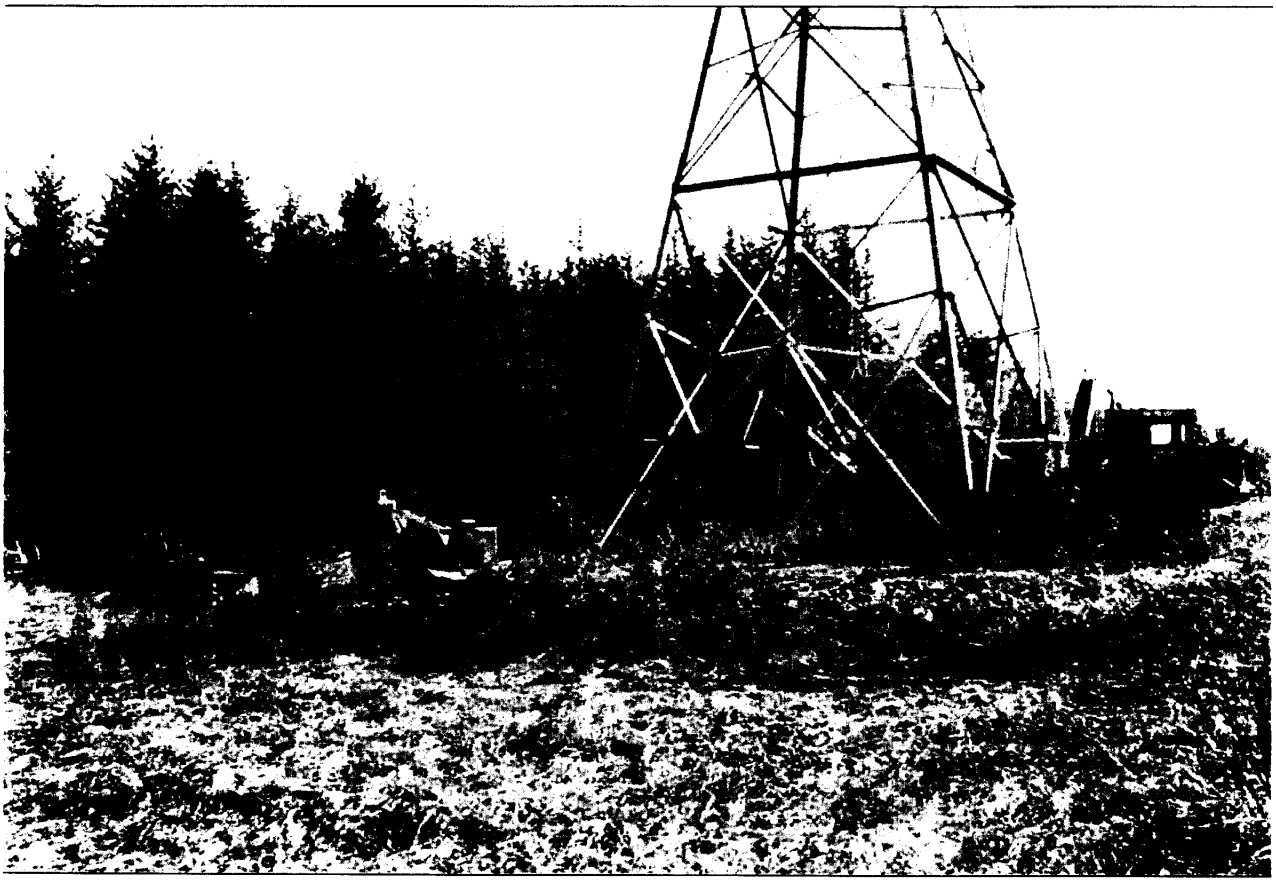
Contractor : GLR Client:ALCAN Technical Partner : TESMEC

Layout equipment in the job site



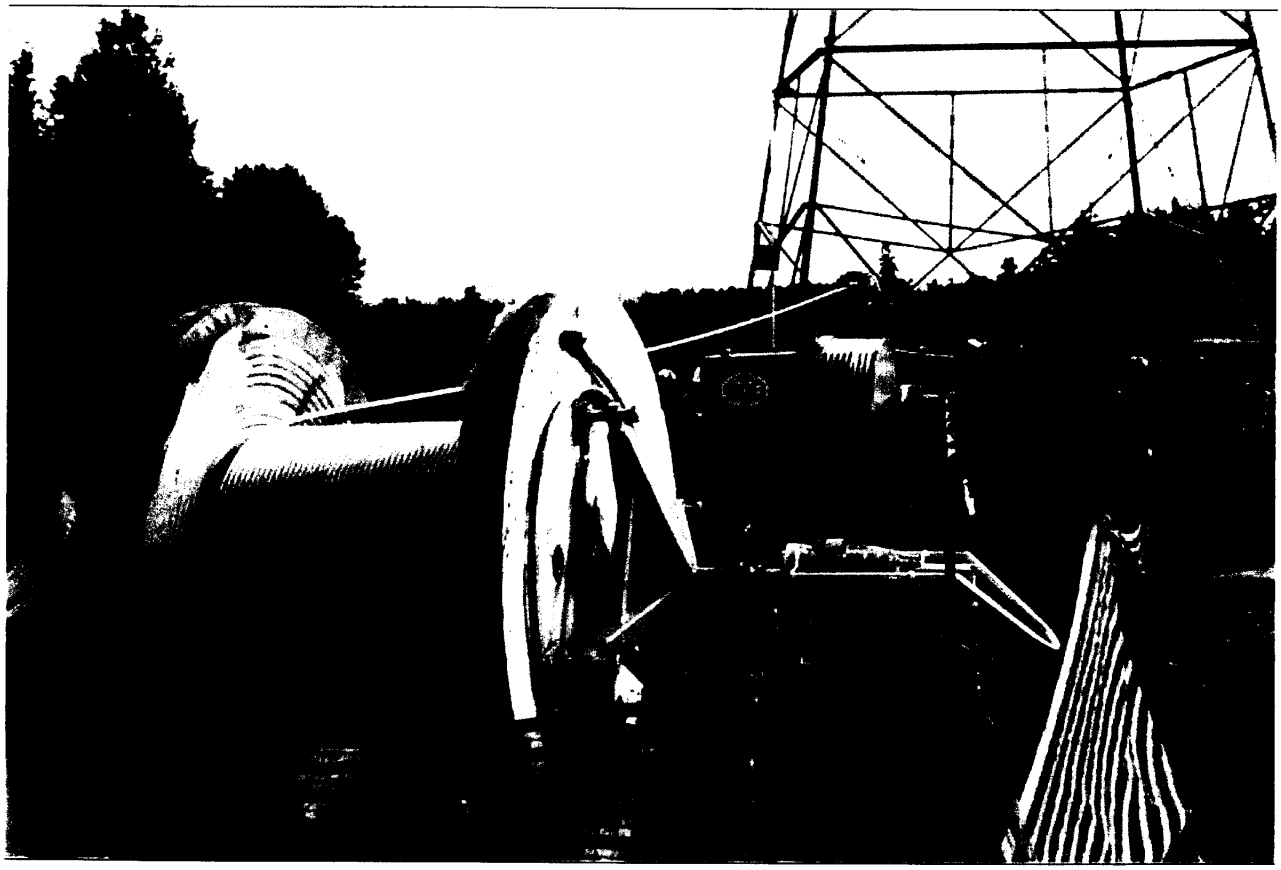
Contractor: GLR Client: ALCAN Technical Partner: TESMEC

Equipment layout



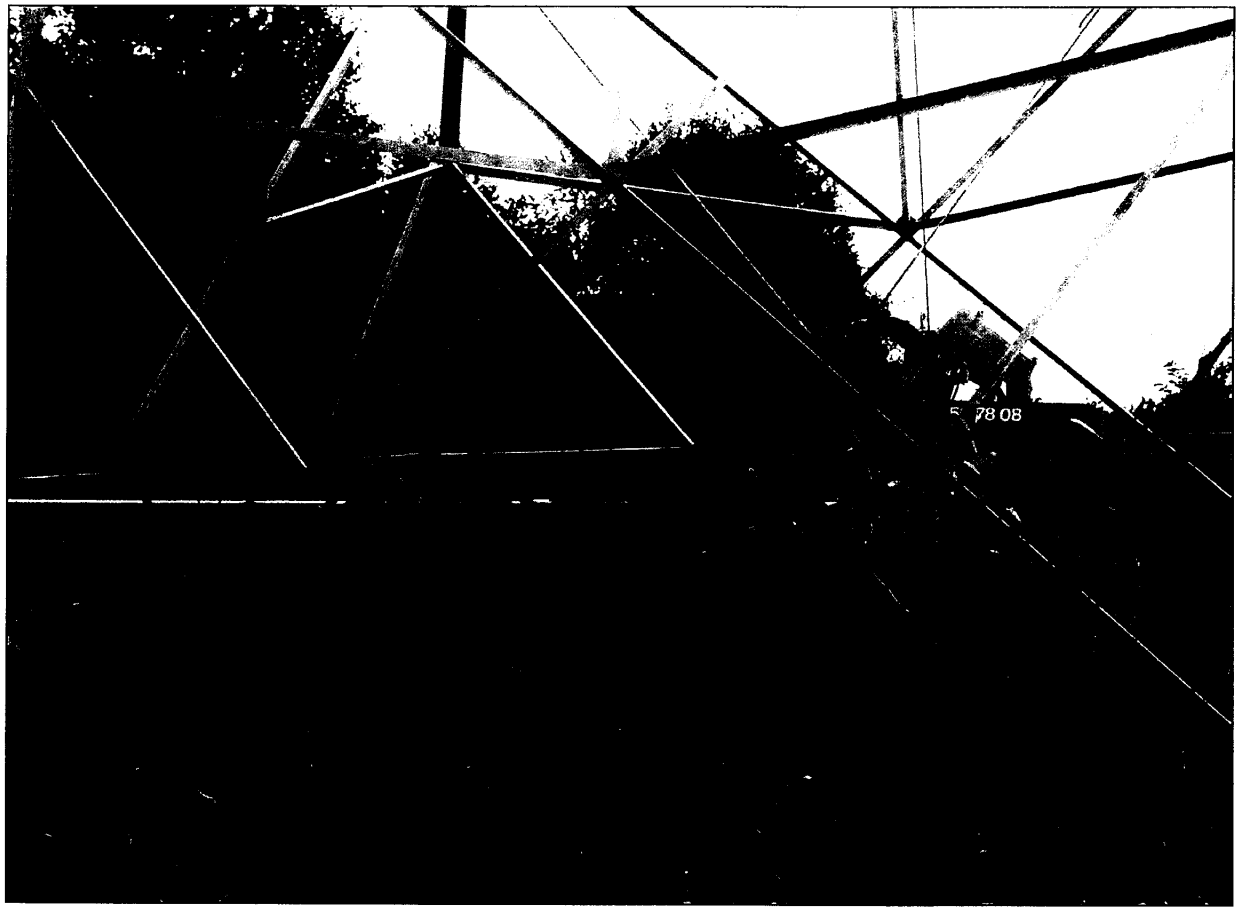
Contractor: GLR Client: ALCAN Technical Partner: TESMEC

Equipment layout



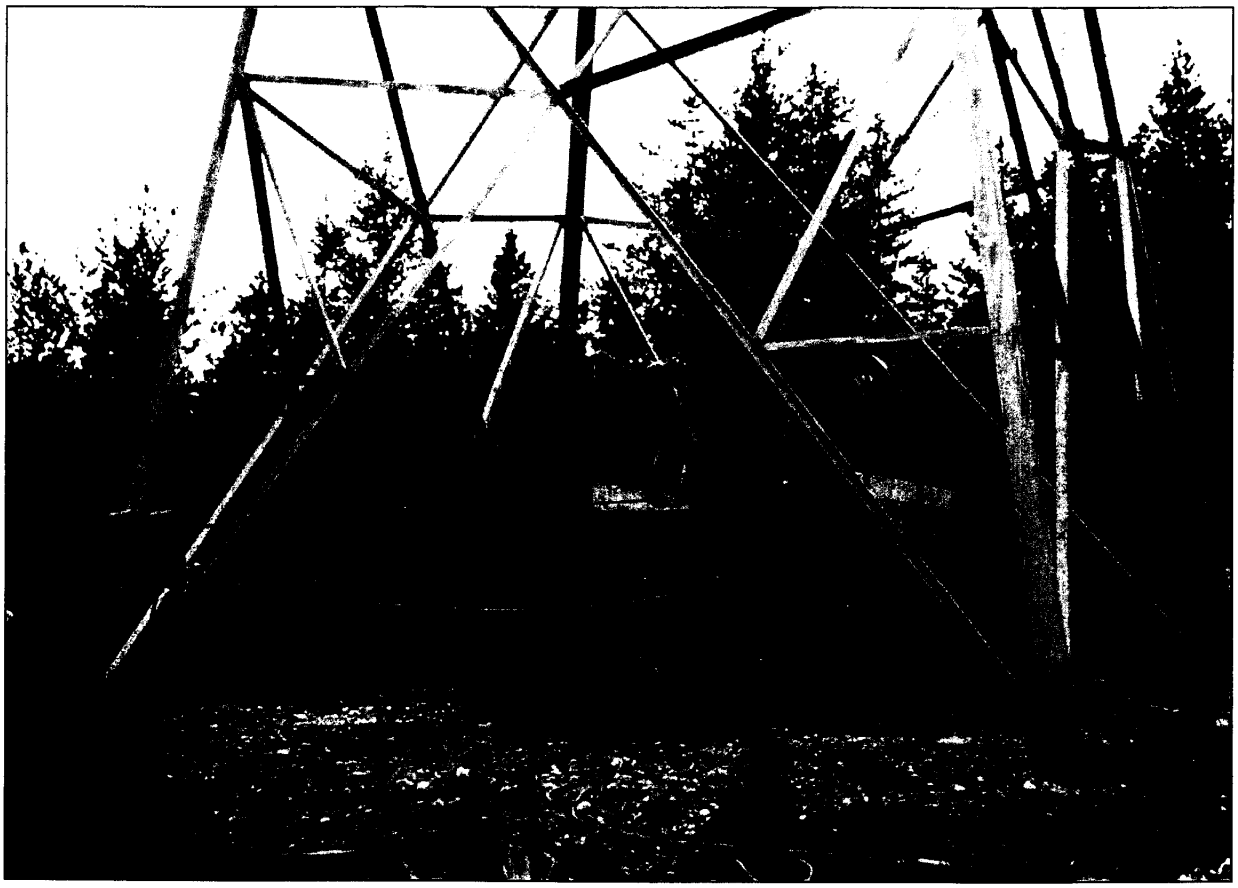
Contractor: GLR Client: ALCAN Technical Partner: TESMEC

Equipment layout



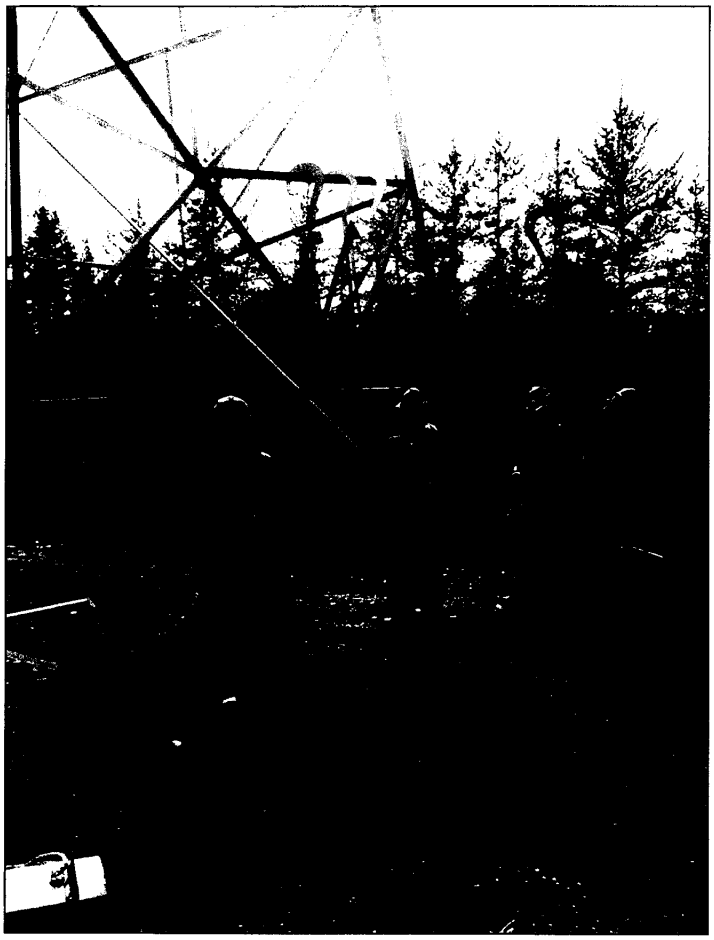
Contractor : GLR Client:ALCAN Technical Partner : TESMEC

Pulley



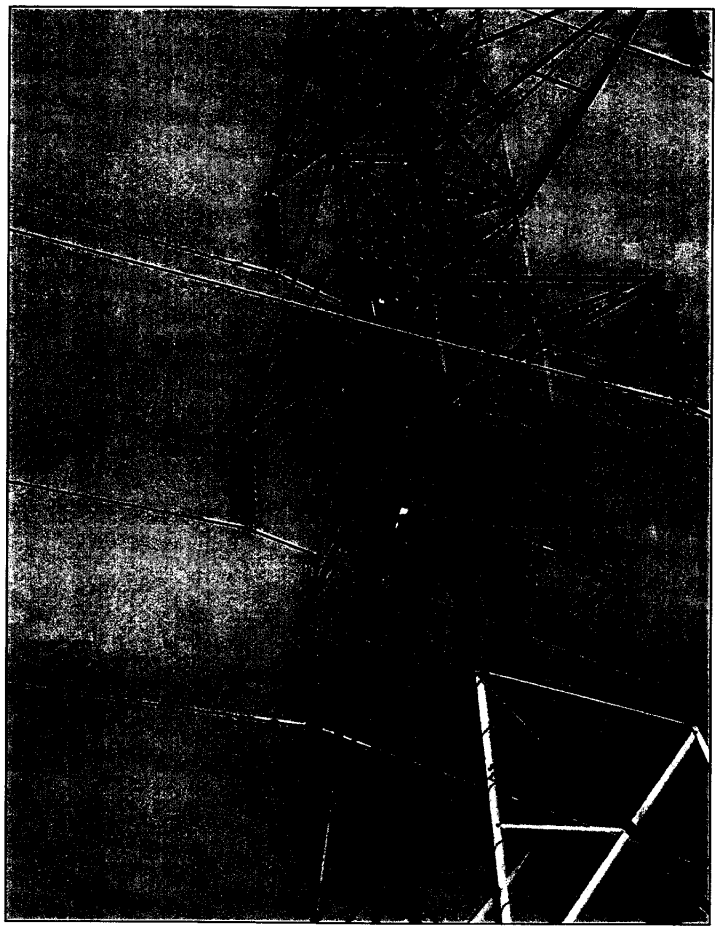
Contractor: GLR Client: ALCAN Technical Partner: TESMEC

Set up to climb the tower with a live line



Contractor: GLR Client: ALCAN Technical Partner: TESMEC

To climb the tower with a live line

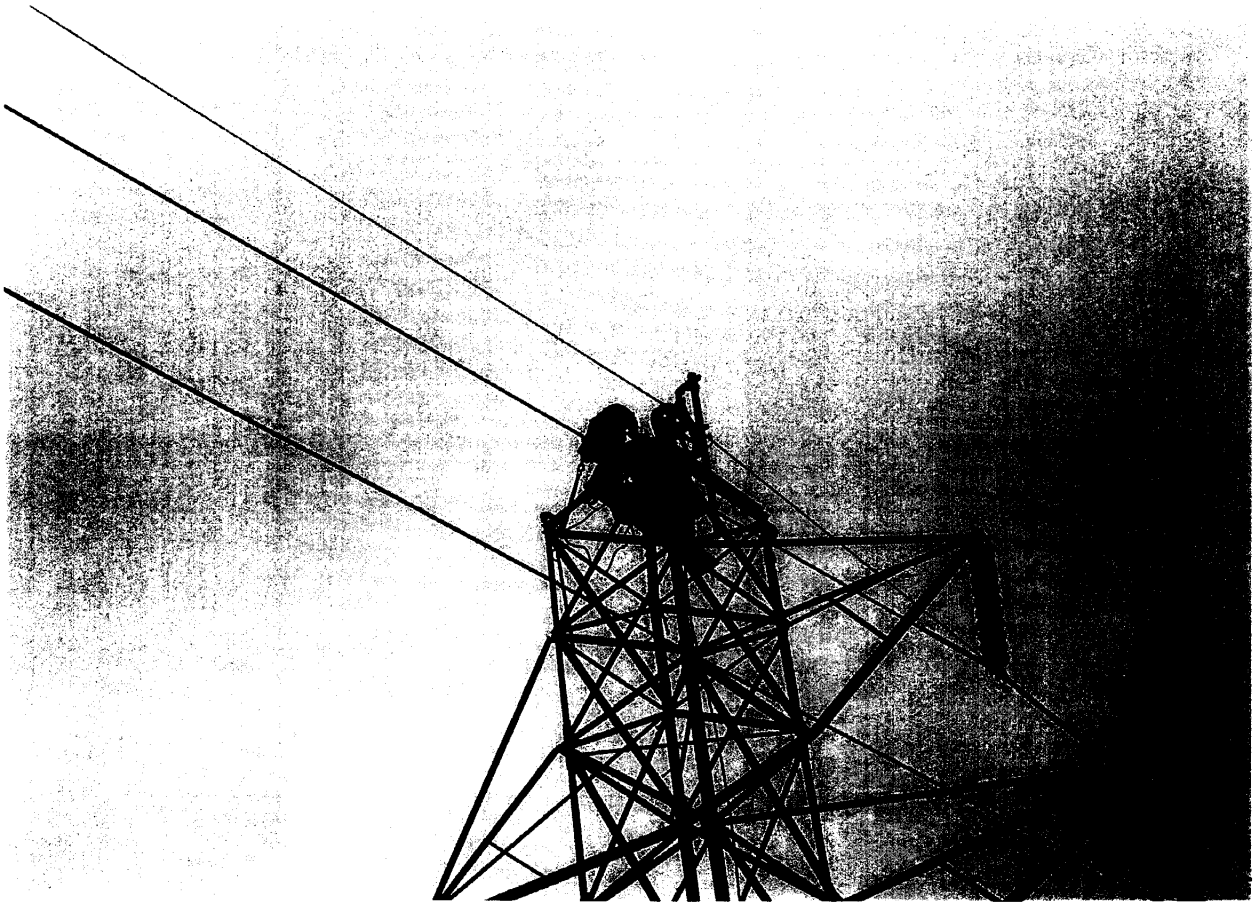


Contractor: GLR Client: ALCAN Technical Partner: TESMEC

To climb the tower with a live line

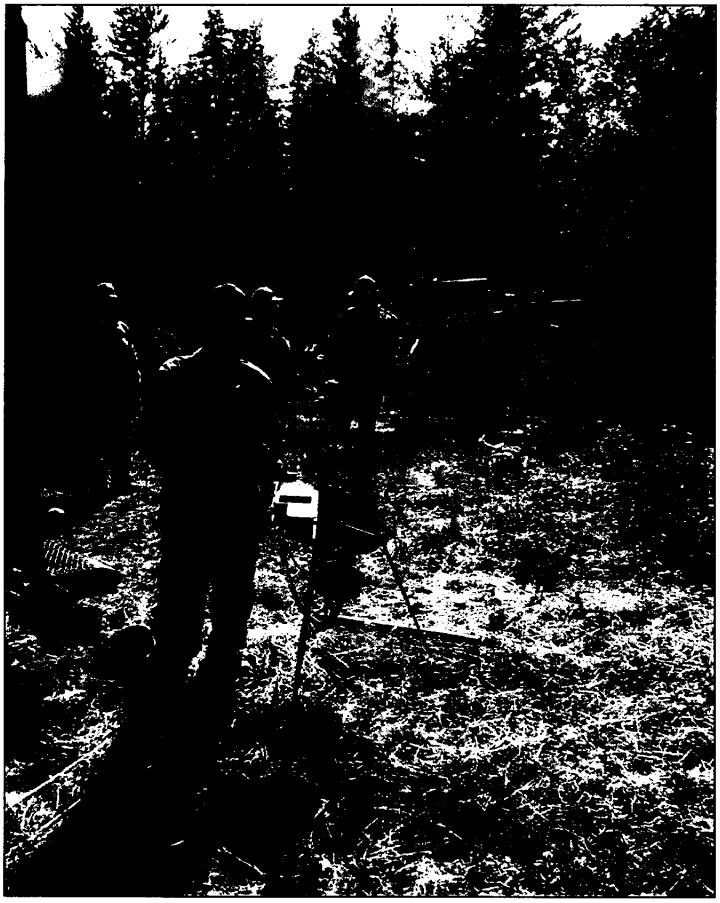
Contractor: GLR Client: ALCAN Technical Partner: TESMEC

Stringing pulley set up with a live line



Contractor: GLR Client: ALCAN Technical Partner: TESMEC

Radio control and pull recording unit



Contractor: GLR Client: ALCAN Technical Partner: TESMEC

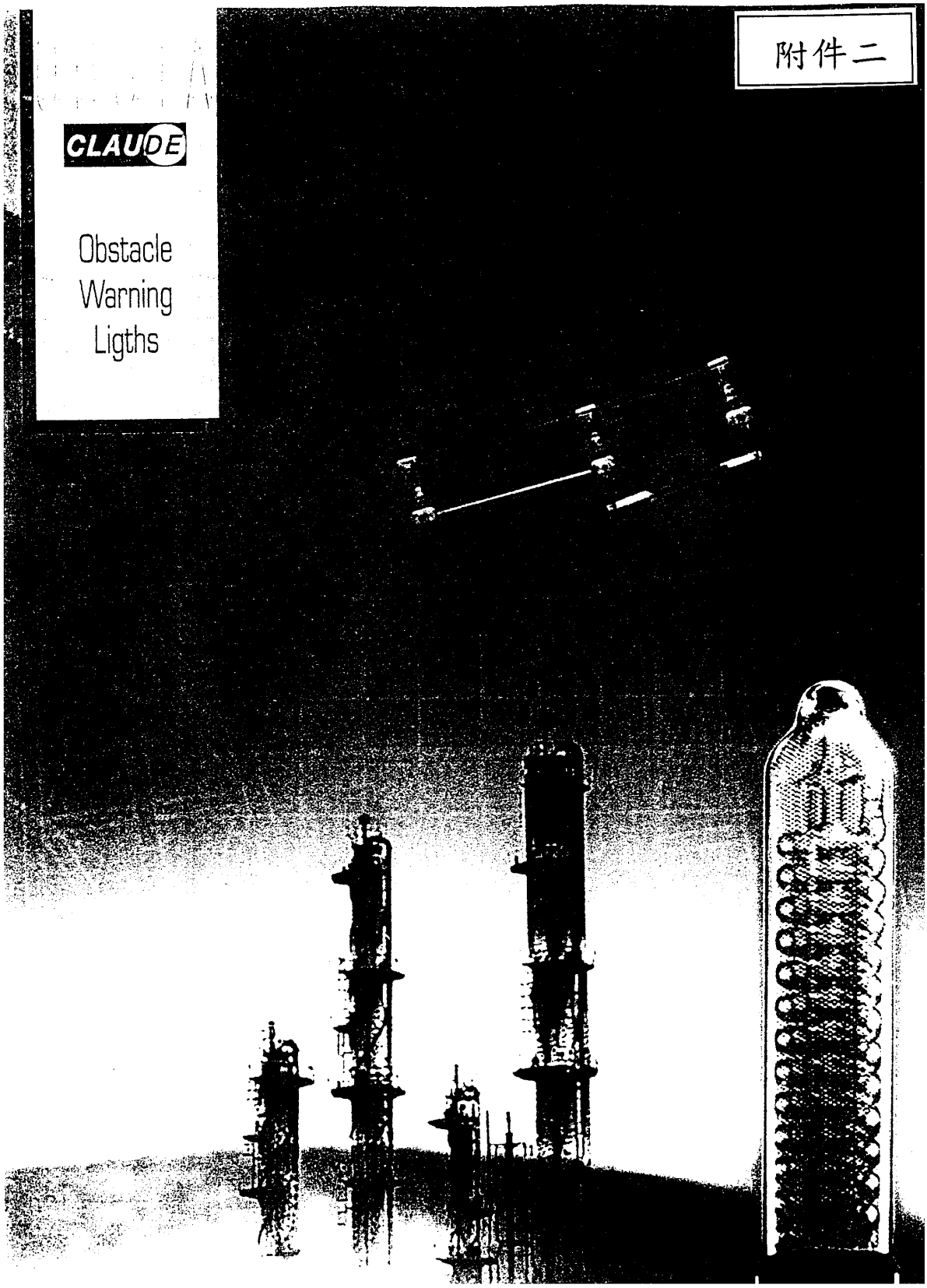
Pull recording unit

Contractor: GLR Client: ALCAN Technical Partner: TESMEC

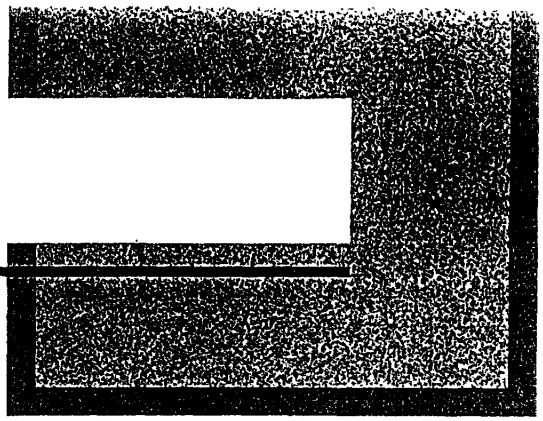
附件二

CLAUDE

Obstacle Warning Ligths



PREFACE
INTRODUCTION



Securite et reglementation
La presence d'obstacles (immeubles, cheminees, poteaux, grues, ligne haute tension, etc) représente un danger permanent et important pour la navigation aerienne Les organismes concernes (OACI, STNA, FAA, etc) ont elaboré une reglementation définissant les modes de balisage des obstacles presentant un danger Cette reglementation impose des regles d'installation minimales des materiels (OACI Annexe 14 Chapitre 6 a la convention relative a l'aviation civile internationale)

La solution OBSTA au balisage des obstacles
Dans un souci constant d'apporter a ses clients et utilisateurs une qualite de service irreprochable, OBSTA a développe toute une gamme de lampes a décharge dans le néon pour le balisage des obstacles a la navigation aérienne
Le principe de décharge dans le neon retenue par OBSTA permet d'obtenir des lampes a haute performance, a durée de vie tres élevee et resistante aux conditions climatiques les plus dures

Caracteristiques generales des lampes OBSTA
- *rendement lumineux / puissance consommée élevée,*
- *lampe en verre dure Bonne résistance aux variations de température,*
- *boîtier etanche,*
- *insensible aux vibrations mécaniques rencontrees sur les ouvrages de type pylônes, tours ou cheminees,*
- *elément lumineux insensible au rayonnement solaire (le neon est un gaz inerte) et au rayonnement HF Supporte des champs bien superieur aux exigences des normes CEM,*
- *protégé contre les surtensions transitoires Un parafoudre est fixé directement sur le câble d'alimentation de l'ensemble*

Safety and regulations
The presence of obstacles (buildings, chimneystacks, pylons, towers, cranes, HV lines, etc) is a major hazard for aircraft The appropriate authorities have defined rules of the marking of such obstacles to obtain the required degree of safety
The organizations involved (ICAO, STNA, FAA, etc) have draw up regulations defining how dangerous obstacles must be marked These regulations lay down rules on the installation and characteristics of beacons (see ICAO recommendations)

The OBSTA technique for obstacle beacons
OBSTA has developed original lighting techniques complying with regulations in force The basic objective was to develop high performance equipment The use of filament lamps was therefore rejected, since they have major disadvantages (limited life and low reliability) Beacon light must offer absolutely continuous service (for safety) and are frequently installed in highly innaccesible positions, Replacing obstruction lights therefore imply delicate and costly maintenance
On the basis of its extensive experience, OBSTA selected cold-cathode rare gas (neon) lamps as the basic component to develop a complete range of low intensity beacons

Description
The neon discharge principle used offers
- *Inherent generation of the aviation «red»,*
- *High reliability and a very long life,*
- *Excellent luminous efficiency,*
- *very low power consumption*

Main characteristics of OBSTA beacons

- *Perfect weatherproofing,*
- *Resistance to hard climatic conditions,*
- *Typical proven lifetime of our light is 100 000 hours (*)*

Avantages des lampes a decharge OBSTA

Avantages of OBSTA lamps

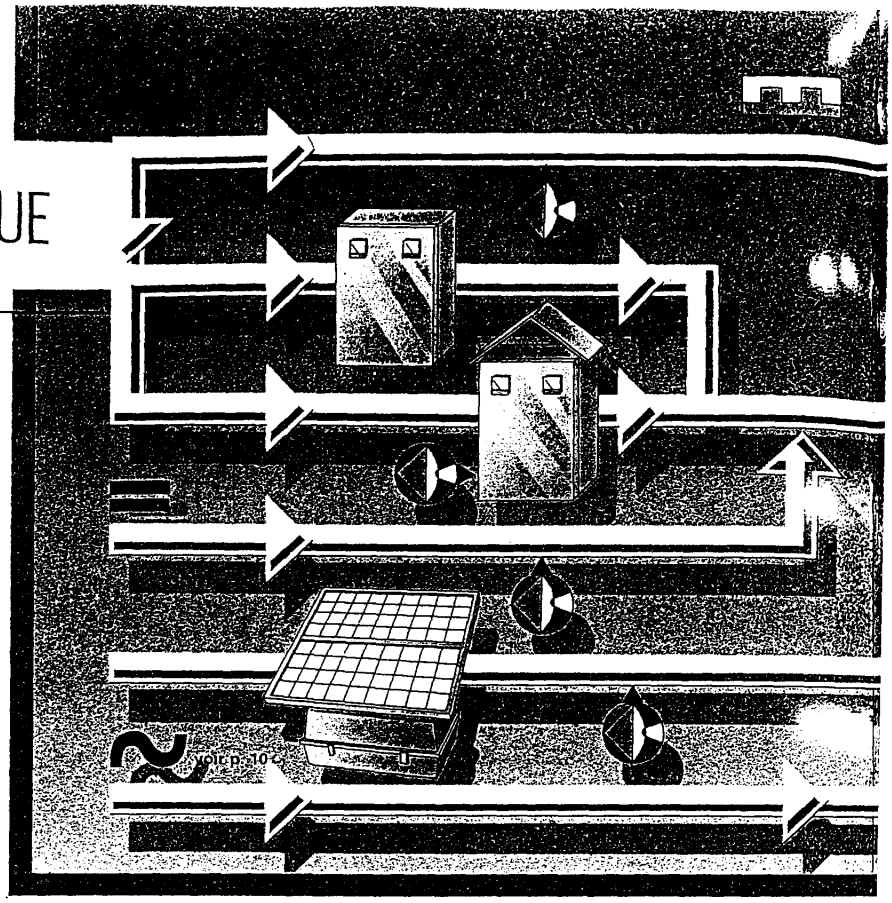
Type de lampe Lamp type	Durée de vie moyenne Typical lifetime	Sensibilité climatique Climatic sensibility	Sensibilite électro- magnétique Electro-magnetic sensibility	Intensite lumineuse Luminous Intensity
Lampes a incandescence	De l'ordre de 1000 à 4000 heures	Oui (vibrations, humidite)	Non	Reste constante et homogene
Incandescent lamp	Approx 1000 to 4000 hours	Yes (vibration, humidity)	No	Remains constant and homogeneous
Lampe a LED	Durée de vie basee sur le MTBF uniquement	Oui (température, soleil)	Oui (la led est un semi-conducteur	Baisse significative apres quelques annees seulement
LED lamp	Based on MTBF only	Yes (temperature, sun)	Yes (the led is a semi-conductor)	Significant drop after a few years only
Lampe a decharge solution CLAUDE	100 000 heures Duree de vie prouvee(*)	Non (100 % verre)	Non (le neon est un gaz inerte)	Reste constante et homogene
The OBSTA (CLAUDE) discharge lamp	100 000 hours Proven lifetime(*)	No (100 % glass)	No (the neon is not reactive)	Remains constant and homogeneous

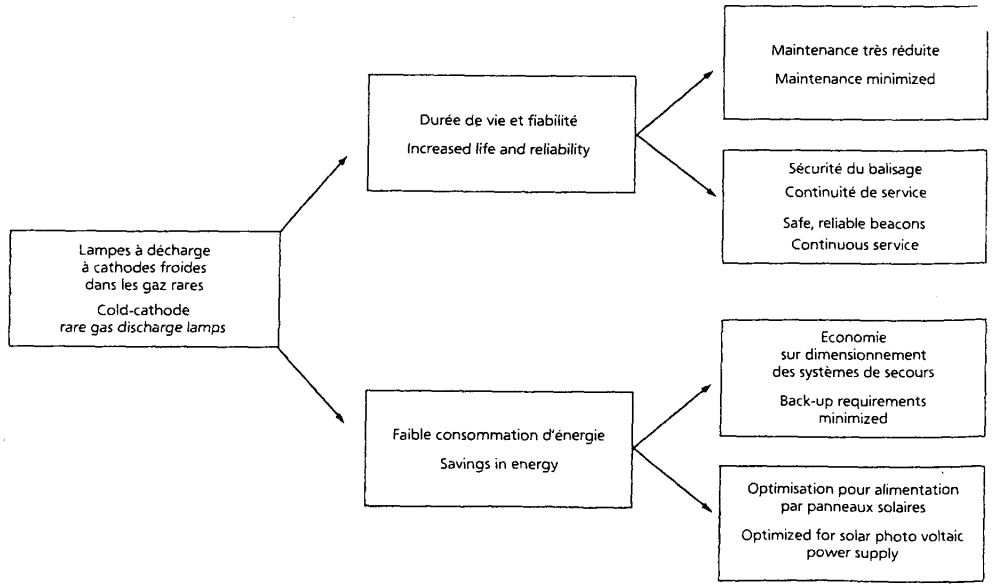
(* duree de vie observee par plus de 50 ans d'experience dans cette technologie)
(* Typical lifetime of OBSTA lights based on 50 years of experience in this technology)

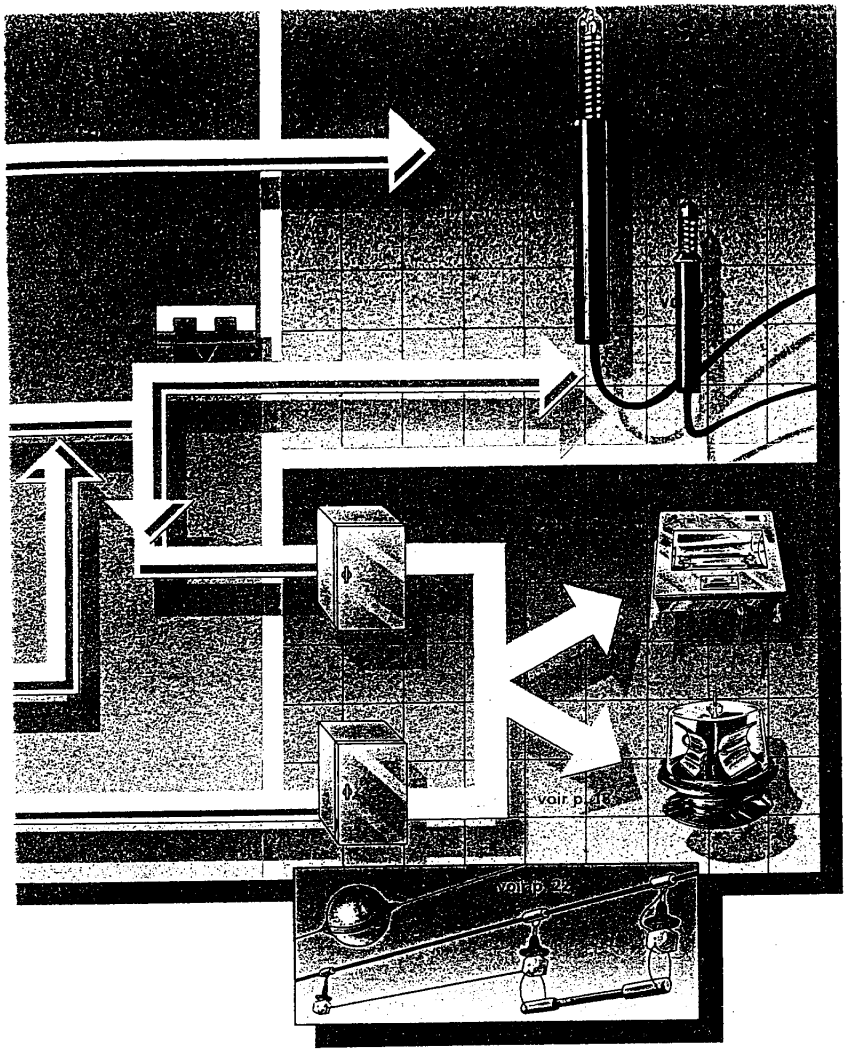
Nota le coût global d'une alimentation secourue etant bien superieur a celui d'une balise, la puissance absorbee par balise est extremement importante pour le coût global d'une installation secourue

Note because the cost of the back-up power supply is far greater that the one of the beacon itself, the power consumption of each beacon is a very important factor to the overall cost of a back-up system

SYNOPTIQUE
SYNOPTIC







Définition
de l'obstacle à baliser

- type d'obstacles *(cheminée, immeuble, grue, antenne, pylône, lignes HT)*
- hauteur, forme • fumée • etc.

Definition
of the obstacle to be marked

- type of obstacle *(chimney, building, crane, aerial, pylon, HV lines)*
- height and shape • smoke • etc.

Consultation
de la réglementation OACI
annexe 14
(voir pages 4 et 5)

- type et nombre de feux
- emplacement • etc.

ICAO appendix 14 specifications
(see pages 4 and 5)

- type and number of lights
- positions • etc.

Définition des produits
à l'aide du synoptique ci-dessus
et des fiches-produits
correspondantes

Selection of products using
the above schematic
and the corresponding product
data sheets

REGULATIONS

Any object which could represent a hazard for low-flying aircraft must be marked by beacon lights. The International Civil Aviation Organization (ICAO) lays down, in appendix 14 (chapter 6) of its convention, internationally-applicable rules on the characteristics of the beacons and their installation. A few of the main points of the regulations on type of obstacles wich must be marked, and the corresponding installation rules, are given below.

Extracts from annex 14 ICAO

Extracts from table 6.3. Characteristics of obstacle lights

Light Type	Colour	Signal Type/ (flash rate)	Pack intensity (cd) at given Background Luminance			Vertical Beam Spread
			Above 500 cd/m²	50-500 cd/m²	Below 50 cd/m²	
Low-intensity, Type A (fixed obstacle)	Red	Fixed	N/A	10 mnm	10 mnm	10°
Low-Intensity, Type B (fixed obstacle)	Red	Fixed	N/A	32 mnm	32 mnm	10°
Medium-Intensity, Type A	White	Flashing (20-60 fpm)	20 000 ± 25 %	20 000 ± 25 %	2 000 ± 25 %	3° mnm
Medium-Intensity, Type B	Red	Flashing (20-60 fpm)	N/A	N/A	2 000 ± 25 %	3° mnm
High-Intensity, type A	Withe	Flashing (40-60/min)	200 000 ± 25 %	20 000 ± 25 %	2 000 ± 25 %	3° - 7°

Position of beacon lights

6.3.11 One or more low-, medium- or high-intensity obstacle lights shall be located as close as practicable to the top of the object. The top lights shall be so arranged as to at lesat indicate the points or edges of the object highest in relation to the obstacle limitation surface.

6.3.12 Recommendation.— In the case of chimney or other structure of like function, the top lights should be placed sufficiently below the top so as to minimize contamination by smoke etc. (see figures 6-2 and 6-3).

6.3.14 In the case of an extensive object or of a group of closely spaced objects, top lights shall be displayed at least on the points or edges of the objects highest in relation to the obstacle limitaion surface, so as to indicate the general definition and the extent of the objects. If two or more edges are of the same height, the edge nearest the landing area shall be marked. Where low-intensity lights are used, they shall be spaced at longitudinal intervals not exceeding 45 m. Where medium-intensity lights are used, they shall be spaced at longitudinal intervals not exceeding 900 m.

6.3.15 *Recommendation.— When the obstacle limitation surface concerned is sloping and the highest point above limitation surface is not the highest point of the object, additional obstacle lights should be placed on the highest point of the object.*

6.3.22 The number and arrangement of low-, medium- or high-intensity obstacle lights at each level to be marked shall be such that the object is indicated from every angle in azimuth. Where a light is shielded in any direction by another part of the object, or by an adjacent object, additional lights shall be provided on that object in such a way as to retain the general definition of the object to be lighted. If the shielded light does not contribute to the definition of the object to the lighted, it may be omitted.

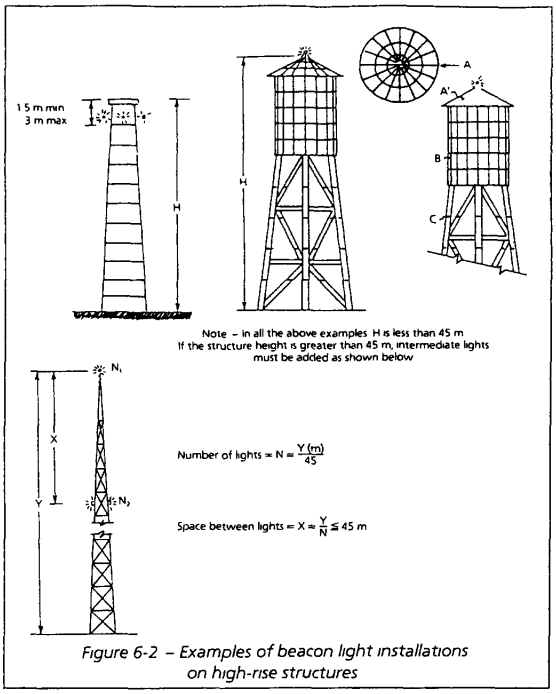
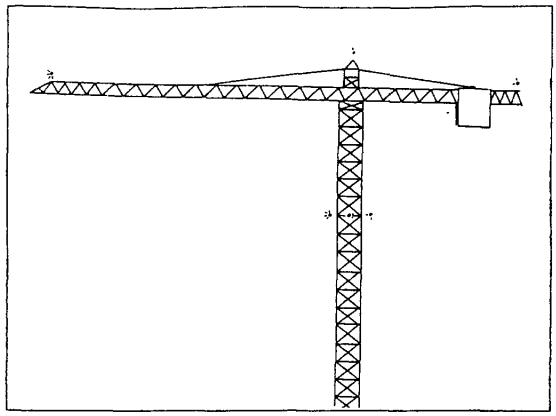


Figure 6-2 – Examples of beacon light installations on high-rise structures



Beacon lights on a crane

One light at the top of the tower plus an intermediate row of lights every 45 meters
1 light at the jib tip and 1 at the counterbalance jib tip
1 intermediate light if the jib is more than 50 meters long

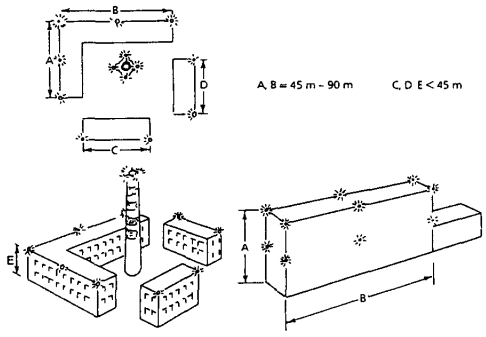
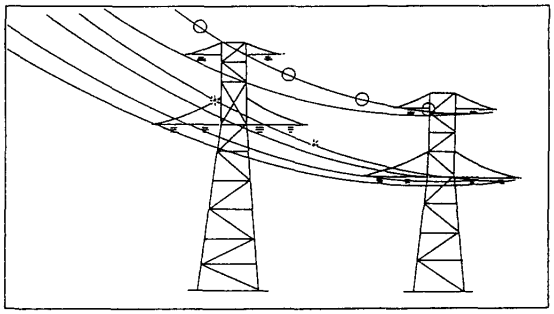


Fig 6.3 – Beacon lights on buildings



Daytime marking and beacon lights on high-voltage lines

Daytime marking

Cables: alternately red and white spheres, complying with the regulations, placed on the top wire
Spacing of spheres (a)
- lines in airfield clearance areas: a max = 35 m
- other lines: a max = 52 50 m

Beacon lights

Supports there must be a beacon light at a maximum distance (b) of 10 meters on either side of the support (applies to supports not more than 45 m high)
Cables they must be beacon lights on the top active conductor or spread over several conductors The space (c) between the lights must be such that

$$c = \frac{D - 2b}{n}$$

where D is the space between the supports (i e the cable spans)
n = the number of spaces between beacons in each span
In airfield clearance zones c max = 70 m
Other lines c max = 105 m

Beacon lights on stacks

Height 60 m, located outside encumbrances

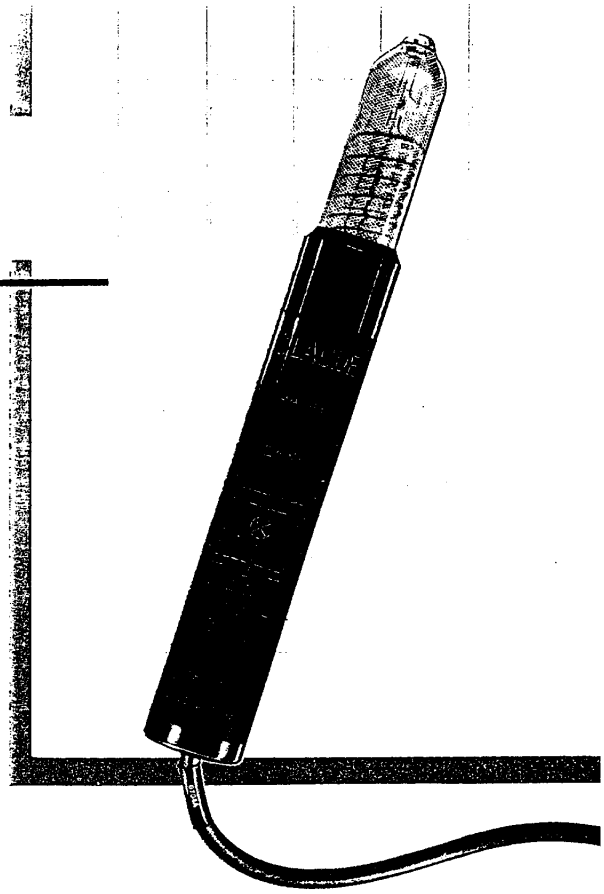
Two sets of beacon lights, each comprising 3 lights separated by 120° around the periphery
Top lights 1 50 to 3 m below the top Second set 30 m above ground level

Beacon lights on an autostable pylon

Pylon height: 60 m, cross-section triangular, pylon located outside encumbrances.

At the top: 2 twin lights, one vertically above the other, such that each light is visible from any direction. If this is impossible, 3 lights placed at 120° around the pylon periphery. At approx 30 m above ground level 3 lights spaced at 120° around the pylon periphery

OBSTA S.T.I.



Application

The OBSTA S.T.I. is designed as a beacon for hazards to low-flying aircraft (buildings, chimney stacks, pylons, cranes, etc.). It falls into the low intensity (type A) category defined by the ICAO (i.e. it generates more than 10 candelas).

The neon discharge principle used offers:
- inherent generation of the "aviation" red
- a very long life
- excellent luminous efficiency
- very low power consumption.

The OBSTA S.T.I. takes its power from a DC source which means its power supply can be, for example:
- a back-up source (batteries) to ensure continuous beaconing: see data sheet 8.
- solar panels: see data sheet 10.

In addition, the very low voltage used means there is no danger to personnel and satisfies the requirements of some standards for hazardous environments.

Description

THE OBSTA S.T.I. is a one-piece moulded assembly which includes a constant-power inverter and the discharge lamp proper (5 turns).
This new design ensures:
- perfect weatherproofing
- no requirement for a ground connection, which allows any connection configuration to be used and avoids any voltage return from the earth (for example due to lightning).

The overall reliability is thus considerably improved.
The OBSTA S.T.I. also includes:
- protection against transient overvoltages
- circuitry to monitor the operation of the lamp and, in the event of a failure, to trigger an alarm or light an auxiliary lamp (if active redundant circuits are used).

Auxiliary functions are also available (photoelectric cell) : see block diagram.

The OBSTA S.T.I. is easy to install and requires no servicing.

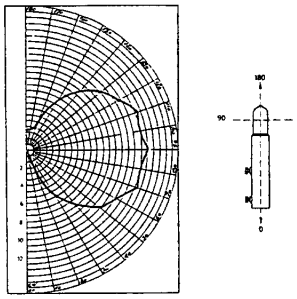
Main characteristics

OBSTA S.T.I.	Power supply	Luminous intensity	Current drawn	Power consumed	Typical life time
Part 13200	48 V DC	> 10 Cd	250 mA	12 W	100,000 h
Part 13300	24 V DC	> 10 Cd	500 mA	12 W	100,000 h
Part 13400	12 V DC	> 10 Cd	700 mA	8 W	100,000 h

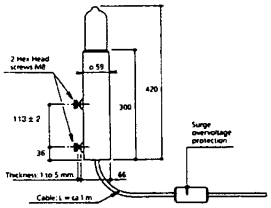
CHAUDE

Complementary characteristics

Light Intensity Diagram:



IP Degree: 66
Operatin temperature: .....-20 à + 60° C
Power voltage: .....12, 24 ou 48 V (-10; + 15 %)
Weight: .....1,5 kg
Overall dimensions:

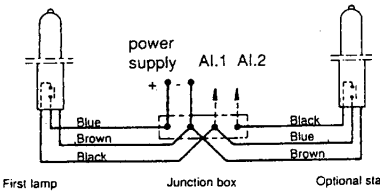


Attachment:..... by 2 screws (tightening thickness: 1 to 5 mm)
Connection:..... on bare wires (2 power wires, 1 alarm)
Maintenance:..... none
Specific precautions: for chimney installations, secure the lamp beneath the top (1.5 to 3 m), in accordance with ICAO's recommandations

For installation with RFI risk, the power supply cable must be shielded.

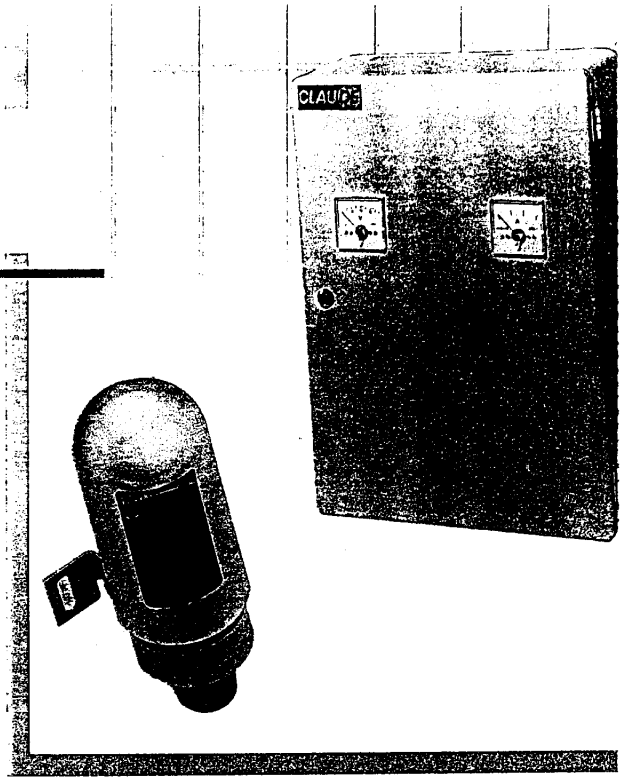
Complementary functions:

• out of order alarm (relay switching)



• automatic emergency lamp configuration enabling automatic control of an emergency lamp and/or an alarm in case of a fault with the main lamp (active redundancy)
• control by crepuscular photoelectric cell (see p. 16).
• EMC Specification EN 55011, class B.

POWER SUPPLY CABINETS PHOTOCELLS



POWER SUPPLY CABINETS

Application

Obstacles require constant beaconing and, consequently, a continual electric power supply.

CLAUDE power cabinets house battery-charger units, with all the associated annex monitoring and control functions, and are specifically designed to provide continuous service.

Description

The various components in CLAUDE power supply cabinets are grouped in a metal enclosure.

The power supply unit draws its power from the AC mains supply and outputs a DC voltage to feed the lights.

The range of units available offers choice to select the most suitable configuration to match the number of lights and the autonomy required (the STNA require a minimum of 10 hours).

The dry batteries used require no servicing during normal operation.

CLAUDE power supply cabinets are designed for installation in enclosed premises.

Auxiliary functions are also available (photoelectric cells, weatherproof cabinet, etc.): see block diagram.

To further improve the reliability of the equipment, the cabinet includes:

- protection against transient overvoltages
- protection against complete discharge of the batteries.

Main characteristics

POWER SUPPLY CABINET	Capacity	Power supply	Output voltage	Max DC intensity	Max number of OBSTA S.T.L. for 10 h autonomy
P/N 13500	16 Ah	230 V	48 V	2.5 A	4 lights
P/N 13501	25 Ah	230 V	48 V	4 A	7 lights
P/N 13502	40 Ah	230 V	48 V	6 A	12 lights
P/N 13506	7 Ah	230 V	48 V	2 A	2 lights

PHOTOCELLS

Application

CLAUDE photocells are used to automatically switch the beacons on or off to match changes in the daylight level (day/night switching).

Photocells therefore:

- save power (when operating from solar panels or power cabinets for example)
- increase the life of the beacon system
- can fulfill auxiliary functions.

Description

CLAUDE photocells plug into a socket. A delay system prevents the cell triggering on brief flashes (for example lightning). The actuator is a normally open relay.

Main characteristics

PHOTOCELL	Power supply	Triggering level
Part 00752	230 V AC	50 lux
Part 00755	48 V DC	
Part. 00754	24 V DC	

CLAUDE

POWER SUPPLY CABINET

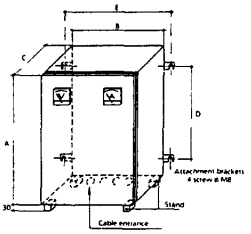
Complementary characteristics

IP Degree: 20

Operating temperature . . .. 0 to 45 °C

Power voltage..... . .. . 220 V ± 10 %, 50 Hz

Weight and overall dimensions:



	Power cabinets			
	12 Ah	20 Ah	36 Ah	7 Ah
A	634	815	815	600
B	434	515	515	400
C	206	265	265	200
D	490	690	-	550
E	466.5	550	-	450
Weight	44 kg	77 kg	95 kg	43 kg

N B 36 Ah cabinet has no wall mounting brackets
Dimensions inn mm

Attachment. secured by wall brackets (except for the 36 Ah cabinet) or placed on a flat surface.

Connection: .... by terminals

Maintenance: ... . none.

Particular precautions:

• Use indoors (except for double-casing cabinet). Recharge batteries during prolonged storage

Complementary functions:

• Output voltage control in manual mode, or in automatic mode by crepuscular photoelectric cell.

Batteries: .... lead, gelated type

Other versions. with double-casing for outdoor installation (IP 55). See table

Double casing cabinets		Capacity (Ah)		
		12 Ah	20 Ah	36 Ah
Supply voltage (V)	220 V	13510	13511	13512
	380 V	13520	13521	13522

PHOTOELECTRIC CELL

Complementary characteristics

IP Degree:..... 67

Operating temperature . . . . — 25 to + 60 °C

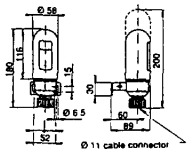
Supply voltage. ... . See recto side

Voltage tolerance . . ..— 10 ; + 15 %

Consumption.... . .. .1,5 VA

Weight: .. . . .300 g

Overall dimensions: .. . .



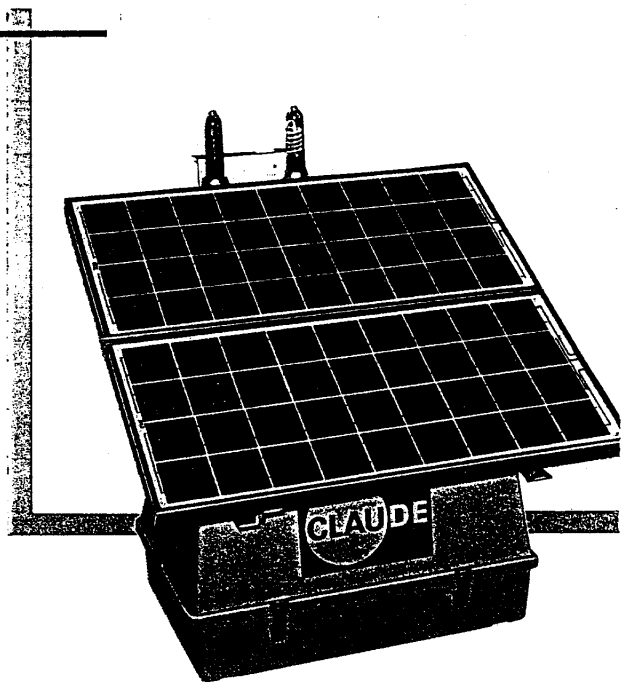
Attachment .. . . by harness and screws

Connection:... . . . . screw terminals

Maintenance .. . . .none

Complementary functions: .. . 10 A contact closed in darkness

SOLAR POWER



Application

A self-contained source of power is required for beacons in remote spots (where no source of power is accessible).

CLAUDE solar panels use the photovoltaïc effects to convert sunlight directly into electricity and thus generate the power required for beacon lights.

The surface area of the panels depends on the insolation of the site and the number of beacons connected.

Description

CLAUDE solar panels are self-contained units (transportable by helicopter) which fulfill the following functions:

- the conversion of sunlight to electricity (polycrystalline silicon photocell panels)
- the storage and control of the power generated (by a battery-charger system and the associated circuits)
- system safety (protection againt complete battery discharge, etc.).

The configuration can be easily adapted to match any specific case.

Auxiliary functions are also offered (photoelectric cell, active redundancy, etc.): see block diagram.

Mains characteristics

SOLAR STATIONS	Number of panels	Capacity	Output voltage	To operate
TSB 90	2	120 Ah	24 V DC	1 OBSTA S.T.I.
TSB 180	4	180 Ah	24 V DC	1 OBSTA H.I. with appropriate adapter 2 OBSTA S.T.I.
Powerpac 40	1	60 Ah	12 V DC	1 OBSTA S.T.I.
Powerpac 80	2	120 Ah	24 V DC	1 ou 2 OBSTA S.T.I.

CLAUDE

TSB STATIONS

Complementary characteristics

IP Degree: 55

Operating temperature: ..... 0 à 60° C

Output voltage: ..... 12, 24 ou 48 V on request

Weight: .....
Overall dimensions: .....] dépending on configuration

Attachment : ..... placed on a platform, slab, etc.

Connection: by connector (between the differents elements of the station)

Maintenance : annual inspection (level of batteries, cleanliness of panels, etc.).

Particular precautions:

- Avoid shade of surrounding objects.
- Charge the batteries, during prolonged storage.

Complementary functions: crepuscular photoelectric cell (see p. 8)

Batteries: ..... Acid-lead

Photovoltaïc panels: ..... polycristalline

Other versions: ..... consult us for configurations (power, voltage, site, etc.).

POWERPAC STATIONS

Complementary characteristics

Operating temperature: ..... de - 20 à + 60° C

Output voltage: ..... 12 VDC

Weight and overall dimensions : ..... depending of configuration

Attachment: ..... on vertical corner

Connection : ..... by terminals

Maintenance: annual inspection

Particular precautions:

- avoid shade of surrounding objects
- charge the batteries, during prolonged storage

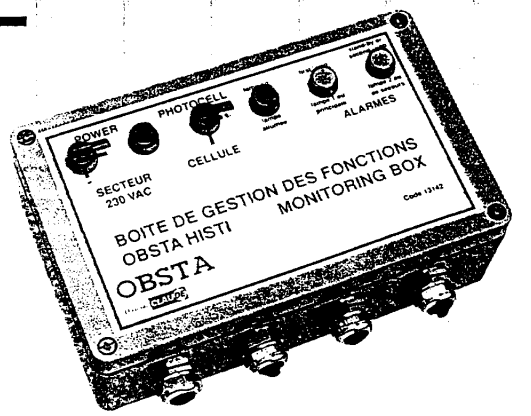
Complementary functions: crespuscular switch integrated

Batteries : ..... sealed

Photovoltaïc panels: ..... polycristalline

Ohter versions: (voltage, location, power) : ..... consult us

ACCESSORIES FOR INSTALLATION



The lighting of obstacles to aircraft is a security element that installation procedures must include. The range of products proposed by OBSTA has been designed for wiring and monitoring a group of obstruction lights.

OBSTA junction boxes allow to:
- Simplify the wiring connection of lights,
- Facilitate the required configuration for obstruction lighting (night only operation, alarms and active redundancy...)

Those boxes have to be installed at the bottom of the obstacles or just near the obstruction lights.
Advantages:
- Good resistance to mechanical chocks,
- Resistant of hard climatic environment,
- Protection against electromagnetic fields.

Some of those boxes also include:
- Remote monitoring of defaults,
- Night only operation.

Application
OBSTA monitoring box have been designed for the installation of obstruction lights for aircraft obstacles (buildings, chimneys, cranes, towers and many more...). They have been designed mainly for low intensity lights as defined in ICAO recommandations and FAA standards. They can also be used for medium and high intensity lights. Depending on the input voltage and the required configurations, those boxes allow to:
- Operate only at night,
- Connect groups of lights operating simulatneously or with one first lamp and one stand-by lamp,
- Display locally the status of the system,
- Monitor and display by remote control a buzzer or a luminous signal.

Description
This range of products is made in modled and painted aluminium boxes. entry of cables is made with nickel-plated brass. Inside the box, cable connectors fix all the wires.
This concept allows:
- Easy attachment on vertical panel,
- Easy wiring of cables,
- Easy junction to external device for the remote monitoring,
- Excellent waterproof of the system (IP65),
- Good resistant to strong climatic condition,
- Operation in strong electromagnetic fields.

For monitoring option, luminous display and interrupters are waterproof.
They display:
- Power supply on,
- The status of the lights,
- The defect (if there are) of the main lights or the back-up lights,
- Automatic or manual operation mode.

Main characteristics

Power supply	Simultaneous operation	Active redundancy operation	Night only operation	Local display	Remote monitoring
24 V DC	13140	13140	13140	13144 + 13141	13144 + 13141 ou 13146
48 V DC	13140	13140	13140	13143 + 13141	13143 + 13141 ou 13145
230 V AC	13140	13140	13140	13142 + 13141	13142 + 13141

For the design of the installation (drawings, quantity of boxes...), consult us.

Caractéristiques complémentaires

IP Degree: 65

Cable entries quantity 4

Cable diameter ..... from 8 to 15 mm

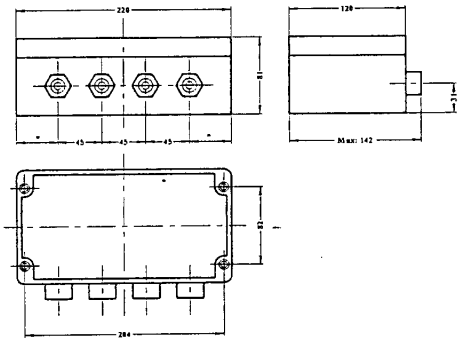
Wire cross section: ..... from 1 to 4 mm²

Attachment: ..... by 4 M5 screws

Overall dimensions:

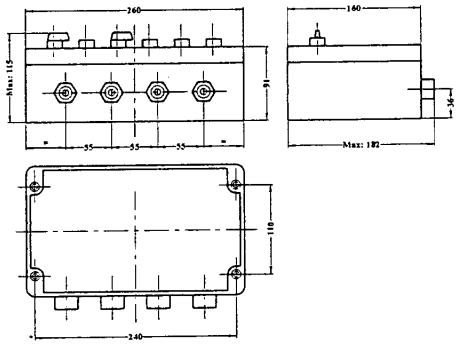
- Drawing A

All dimensions are in mm



- Drawing B

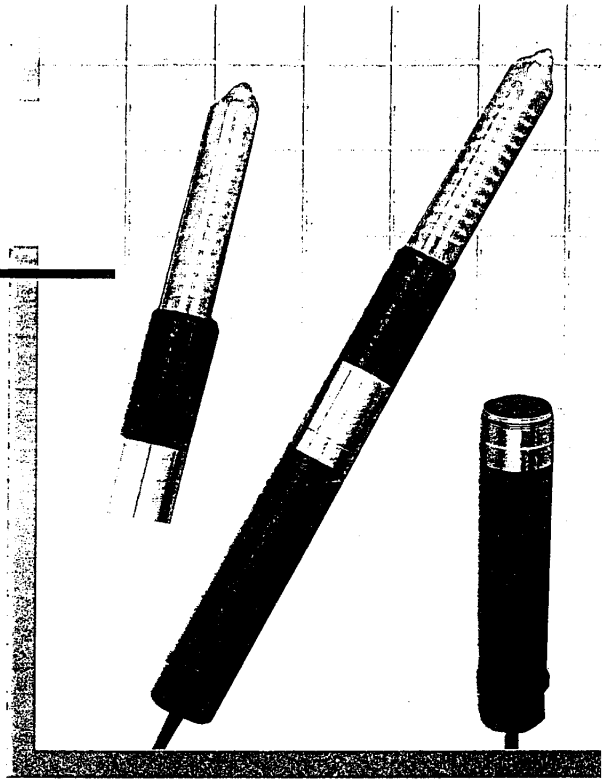
All dimensions are in mm



Code	VOltage	Drawing	Weight	Photocell	Display	Back-up	Remote control	Nber of lights
13140	N/A	A	1,8	Yes	No	Yes	Non	1 to 3
13141	N/A	A	1,8	Used with 13142, 13143 or 13144				2
13142	230 V AC	B	2,8	Yes	Yes	Yes	Yes	< 7
13143	48 V DC	B	2,8	Yes	Yes	Yes	Yes	< 7
13144	24 V DC	B	2,8	Yes	Yes	Yes	Yes	< 7
13145	48 V DC	A	1,9	No	No	Yes	Yes	2
13146	24 V DC	A	1,9	No	No	Yes	Yes	2

For exact drawings, please contact us

OBSTA H.I.S.T.I.M.



The OBSTA H.I.STI.M. warning light supplied by the AC power line combines the advantages of an integrated assembly and the modularity for the servicing. A neon discharge lamp has a very long lifetime but it requires very high voltages to operate.
In addition to the electronic technology supplying this discharge lamp, the design of the unscrewable luminous part allows to:
- avoid the high voltage plugs,
- offer additional functions,
- reduce drastically the weight and wind load.
Without external high voltage connections between the converter and lamp, this new concept is more reliable in:
- safety for people against electrical shocks,
- no more interferences due to poor electrical contacts,
- no corrosion
This design also allows:
- indication of the presence of the luminous element,
- monitoring the end of life of the lamp.
Those incidents are indicated by the switching of a potential free contact to supply a stand by lamp or to remotely monitor an alarm (easier redundant installation).
The electronic converter is completely isolated. A complete screening arround the converter and the lamp allows to operate in the strongest electromagnetics fiels.
The OBSTA H.I.S.T.I.M. is regulated to operate at constant power (so is the luminous intensity).

Application
The OBSTA H.I.ST.I.M. is a beacon light for obstacles to air traffic (buildings, chimney stacks, pylons, cranes, etc...).
It falls into the ICAO (type B) and FAA low-intensity category, improved.
The neon discharge used offers:
- inherent generation of « aviation » red,
- a very long life,
- excellent luminous efficiency.
The OBSTA H.I.ST.I.M. draws its power directly from the mains supply.
The luminous intensity generated by The OBSTA H.I.ST.I.M. (35 candelas) is far higher than the minimum tne ICAO regulations require (10 candelas). It considerably increases the visibility of the beacon. This value also complies with the FAA standards in force (minimum required: 32 candelas).

Description
The OBSTA H.I.ST.I.M. is built in two parts. The main part is a completed molded cylindrical assembly which includes a constant-power converter. The 13 turn discharge lamp is screwed on the top of it.
This new design ensures:
- no external High Voltage connections,
- perfect watherlightness of the 2 parts,
- an isolation from the ground which avoids any voltage return from the earth (for example due to lightning).
The overal relability is thus considerably improved.
The OBSTA H.I.ST.I.M. also includes:
- protection against transient overvoltage,
- circuitry to monitor the normal operation of the lamp and, in case of failure, to trigger a remote alarm or easily light up an auxiliary stand-by lamp (if active redundant circuits are used).
Auxiliary functions are also available (photoelectric cell.).
The OBSTA H.I.ST.I.M. is delivered with 2 collars to be mounted with an adjustable distance for easy installation and does not require any servicing.

Main characteristics

OBSTA H.I.S.T.I.M.	Power supply	Luminous intensity	Consumed current	Nominal power	Typical lifetime
P/N 13150	230 V ∿ 50/60 Hz	> 32,5 cd	370 mA @ 240 V ∿	45 W	100 000 h

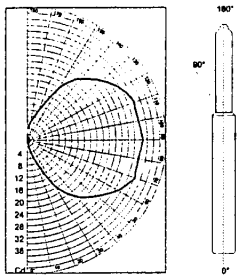
Spare parts

Désignation	Code	Number of turns	Luminous intensity	Typical lifetime
OBSTA H.I.M. Lamp	13156	13	35 Cd	100 000 h
H.I.S.T.I.M. 230 V AC Converter	13155	-	-	100 000 h

CI AIDE

Complementary characteristics

Light intensity diagram



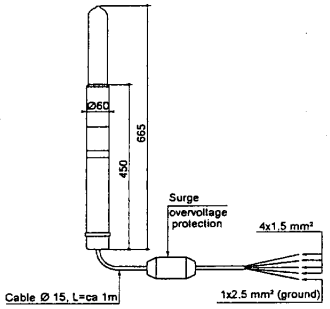
IP Degree: 66

Operating temperature: ..... -30° + 60° C

Power voltage: ..... 220 - 240 V AC (+/- 10%) - 50/60 Hz

Weight: ..... 3 kg

Overall dimensions (in mm):



Attachment: ..... with 2 collars

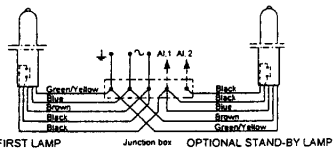
Connection: ..... on bare wires (2 power wires, 2 alarm)

Maintenance: ..... none

Specific cautions: for chimney installations, secure the lamp beneath the top (1,5 to 3m), in accordance with ICAO's recommandations.
For installation with RFI risk, the power supply cable must be shielded.

Complementary functions:

• Out of order alarm (relay switching)

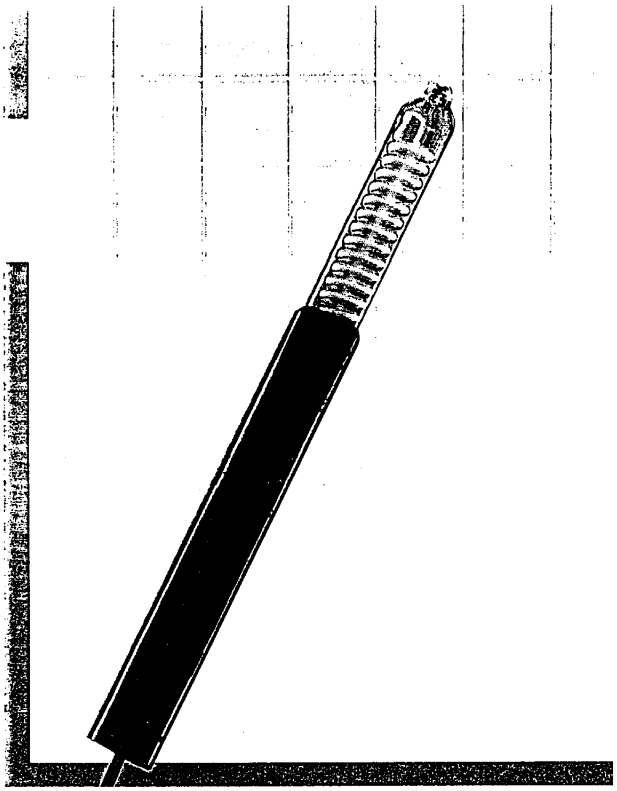


• Automatic emergency lamp configuration enabling automatic control of an emergency lamp and/or an alarm in case of fault with the main lamp.
(active redundancy) (see diagram).

• Control by crepuscular photocell.

• EMC Specification EN 55011, class B.

OBSTA H.I./S.T.I.



The OBSTA H.I. S.T.I. has been designed to replace the OBSTA H.I. transformer system. Besides the fact that the electronic system is more reliable than an electro mechanical one, the OBSTA H.I. S.T.I. has the following added features:
– The discharge tube and the converter-power supply unit are integrated in one solid, molded, weather proof light.
This arrangement renders the system free of contact problems. (Corrosion, Electro Magnetic noises, etc.).
– The unique model will adjust itself to the main supply voltages, continuously from 110 to 240 V RMS, 50/60 Hz.
– The total weight of the unit is considerably lowered to a meagre 2.3 kg.
– One alarm contact is factory built into the unit so that a stand by lamp or a remote monitoring of the operation of the lamp is possible without any extra hardware required.
– The unit is not referenced to the ground potential (class II) and thus protected against ground potential changes.
– The power consumption is constant (and so is the light output intensity).

Application

The OBSTA H.I.S.T.I. is a beacon light for obstacles to air traffic (buildings, chimney stacks, pylons, cranes, etc.). It falls into the ICAO low-intensity (type B) category, improved.
The neon discharge used offers:
• inherent generation of « aviation » red
• a very long life
• excellent luminous efficiency.
The OBSTA H.I.S.T.I. draws its power directly from the mains supply.
The luminous intensity generated by the OBSTA H.I.S.T.I. (35 candelas) is far higher than the minimum the ICAO regulations require (10 candelas), wich considerably increases the visibility of the beacon. This value also complies with the FAA standards in force (minimum required: 32,5 candelas).

Description

The OBSTA H.I. S.T.I. is a one-piece moulded assembly which includes a constant-power inverter and the discharge lamp proper (13 turns).
This new design ensures:
• perfect weatherproofing
• no requirement for a ground connection, which allows any connection configuration to be used and avoids any voltage return from the earth (for example due to lightning).
The overall reliability is thus considerably improved.
The OBSTA H.I. S.T.I. also includes:
• protection against transient overvoltages
• circuitry to monitor the operation of the lamp and, in the event of a failure, to trigger an alarm or light up an auxiliary lamp (if active redundant circuits are used).
Auxiliary functions are also available (photoelectric cell) see block diagram.
The OBSTA H.I. S.T.I. is easy to install and requires no servicing.

Main characteristics

OBSTA H.I.S.T.I.	Power supply	Luminous intensity	Current drawn	Power consumed	Typical lifetime
Part 13110	from 110 V to 240 V AC 50/60 Hz	> 32,5 cd	110 V - 730 mA 240 V - 370 mA	45 W	100 000 h

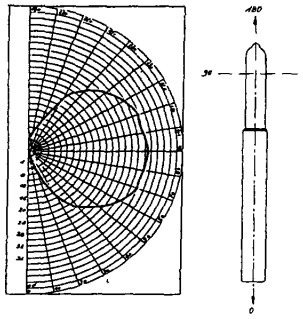
Spare lamps for existing installation

OBSTA H.I. Lamp	Number of turns	Luminous intensity	Interference suppression	Typical lifetime
Réf. 00653	13	35 Cd	Normal	100 000 h
Réf. 00654	13	35 Cd	Renforced	100 000 h

CLAUDE

Complementary characteristics

Light Intensity Diagram:



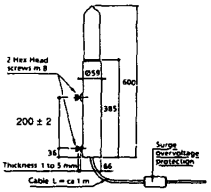
IP Degree:..... 66

Operating temperature: ..... – 30 to + 60 °C

Supply voltage: ..... 110 V to 240 V ~ (± 10 %) - 50/60 Hz

Weight. ..... 2.3 kg

Overall dimensions (in mm):



Attachment:..... by 2 screws (tightening thickness: 1 to 5 mm)

Connection:..... on bare wires (2 power wires, 2 alarm)

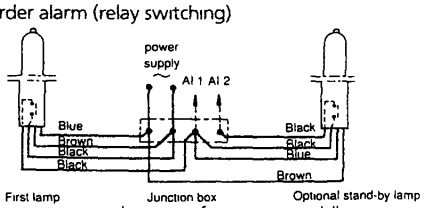
Maintenance: ..... none

Specific precautions: for chimney installations, secure the lamp beneath the top (1.5 to 3 m), in accordance with ICAO's recommandations

For installation with RFI risk, the power supply cable must be shielded

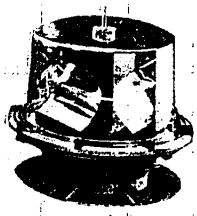
Complementary functions.

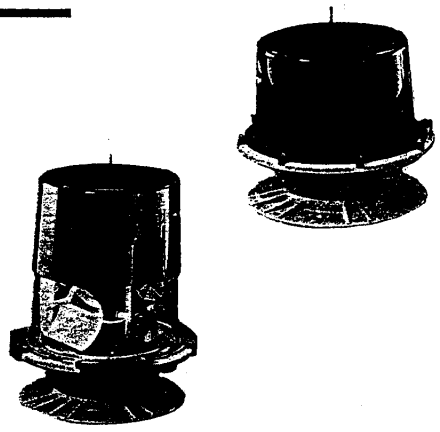
- out of order alarm (relay switching)



- automatic emergency lamp configuration enabling automatic control of an emergency lamp and/or an alarm in case of a fault with the main lamp (active redundancy)
- control by crepuscular photoelectric cell (see p. 16)
- EMC specification EN 55011, class B.

MEDIUM INTENSITY OBSTRUCTION LIGHT BEACON SYSTEM





Conforms with ICAO regulations and FAA L. 856 and L. 865 specifications

Extracts from annex 14 ICAO

6.3 3 ***Recommendation*** *- Where the use of low-intensity obstacle lights, type A or B, would be inadequate or an early special warning is required, then medium - or high-intensity obstacle lights should be used.*

6.3 7 ***Recommendation*** *- Medium-intensity obstacle lights, Type A, B or C, should be used, where the object is an extensive one or its height above the level of the surrounding ground is greater than 45 m. Medium intensity obstacle lights, Type A and C, should be used alone, where as medium-intensity obstacle lights, Type B, should be used either alone or in combination with low-intensity obstacle lights, Type B.*
Note. - A group of trees or buidings is regarded as an extensive object.

6.3 30 ***Recommendation*** *- Medium-intensity obstacle lights, Type A, shall be flashing-white lights, Type B shall be flashing-red lights and Type C shall be fixed-red lights.*

Application
Aviation obstruction warniong system
- broadcast transmitting towers,
- wind farm,
- microwave repeater towers,
- similar skeletal structures,
- temporary obstruction lighting system or chimneys, hyperbolic cooling towers and other tall structures using a high intensity system as permanent obstruction marking.

Description
Medium intensity lighting system is a two part assembly which includes a flashead and a control cabinet.
This design ensures:
- a low weight flashead to be installed anywhere,
- a good weatherproofing,
- an easy installation.

The MI lighting system also includes:
- automatic day/night switching,
- fault monitoring

No servicing is required.

Main characteristics

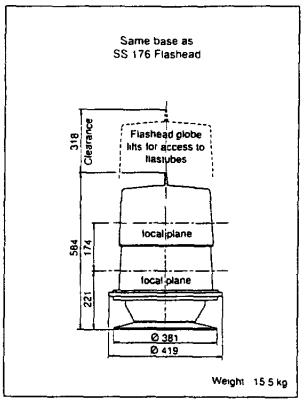
Medium intensity lighting system	Light intensity		Beam spread		Flashes per minute
	White	Red	Vertical	Horizontal	
	> 20 000 Cd	> 1600 Cd	3°	360°	40

Main supply	Fréquency	Power consumption	Peak VA
230 V	50 hZ	160 W	> 600 VA

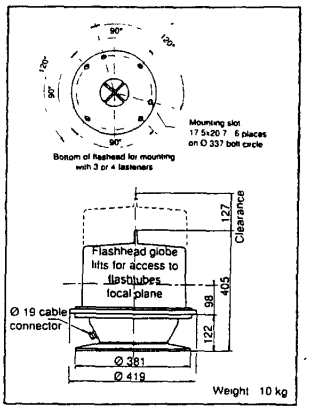
CLAUDE

WEIGHT AND AVERALL DIMENSIONS (in mm)

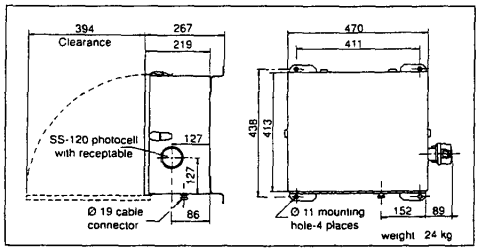
SS 178 Flashhead



SS 176 Flashhead



SS 175 and SS177 Control Cabinet



SYSTEM ELEMENTS

OBSTRUCTION LIGHTING SYSTEM 230 V-50 Hz		MEDIUM INTENSITY	
		Description	Code
FG2000	FLASHHEAD SS176 CONTROL CABINET SS175	white (red as option) one per flashead	13618
FG3000	FLASH SS178 COMMANDE SS177	red and white one per flashead	13617
FKHLASHEAD CABLE		length < 200 m	-
SPARE FLASHTUBE ASSY		xenon type	13630
Back-up system white/white or red/red. consult us			

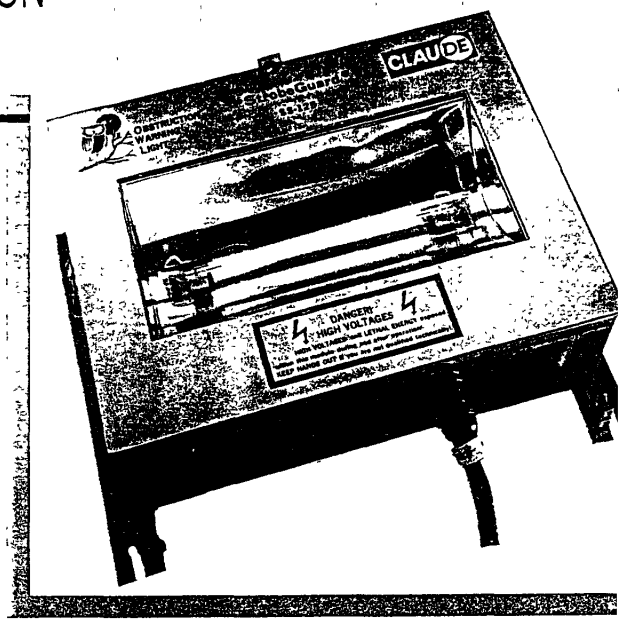
OTHER CHARACTERISTICS

- quartz flashtube especially manufactured
- "weathertight" stainless steel enclosures (in vertical position)
- "plug-in" modular construction with gold-plated contact surfaces
- conformally coated printed circuit cards protect solid state circuitry
- flashhead and control cabinet separation distance up t0 200 m (to be specified on the order)
- safety interlock in both flashhead and control cabinet
- day/night automatic switch

OPTIONS

- master/slave multiple beacon systems
- remote mounting of the protocell
- red beacon (red light)
- synchronization with High Intensity system (see page 17)
- other voltage (24 VDC)

IGH INTENSITY OBSTRUCTION LIGHT BEACON SYSTEM



Conforms with ICAO regulations and FAA L 856 specifications

Extracts from annex 14 ICAO
6 3 3 ***Recommendation*** *- Where the use of low-intensity obstacle lights, type A or B, would be inadequate or an early special warning is required then medium or high-intensity obstacle lights should be used*

6 3 8 ***Recommendation*** *- High-intensity obstacle lights, Type A, should be used to indicate the presence of an object if its height above the level of the surrounding ground exceeds 150m and an aeronautical study indicates such lights to be essential for the recognition of the object by day*

6 3 33 ***Recommendation*** *- High-intensity obstacle lights, Type A and B, shall be flashing-white lights*

Application
Aviation obstruction warning system
- Broadcast transmitting towers,
- microwave repeaters towers,
- similar skeletal structures,
- chimneys, cooling towers and all tall structures,
- wind farm

Description
Hight intensity lighting system is modular flasheads include power and optic elements and a controller that drives the total equipment

This design ensures
- a choice of the number of flashead,
- the synchronisation of all flashes,
- the simultaneous swtiching mode operation,
- an easy installation with adjustable centerline of the light beam

The HI lighting system also includes
- protection against transient overvoltages,
- automatic day/twilight/night switching,
- fault monitoring with digital lamp visualisation

Main characteristics

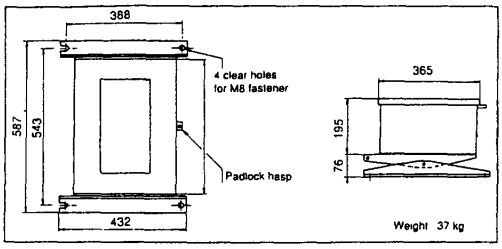
High intensity lighting system	Light intensity			Beam spread		Flashes per minute
	White	Twilight	Night	Site	Azimut	
	200 000 Cd	20 000 Cd	4 000 Cd	+/- 2°	+/- 60°	40

Main supply	Frequency	Power consumption per light	Elevation of flashead can be tilted
230 V	50 hZ	< 0,5 kVA	- 2° to + 8° to the horizontal

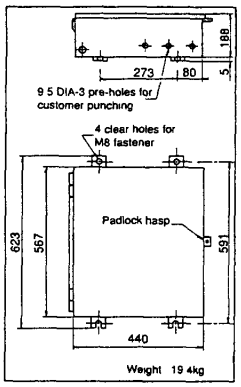
CLAUDE

WEIGHT AND AVERALL DIMENSIONS (in mm) ·

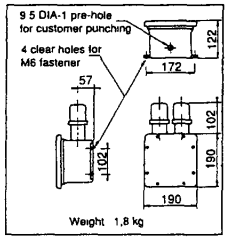
SS 125 Flashhead



SS 122 Controller



SS 124 Photocell



SYSTEM ELEMENTS

OBSTRUCTION LIGHTING SYSTEM 230 V-50 Hz	HIGH INTENSITY	
	Description	Code
FLASHHEAD	white	13621
POWER SUPPLY	N/A	-
CONTROLLER	one per installation	13625
FLASHHEAD CABLE	not supplied as standard	-
SPARE FLASHTUBE ASSY	xenon type	13631

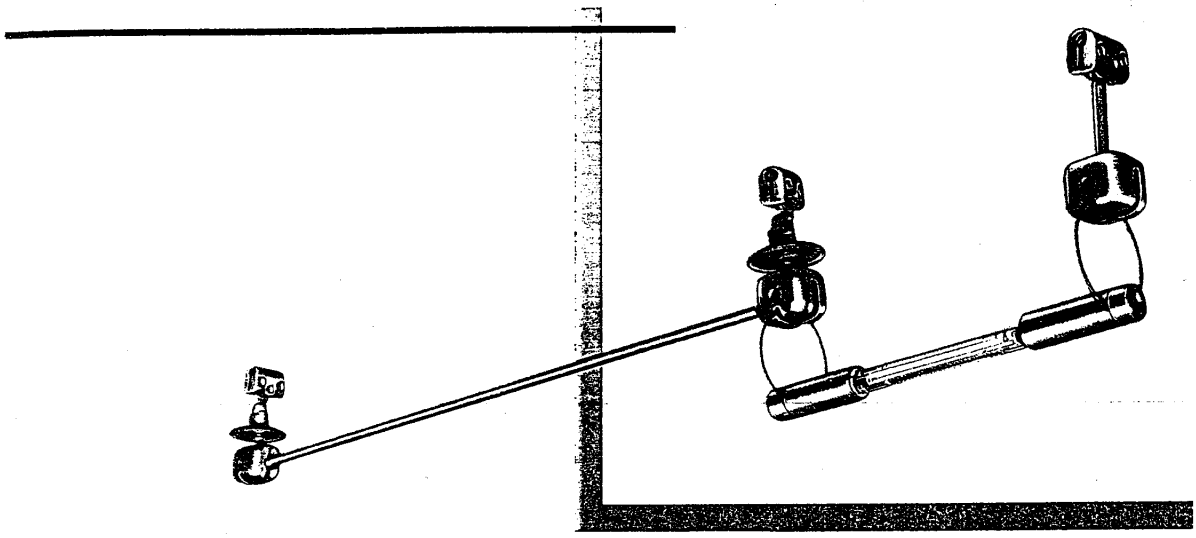
OTHER CHARACTERISTICS

- quartz flashtube especially manufactured
- "weathertight" stainless steel enclosures (in vertical position)
- "plug-in" modular construction with gold-plated contact surfaces
- conformally coated printed circuit cards protect solid state circuitry
- built-in surge arrester
- one controller for the whole installation
- fault indicator in the controller (up to 32 flashheads)
- safety interlock in the flashhead
- day/twilight/night automatic switch

OPTIONS

- inquire for other configurations

BALISORS



Application:
High-voltage lines are a major hazard for low-flying aircraft. Placing beacons on pylons is not sufficient to ensure safety due to the very long spans of cable.

The BALISOR system – exclusive to CLAUDE – beacons high-voltage conductors by tapping the power required directly from the line. The system is, therefore, completely self-contained. The BALISOR falls into the ICAO low-intensity category.

The neon discharge offers:
- inherent generation of the "aviation" red
- a very long life – essential to allow continuing operation of high-voltage lines.

Description
The BALISOR system comprises:
- a discharg lamp,
- A set of capacitive tappings (which depends on the voltage of the line to be protected)
- A set of accessories for suspension and insulation

- options:
- antipollution version for polluted area (chemical industry, sea...).

Main characteristics

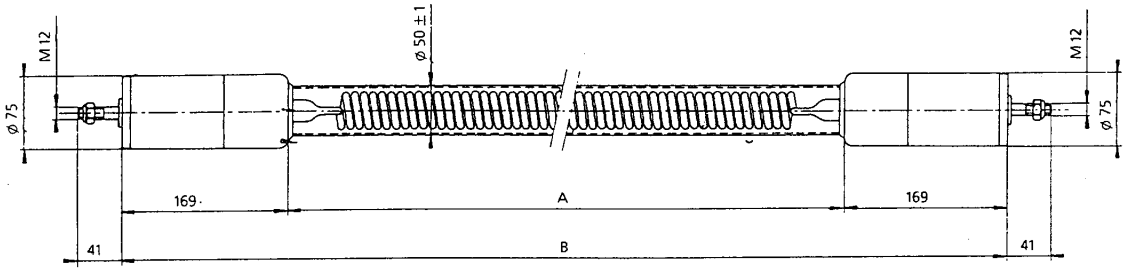
BALISOR LAMP	Luminous intensity	Voltage of the line	Interference suppression	Typical lifetime
P/N 00616	> 10 Cd		yes	> 100 000 h
P/N 00618	> 10 Cd	115 kV - 132 kV - 220 kV - 380 kV	yes	> 100 000 h

power trapping accessories configuration depend on power lines, cable diameter...

Characteristics:

	A	B	Weight
B type lamp (49 turns)	563 ± 5	901 ± 5	4,7 kg
B33 type lamp (33 turns)	376 ± 5	714 ± 5	4 kg

Lamps weight and dimensions (in millimeters):



Constitutive elements depending on line voltage

Unit weight	Parts	Designation	115 kV Number of elements	132 kV Number of elements	220 kV Number of elements	380 kV Number of elements
0,85 kg	00637	Clamp	7	6	4	3
3,50 kg	00621	Insulator	7	6	4	3
0,10 kg	00636	Shunt braid	1	1	1	1
0,50 kg	00628	Simplified auxiliary holder	7	6		
2,00 kg	00631	Lamp holder			2	2
1,35 kg	00632	Auxiliary tubing holder			2	1
1,90 kg	00623	Auxiliary tubing	5	4	2	1
0,50 kg	00606	Flexible connector	2	2		
0,50 kg	00624	Lamp end suspender	2	2		
4,70 kg	00618	BALISOR B Lamp	1	1	1	1
4,00 kg	00616	B33 BALISOR				
Unit weight	Parts	Designation	115 kV	132 kV	220 kV	380 kV
			Line voltage			

Other line voltage, consult us.

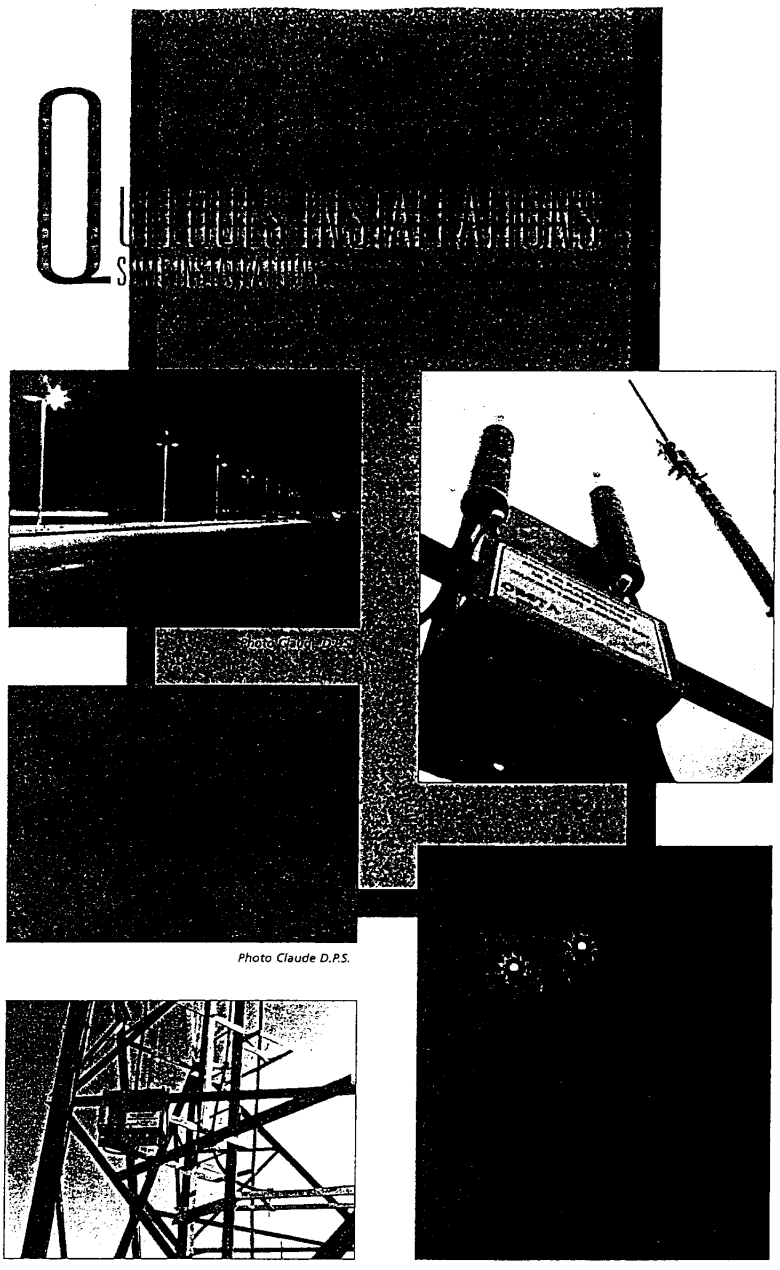


Photo Claude D.P.S.