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February 24, 2000

VIA FEDEX

United States Nuclear Regulatory Commission
Office of International Programs
Mail Stop 04E9
11555 Rockville Pike
Rockville, MD 20852-2738

Re: Submission of NRC Form 7

Dear Sir or Madam:

I enclose the Application for License to Export Nuclear Material and Equipment on NRC Form 7 made by Harper International Corporation, for the export of nuclear equipment comprising pusher type furnaces for sintering of UO2 pellets to the People's Republic of China. In conversations with Ms. Betty Wright of the NRC Division of Non-Proliferation, Exports and Multilateral Relations, I was informed that this application required Executive review and hence the filing fee would be $5,600 under Category K.2. on the Schedule to 10 CFR 170.21. Accordingly, I enclose a check for that amount payable to "U.S. Nuclear Regulatory Commission".

However, it appears that the instant application more properly should be considered under 10 CFR 110.42(b) as this equipment is not for a production or utilization facility but rather is of the type stated in 10 CFR 110.8(e). This would mean that Executive review would not be required and that the appropriate filing fee would be either $1,700 or $1,100 under Category K.3. or K.4. under the Schedule to 10 CFR 170.21. If you concur, kindly issue an appropriate refund in the name of Harper International Corporation which should be sent to my attention.

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2000 FEB 28 AM 7:56

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Please contact the undersigned should you require anything further.

Very truly yours,

JAECKLE FLEISCHMANN & MUGEL, LLP

By Peter G. Klein

Peter G. Klein

PGK/rad

Enclosures

cc: Mr. Charles W. Miller, Jr.
Mr. Thomas Haggerty

Contract Specifications
for

Baotou Nuclear Fuel Plant
P.R. China

HARPER INTERNATIONAL

HARPER Tunnel Kiln Thermal System

Model No. MG-12677-PTKA-20-PR-EDD

HARPER Reference No. 961010-3

December 9, 1999

HARPER INTERNATIONAL CORPORATION

West Drullard Avenue

Lancaster, New York 14086
USA

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4.0 PROCESS AND PRODUCTION PARAMETERS

4.1 Process Description ..... Sintering

4.2 Process Material ..... Uranium Oxide Fuel Pellets for Candu style fuel

4.3 Process Containers, Fixtures, Furniture, Etc.

All of the listed data below was used in our assumption for sizing.

4.3.1 Container ..... Molybdenum bent sheets (i.e separators)

Material	Molybdenum	
Dimensions		
Width	280 mm	11 inches
Length	133 mm	5.25 inches
Thickness	1 mm	.040 inches

4.3.2 Fixtures and/or Furniture ..... Molybdenum bent sheets

4.3.3 Pusher Plate ..... Per HARPER Recommendation

Material	Molybdenum	
Dimensions		
Width	305 mm	12 inches
Length	305 mm	12 inches
Thickness	16 mm	.625 inch

4.4 Load or Charge Description

The following is a description of the individual load or charge being processed.

4.4.1 Dimensions, Overall

Width	305 mm	12 inches
Length	305 mm	12 inches
Height	153 mm	6.0 inches

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4.4.2 **Loading per Pusher Plate**

Separators are placed on the pusher slab, 2 per layer, and stacked to a maximum 8 layers high. This gives a maximum boat capacity of 1344 pellets.

4.5 Process Requirements

4.5.1 **Atmosphere** ..... Hydrogen

4.5.1.1 **Dewpoint** ..... - 20.6°C - 5°F

Temperatures ..... Per sample below

4.5.2.1 **Zone Profiles**

The following are the design operating profiles, as measured by the zone thermocouples, for normal operation. The actual product temperature in each zone will be a function of furnace operating techniques. Based on experience and sound design practice, Harper International expects the product to achieve and be at the temperatures stated through most of the zone lengths.

Zone 1	750 °C **to 900 C**
Zone 2	750 °C **to 900 C**
Zone 3	1650 °C **to 1750 C**
Zone 4	1650 °C **to 1750 C**
Zone 5	1650 °C **to 1750 C**

4.6 Production Requirements

Hourly ..... 20 to 24 kg/hr

4.7 **NOTE:** The proposed HARPER Thermal System is based upon the above information. Further customer discussion will be required to verify that this information and the requirements specified are correct.

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6.0 SUMMARY OF EQUIPMENT SPECIFICATIONS

The proposed HARPER Thermal System shall have the following overall specifications.

6.1 HARPER Model MG-12677-PTKA-20-PR-EDD Tunnel Kiln

The proposed heating equipment shall be designed and fabricated to process material and carriers of the size, weight and configuration described in Section 4.

The proposed tunnel kiln shall consist of the following major sections and assemblies:

6.1.1 General Configuration

The kiln shall consist an entrance purge chamber, pre-heat section, high heat section, insulated cooling section, water-jacketed cooling section, exit chamber, exit purge chamber, and a material handling system. The latter does not include a return conveyor.

The kiln shall be designed and fabricated for operation under a controlled atmosphere at temperatures up to a maximum of 1800°C.

6.1.2 Entrance Purge Chamber

Material of Construction	Carbon steel
Door Locations	
Entrance Door	Right-hand side of chamber
Door Operation	Pneumatic
Flame Seal system	Included

6.1.3 Preheat Chamber (Zones 1 and 2)

The preheat section will incorporate a high temperature alloy muffle to effectively handle the burn-off of binders from the product. A high temperature bellows is employed to accommodate thermal expansion of the muffle assembly.

6.1.3.1 Thermal Control Zones

Number Of Individual Control Zones	Two (2)	
Nominal Length of Zones(ea)	762 mm	30 inches
Nominal Length Total	1524 mm	60 in
Temperature Rating	900°C Maximum	

6.1.3.1.1 Heat Sources

Type	NiCr resistance elements
Number of Elements	To be determined at final design

6.1.3.1.2 Thermal Insulation

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Type ..... Insulating Fire Brick

6.1.3.1.3 **Thermocouples** ..... There shall be provisions for a dual-type thermocouple through the approximate center of the sidewall in the control zone

6.1.4 <u>Heating Chamber (Zones 3 through 5)</u>

In order to achieve optimum temperature uniformity within the process load space, the heating chamber shall be designed with sufficient room over, under and on both sides of the load for excellent cross-radiation and reflection of heat.

6.1.4.1 **Thermal Control Zones** 2 12/9/99

Number Of Individual Control Zones ..... Three (3)
Length Zone -3 ..... 762.0 ~~1147~~ mm 30 inches
Length Zone -4 ..... 546.1 ~~775~~ mm 21.5 inches
Length Zone -5 ..... 546.1 ~~775~~ mm 21.5 inches
Baffles ..... 76 mm / 3 inches thick between each control zone for good temperature control

Temperature Rating ..... 1800°C Maximum

6.1.4.1.1 **Heat Sources**

Type ..... Molybdenum resistance elements
Location of Elements ..... Side walls

6.1.4.1.2 **Thermal Insulation**

Type ..... 99.8% alumina hot face brick
Insulation Thickness, Nominal ..... 368 mm 14.5 inches

High alumina insulation shall be used for the inner "hot" lining of the heating chambers to resist the effects of the reduction of silica from the use of a hydrogen atmosphere at elevated chamber temperatures.

6.1.4.1.3 **Load Supporting Hearths** ..... Alumina, high purity

6.1.4.1.4 **Thermocouples** ..... There shall be provisions for a single thermocouple through the approximate center of the roof in each control zone

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6.1.5 **Insulated Cooling Section**

The insulated cooling section shall be provided with 2-stage insulation to achieve a gradually increasing level of product cooling in order to minimize thermal shock.

6.1.5.1 **1st Stage Insulated Cooling**

Thermal Insulation, 1st Stage	high alumina hot face

6.1.5.2 **2nd Stage Insulated Cooling**

Thermal Insulation, 2nd Stage	high alumina hot face

6.1.5.3 **Insulated Cooling Section Length**

Length of 1st Stage	406 mm	16 inches
Length of 2nd Stage	457 mm	18 inches
Total Length of Insulated Cooling Section	864 mm	34 inches

6.1.6 **Water-Jacketed Cooling Section**

The final cooling stage shall be water-jacketed to reduce the product temperature to a satisfactory level before discharge into the room environment.

Material of Construction	Carbon steel	
Refractory Hearth	Included	
Material	Alumina, high purity	
Total Length of Water-Jacketed Cooling Section	1803 mm	71 inches

6.1.7 **Exit Chamber**

Material of Construction	Carbon steel

6.1.8 **Exit Purge Chamber**

Material of Construction	Carbon steel
Door Locations	
Exit Door	Right-hand side parallel to the centerline of the kiln tunnel
Door Operation	Pneumatic
Flame Seal system.....	Included

6.1.9 **Material Handling**

The pusher plates with their process material shall be automatically loaded into the entrance chamber, pushed through the kiln at a preset speed, and finally discharged from the exit chamber. Operation of the entrance and exit doors shall also be controlled automatically. The Purchaser shall be responsible for providing the mechanisms required to feed the raw

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product into position to be loaded into the kiln, and to remove the fired process material from the exit end discharge position.

6.1.9.1 Entrance Loading Pusher

Type of Pusher Mechanism ..... Mechanical, roller chain and sprocket, fixed speed

6.1.9.2 Main Pusher

Type of Pusher Mechanism ..... Heavy duty ball screw with parallel ball bushing guides rods

Operation ..... Adjustable, variable-speed pusher. High-speed approach & retract. SCR controlled DC drive motor and speed reducer combination 12/9/99

Speed, Nominal Effective Mid-range .... Nominal 12"/hr
Approx. Range 2"/hr to 20"/hr.

Pusher Safety Overload Device ..... Included

6.1.9.3 Exit Cross Pusher

Type of Pusher Mechanism ..... Mechanical, roller chain and sprocket, fixed speed

6.1.9.4 Exit Discharge Pusher

Type of Pusher Mechanism ..... Mechanical, roller chain and sprocket, fixed speed

6.1.9.5 Automation Control

6.1.9.5.1 Graphic Status Display ..... Designed to provide a visual indication of electro-mechanical pusher devices within the Windows PC based system

6.1.9.5.2 Process Logic Controller (PLC) ..... Texas Instruments 545 Series (or equal)

6.1.9.5.3 Location ..... Temperature control cubicle See Section 6.3 below

6.1.10 Cooling Water System

The kiln shall be equipped with a complete cooling water distribution and drain system with individual flow control valves for each cooling circuit. The drain shall consist of one or more open, gravity receptacles. The latter provide unrestricted release of any steam pressure re-

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sulting from a water supply failure. Open drains receptacles also facilitate the measurement of effluent water flow rates and temperatures.

6.1.11 Atmosphere System

The kiln shall be equipped with a complete atmosphere distribution system. Inclusive with the package are individual flowmeters for each atmosphere inlet into the kiln. The system shall also include appropriate pressure regulators and gauges for both gases.

The system shall include a safety shut-off valve in the hydrogen input line together with a provision to replace the hydrogen flow with nitrogen in the event of a hydrogen supply failure, loss of electrical service, or a loss of adequate hydrogen supply pressure.

A humidifier is included to humidify the process gas delivered to the main tunnel inlet.

The atmosphere system shall be mounted, piped and wired on a separate, free-standing, open backed panel.

6.1.12 Tunnel Kiln Dimensions, Overall Approximate

Width	2400 mm	8 ft
Height	2100 mm	7 ft
Length	Approximately 13m (To be confirmed)	

Refer to General Arrangement Drawing #S-961010-03

6.2 Power System, Proportional

The power system shall be mounted and wired by HARPER in the base of the tunnel kiln, complete with all interconnecting wiring to the heating element terminals. The system shall include all circuit breakers, switches, ammeters, fusing, etc., necessary for a safe, reliable and responsive system.

6.2.1 Power System Configuration

Zone 1 & 2(Preheat two zones)	SCR/Transformer
Zones 3 through 5 (High Heat).....	SCR/Transformer

6.2.2 Power System Rating

Zone 1& 2	12 kVA (to be confirmed upon final design)
Zones 3 through 5	35 kVA (to be confirmed upon final design)
Total Connected Load	130 kVA (to be confirmed upon final design)

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6.3 PC Based Temperature Control System

Complete kiln control, monitoring, and temperature data acquisition is provided to the customer. This system will be mounted and wired by HARPER within a separate, free-standing enclosure together with all required relays, switches, status lights, alarms, etc. Thermocouples and leadwire shall also be provided as a part of the system.

6.3.1 **Control Cubicle** ..... Nema 12, free-standing with cubicle power disconnect switch

6.3.2.1 **PC: Human Machine Interface** — Pentium based PC with Windows operating system , 17" Color Monitor and large capacity hard drive.

6.3.2.2 **Harper's Total Thermal Processing System**

The following capabilities are enabled through the PC:

- Temperature Control Set Points
- Atmosphere System Display
- Materials Handling Display
- Display temperatures, target and measured values
- Supervisory Control
- Complete Data Acquisition, Trending and display
- Alarm Display and Record

6.3.3 **Thermocouples and Leadwire**

6.3.3.1 **Thermocouples**

Zone 1 & 2 ..... One (1) Type "K", dual element thermocouple with alloy protection tube per each zone

Zones 3 through 5 ..... One (1) Type C thermocouple per zone for temperature control. One (1) Type "C" thermocouple with molybdenum protection tube per zone for overtemperature protection.

6.3.3.2 **Leadwire** ..... 15 meters 49.2 ft per each thermocouple element.

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6.4 Additional Items Included

6.4.1 Spare Parts

Although HARPER makes every effort to maintain a stock of the most commonly requested spares, the diversity of components used in our equipment does not allow us to stock replacements for all components. Therefore, in order to minimize the likelihood of start-up delays or subsequent extended production stoppages, we recommend that you maintain an on-site stock of selected spares for your HARPER EQUIPMENT. The following preliminary list represents parts that will be supplied with the equipment. A complete list with pricing will be supplied on completion of the final design of the equipment.

The following quantities of components will be supplied with the contract:

- One(1) Preheat nickel-chromium heating elements
- **Two (2)** Firing molybdenum heating elements
- One (1) Preheat SCR
- One (1) Firing SCR
- **Two (2)** Dual Type "K" T/C
- **Two (2)** Single Type "C" T/C
- One (1) Preheat Temp Controller
- **Two (2)** Firing Temp Controller
- **Two (2)** Hearth Tiles
- One (1) Miscellaneous Fuse Kit
- One (1) High Temperature Gasket Kit

6.4.2 Customer Training at Harper International

HARPER shall train client's personnel in general maintenance and operation of the kiln system. The package includes all travel to and from Beijing and living expenses for four (4) persons of the client's selection for two (2) weeks at Harper International's Lancaster, New York plant site.

6.4.3 Start-Up Supervision

The HARPER Technician shall test all equipment systems and "fine tune" them to ensure that they are functioning smoothly and properly. Our Supervisor shall also oversee the purging (when required) and the dryout of the heating equipment. Purging involves the removal of all residual air from the interior of the heating equipment and its thermal insulation. Dryout is the process of slowly removing residual moisture from the thermal insulation. Purging (when required) and dryout are essential for successful long-term operation of the equipment. While some of these operations must be performed sequentially, others may be performed simultaneously. Our quoted price includes **two (2) trips each for two (2) weeks** to accomplish above. The client is responsible to provide transportation to and from the work site ~~as well as living accommodations~~ during the work.

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6.5 Service and Utilities Required

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The following services and utilities are required for the proper operation of the proposed HARPER Thermal System:

6.5.1 Electric Power Requirements

Primary Power Supply	380 volts, 50 hz, 3 phase
Connected Load, Total	To be confirmed upon final Design

6.5.2 Atmosphere Requirements

Type of Atmosphere	H_2	
Quality, Dew Point	-20.6°C	- 5°F
Supply Pressure at Equipment Site	0.35 kg/cm^2	5 psi
Flow Capacity, Combined Maximum	28.3 cmh	1000 scfh
Purge Gas	N_2	
Quality, Oxygen and water vapor	< 5 ppm	
Supply Pressure at Equipment Site	0.35 kg/cm^2	5 psi
Flow Capacity, Combined Maximum	56.6 cmh	2000 scfh

6.5.3 Compressed Air Requirements

Supply Pressure	5.0 kg/cm^2 ~~7.03 kg/cm^2~~	~~100 psi~~
Usage	Nominal	

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6.5.4 Cooling Water

Quality	Filtered	
Supply Pressure	2.81 kg/cm^2	40 psi
Flow Capacity Recommended, Minimum	7.6 lpm	2 gpm

Note: The cooling water flow rate specified above is based upon operation at maximum rated temperatures and production levels. It is further based upon a nominal 22°C (40°F) water temperature rise together with ideal theoretical heat transfer. Water discharge temperature should not exceed 54°C (130°F) in any water-cooled circuit.

Note:

The details and dimensions specified above are subject to minor revisions upon completion of the final design.

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TO: Chuck Miller

Jack Feb. 17/2000.

最终用户和最终用途说明 № 0003210 B

IMPORTER STATEMENT ON END-USER AND END-USE

序号 Serial No. 000097		出口国别 Country of Exporter	United States
合同类别 Title of Contract	Purchase Contract		
合同号 Contract No.	99CMAE/JF48202US	签字日期 Date of Sign.	Dec.9,1999
进口商名称 Name of Importer	China Nuclear Energy Industry Corporation		
出口商名称 Name of Exporter	Harper International Corporation		
最终用户 End-user	Baotou Nuclear Fuel Element Plant		
最终用途 End-Use	Sintering CANDU Fuel Pellet for the use of Nuclear Power Plant		
说明 Statement	下列商品用于中华人民共和国，不向第三国转口 The commodities listed below is for use in the People's Republic of China and not for re-export to the third country	进口商签字盖章 Signature and Seal by the Importer 日期 Date 2000.01.25	

序号 No.	商品名称 Commodities and Descriptions	数量 Quantity	金额 Value
1	Harper Tunnel Kiln Thermal System MG-12677-PTKA-20-PR-EDD	2	USD.1,220,000.-
		总金额 Total	USD.1,220,000.-

上述最终用户最终用途说明业经对外贸易经济合作部科技发展和技术进出口司核实无误，特此证明

This statement has been verified of the truthfulness of the enduser and enduse by Department of Science and Technology of Ministry of Foreign Trade and Economic Cooperation of the P.R.C.

盖章 最终用户说明专用章 对外贸易经济合作部 科技发展和技术进出口司

签字

科技发展和技术进出口司 司长（副司长）

签署日期

00128