

QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT

**Economic Impact
and
Industrial Strategy Study**

VOL II:

INDUSTRIAL STRATEGY

APPENDICES

FINAL REPORT

prepared by the Consortium of

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APPENDIX A
THE LEGAL TRADING ENVIRONMENT

A.1.0 The Legal Trading Environment

In this Appendix, we propose to examine how the legal trading environment will impact the ability of Canadian firms to penetrate U.S. and international HSR markets. We start with an examination of the legal elements of the global and regional trading environment, looking at the most important global and regional international legal instruments which impact on international trade.

We will also examine the U.S. trade policy with a view to predicting future policy as it will impact on Canada. At the end of this Appendix we will examine the impact of three of the most important instruments in determining, in the short term, Canada's ability to leverage its involvement in the Quebec-Ontario high speed rail project to generate returns by way of exporting to the United States.

Separate Appendices have been included to provide greater detail on the operation of the Buy America policy and the tariff treatment of certain key components of a high speed train project.

A.1.1 Elements of the Environment: Globalization and Regionalization

In the last twenty five years, markets for an ever increasing number of goods and services have become global. The inter-penetration of markets has developed to such an extent that governments can no longer ignore the dictates of international markets to follow a truly independent domestic economic policy. No developed economy is closed and government policy must take into account international factors.

In the area of the international trade in goods, the GATT had been the most influential instrument in promoting trade growth. In more recent years, regional trading blocks such as the European Community, the European Free Trade Area and the North American free trade area have sped ahead of the GATT to create huge pockets of even greater trade interdependence.

In this section, we will look at both the GATT instruments and the North American regional instruments, commenting along the way on their impact on trade between Canadian and the United States.

A.1.2 Global Policy Instruments

(a) GATT and its Codes

The history and background of the GATT are well known. It grew out of U.S. and British cooperation in the closing days of World War II. The protectionist economic policies of

earlier times, as typified by the Smoot-Hartley Tariff, were recognized as destructive to economic well being. The GATT imposed international rules on its signatories which had the effect of submitting domestic trade policy to the discipline of international rules. By agreeing to international discipline in key areas, the signatories created a framework of predictability and market access which allowed international trade to develop. Tariff rates were reduced and bound so that they could no longer be raised unilaterally. The ability of signatories to impose unilateral quantitative restrictions on imports was strictly curtailed.

While the GATT was a critical first step in international trade liberalization, it was the GATT Codes resulting from the Tokyo Round which added the complex series of rules that have characterized the legal environment of world trade to date. Those rules are in turn being subjected to major revisions and additions with the signing of the Final Act embodying the results of the Uruguay Round of multilateral trade negotiations of Marakesh on April 15, 1994 (Uruguay Round agreements). The Uruguay Round agreements include more than twenty five separate agreements, all contained within a strengthened World Trade Organization.

The majority of the signatories of the Uruguay Round Agreements (including Canada and the United States) must now implement the Agreements by passing the appropriate national legislation.

Our analysis of the impact of the GATT system will review the existing obligations arising out of the Tokyo Round agreements and highlight the relevant changes brought about by the Uruguay Round agreements.

The cornerstone of the GATT system is the national treatment standard which prohibits any signatory from discriminating against the goods (and under the Uruguay Round many services) of another signatory; the goods of a foreign signatory must be treated in a way that is no less favourable than the treatment afforded domestic goods. Thus, foreign goods must not be subject to special taxes or to regulatory requirements that are more onerous than those placed on domestic goods.

The goals of the Uruguay Round were twofold. Firstly, there was a need to blunt protectionist pressure that was building up as a result of the perceived inadequacies of the existing GATT system. Disputes often went unresolved, even with one signatory clearly in violation of its GATT obligations and, as a result, confidence in the system eroded and the temptation to introduce various protectionist measures grew increasingly difficult to resist. The second goal of the Uruguay Round was to extend GATT discipline to areas of international trade not covered or inadequately covered by the existing GATT system, in particular to services and intellectual property.

The Uruguay Round must be seen as having effectively halted the decline in confidence in the GATT system and replaced it with a cautious optimism for the future. In addition, the agreements have successfully extended both the depth and scope of coverage of the GATT,

increasing liberalization and opportunities in areas previously covered and extending coverage to areas that were previously outside the scope of the GATT.

From the perspective of the proposed high speed train project, the promise of greater access to the U.S. federally funded purchases in transportation has, unfortunately not materialized and is, in our opinion, unlikely to materialize.

The GATT as originally negotiated specifically excluded government procurement from the national treatment standard (GATT III(8)). During the Tokyo Round, a Code on Government Procurement was negotiated but the United States excluded from the Code, purchases by the Department of Transport, AMTRAK and Conrail. As a result, government funded purchases in these areas are largely immune to GATT discipline.

In virtually all negotiations since, U.S. negotiators have steadfastly refused to bargain away that core government procurement function.

The new GATT Procurement Agreement was signed on April 15, 1994 and provides for implementation of its obligations on January 1st, 1996. Unlike the other agreements, the Agreement provided for the continued negotiation of improvements until its implementation. The Agreement is also unique among GATT instruments in that it provides that commitments are made on the basis of mutual reciprocity and not on the basis of a most favoured nation obligation. As a result, Canada is still obliged to negotiate commitments with the major trading partners on a bilateral basis and cannot rely on commitments made by its partners to other countries.

The United States and the European Union (EU) have already completed their bilateral agreement respecting government procurement. During the U.S./E.U. negotiations, it became clear that U.S. negotiators were prepared to discuss (and perhaps even make commitments on) federally funded purchases in transportation in the event that the E.U. was prepared to make appropriate concessions. Despite the fact that E.C. officials granted access to the EU telecommunications market, a U.S. offer on federally funded transportation payments did not materialize.

Canada has yet to formulate its offer to the U.S. therefore the coverage of a U.S./Canada agreement is still open. However, given the inability of the E.U. to obtain access to the federally funded transportation market, it appears highly unlikely that Canada would be successful in that area.

Thus while the GATT Procurement Agreement will give Canadian companies significantly enhanced access to U.S. government procurement contracts, the existing situation with respect to federally funded transportation contracts is not expected to change.

The GATT rules respecting the imposition of countervailing duties to counteract the injurious effect of subsidization of goods that are exported are of particular interest in

assessing the export potential of any project that involves government funding. The rules are set out in the Subsidies Code of the Tokyo Round and have been amended by a new Subsidies Code in the Uruguay Round. Both codes allow an importing country to impose countervailing duties on any goods that have benefitted from a subsidy where the importation of those goods causes, or is likely to cause, material injury to the domestic production of like goods in the country of importation. In addition, the U.S. Department of Commerce constantly adjusted its definition of a countervailable subsidy in light of ever more imaginative government and programs. As a result, in determining the form of assistance to be given to any particular industry or firm that is likely to be exporting goods, governments must be cognizant of the type of government subsidies that are countervailable.

The Uruguay Round Agreement on Subsidies and Countervailing Measures seeks to address the uncertainty caused by the lack of agreement on what was countervailable. For the first time in such an agreement, there is a definition of subsidy. In addition, certain types of subsidies will be exempt from countervailing duties provided they are granted and administered in a manner consistent with the Agreement (e.g. subsidies for regional development, the environment and R & D). The new Code will inject more discipline and certainty into the system giving greater assurances to governments seeking to grant aid to industry.

One of the Uruguay Round agreements with perhaps the most potential for new trade creation is the General Agreement on Trade in Services (GATS). GATS provides, for the first time, a comprehensive framework of rules and disciplines on government measures affecting trade in services. The fundamental rule for the GATS is an obligation to treat all members equally. Government procurement in services are, in large part, excluded from the most favoured nation obligation imposed by the GATS but there is an obligation to negotiate on government procurement in services under the GATS.

In determining the form of any governmental aid, Governments must take cognisance of the possible imposition of countervailing duties. A subsidy that is eventually countervailed by the importing country is basically a transfer of wealth to that importing country.

A.1.3 Regional Policy Instruments

While the world spent years negotiating global liberalization in the Uruguay Round, regional liberalization, under the Enterprise of the Americas initiative continues at a swifter pace. The Canada-United States Free Trade Agreement (FTA) and the North American Free Trade Agreement (NAFTA) are the most important documents to have emerged from this process and are having a profound effect on Canada/United States trade.

The FTA was negotiated during a period of rising protectionism in the U.S. Not the across the board protectionism of the Smoot-Hartley kind but a "process protectionism" driven by strict and imaginative enforcement of existing trade remedy legislation and the introduction

and application of special remedies such as Super 301. Canada's goal in the FTA was to seek shelter from that process protectionism as well as to secure access to the U.S. market. Its goal in the NAFTA was to build on and improve on gains made in the FTA.

From the perspective of this study, the most glaring failure of the NAFTA is the continued exclusion of the Buy America provisions from the agreement. We understand that Canadian negotiators made serious efforts to gain some Canadian advantage in the Buy America policy but the policy was viewed as one of the non-negotiable elements of the Canada-United States trading environment.

While Canadian negotiators failed to have U.S. federally funded transportation projects included in the NAFTA procurement obligations, Canada agreed to have both Via Rail Canada Inc. (Via) and Canadian National Railway Company (C.N.) comply with the obligations contained in Chapter 10 in NAFTA on Government Procurement. Thus, for any contract for goods and services where Via or C.N. is the contracting party and where the value of the contract is greater than \$250,000 (\$8 million for construction contracts), both companies would have to follow the strict requirements of the NAFTA in awarding the contract. Those requirements cover publication of tender information, fair qualification of suppliers, time limits for the bids, etc. NAFTA does not allow a covered procuring agency to favour domestic companies or even to favour bids with higher local content. Thus, if any contract to provide goods and services in respect of the high speed train was to be given by either C.N. or Via, NAFTA's procurement rules would apply unless the monetary threshold was not reached.

Even with the Buy America policy in place, there are opportunities for Canadian exporters in contracts governed by those requirements. To the extent that Canadian goods can overcome the restrictions, the NAFTA will give the suppliers of those goods significant advantages in the American market vis-a-vis third party suppliers. The ongoing tariff reductions negotiated in the FTA, which are continued in NAFTA will give Canadian suppliers an increasing, albeit modest, cost advantage over third country supplies. As a result, U.S. purchases looking for non-U.S. suppliers are facing a growing incentive to source from Canada rather than from third countries.

From a Canadian perspective, one of the most serious omissions of both the FTA and NAFTA was the negotiated elimination of the customs duty drawback and remission on inputs imported in Canada for use in the manufacture of goods exported to the U.S. Given the lack of depth in Canada's secondary manufacturing industry, Canadian manufacturers have traditionally relied on imported inputs to a greater extent than did their American counterparts. The ability to eliminate the duty cost of such inputs when the finished product was exported greatly assisted Canadian manufacturers in remaining competitive. Under the FTA, Canada agreed to eliminate customs duty drawback and performance based remission by January 1st, 1994 and January 1st, 1998 respectively. Under NAFTA, the deadline for elimination of drawbacks has been extended until January 1st, 1996 but the deadline for the elimination of performance based remission programs remains the same. It is widely

considered that the elimination of drawback and remission is detrimental to Canadian manufacturers. The Department of Finance has recently proposed the unilateral elimination of customs duty on a wide variety of industrial inputs used by Canadian manufacturers in an effort to correct the problem. This would permit Canadian manufacturers to obtain inputs duty free even in the absence of drawback or remission programs.

The NAFTA was not an agreement that Canada has sought out; extension of the Canada/United States arrangement to other countries in the region has never been a Canadian trade policy priority. Canada, therefore, entered the negotiations with the somewhat negative goal of ensuring that a trade deal with Mexico would not be detrimental to Canadian interests and to protect the gains of the FTA. However, Canadian negotiations quickly discovered the possibilities of correcting some of the defects which had marred the FTA. The NAFTA does not radically alter the Canada/United States trading environment. Leaving aside the impact of a third country entering the arrangements and the potential competitive effect of that on Canada, the agreement only finesses the existing relationship. That finessing may, however, have a significant impact on Canada.

Irritants which had developed under the FTA are addressed in the agreement. This is perhaps most significant in the area of rules of origin where several public disputes had a chilling effect on Canada's ability to attract new investment.

In many cases, Canada's ability to attract new industrial investment depends on the investor's ability to export its finished products to the United States. High profile dispute involving the qualification of Canadian produced goods for preferential treatment have a chilling effect on new investment. The Honda rules of origin dispute under the FTA was the most famous example of the problem. When potential investors believed that their Canadian exports to the United States would continue to be subject to harassment by U.S. customs, the temptation to locate investment in the U.S. and ship product to Canada was, in many cases, irresistible.

A primary goal of the Canadian negotiators was to introduce more certainty in the application of the rules of origin. As a result, the NAFTA rules leave much less room for creative administrative interpretation ensuring less harassment of Canadian exports to the U.S. If it can be shown that Canadian produced NAFTA qualifying goods can move into the U.S. easily, one disincentive to investing in Canada will be removed.

A.2 United States Trade Policy

A.2.1. The Insulation of Congress

On the whole, the last three decades have seen a liberalizing influence of the United States

on world trade. That policy, reflected in the Kennedy Round, the increased influence of the GATT and the FTA and perhaps more significantly in the absence of wholesale protective measures, is the direct result of Congress giving up its day to day authority to set U.S. trade policy. Through various means and on different occasions, Congress has transferred its trade policy authority to the Executive and to other administrative institutions which operate, at least in theory, independent of that Congressional authority. Examples of the trend are common: the transfer of authority to negotiate particular trade agreements to the Executive, the grant of "fast track" authority, the establishment of the STR and subsequently the USTR.

This transfer of authority had the effect of insulating Congress from the incessant demands of various industry groups for legislated protection from a host of trade difficulties. When Congressmen were besieged with calls for special measures to protect domestic industries, they could send the petition to the USTR, the Department of Commerce or even the President without being accused of ignoring the problem. The result was that, with varying degrees of success, trade liberalization could move forward.

It is of course true that there were several notable instances where Congress clearly took the initiative to introduce non-liberalizing policies. There are many examples of industry specific protective measures that found their impetus in Congressional action - the steel and auto VRA's, the Super 301, the semi-conductor agreement are but a few. In many instances, however, these measures were the price that was paid to allow a general liberalizing policy to continue.

The key to the success of such an arrangement was the desire and ability of some other agency to take the lead and exercise authority in trade matters. The threatened growth of Congressional protectionism in the mid-1980's was precisely the result of the absence of sufficient Executive interest in a trade policy. The result was that in 1985, the White House and the USTR lost the initiative to Congress. The trade leadership displayed by President Bush and Carla Hills in the late 1980's shows how effectively the practice can work when the non-Congressional institutions exercise clear leadership.

Under the new Administration, the unspoken arrangement between Congress and the Executive have frequently appeared in danger. The apparent inability of the President to establish firm authority in trade issues appears to have left a policy vacuum that is attracting protectionist elements.

A.2.2 Trade Policy under the New Administration

Mr. Clinton's dedication to trade issues appears driven less by any philosophical or political creed but rather the understandable desire not to be defeated on clearly important issues. The energy given to the passage of NAFTA is a case in point. The passage of implementing legislation for the Uruguay Round of agreements is another. The Uruguay Round

implementing legislation does not appear to be as threatened as the NAFTA once did. However, its passage is not yet assured, especially until the outcome of the November 1st elections are known. From a Canadian perspective, the failure of the United States to implement the Uruguay Round agreement would be a disaster in a global sense. However, Canada's trade relations with the United States, governed by NAFTA, would continue to offer benefits in excess of those set out in the GATT.

A.2.3 The relationship with Canada

Canada has always prided itself on its close relationship with the United States. However, as the recent experiences with steel, beer, pork and lumber and other products seem to show, that close relationship with the United States may be more wishful thinking than reality. Time and again, when the Canada/United States relationship is tested against domestic American interests, the relationship is sacrificed.

As a result, Canada should not look for any special treatment or concession in the trade area without being able to demonstrate to the U.S. authorities a clear benefit for the United States.

In particular, the possibility of gaining preferential treatment in Buy America projects does not appear to be a reasonable one. Clearly, if such a preference was to be had, it would have been available, at a price, in the FTA or NAFTA negotiations. It is unlikely that Canadian suppliers can expect any favourable treatment in this respect.

APPENDIX B
BUY AMERICA LEGISLATION

APPENDIX B

Buy America Restrictions in Federally Funded Transit Contracts

Pursuant to Section 165 of the Surface Transportation Assistance Act of 1982 (public law 97-424, Jan. 6, 1983) ("STAA"), no funds shall be obligated under:

- (i) that Act;
- (ii) the Urban Mass Transportation Act ("UMTA") of 1964; or
- (iii) the STAA of 1978,

unless "steel, iron and manufactured products used in such projects are produced in the United States". That provision is the cornerstone of the Buy America requirement in federally funded rail projects and applies to all federally assisted mass transit projects using funds authorized by Congress.

It is reliably assumed that any funds that are set aside for High Speed Rail Projects those funds will be subject to Buy America. Privately funded rail projects are not subject to Buy America requirements. In addition, individuals may impose State content requirements in individual contracts. Such requirements would be applied on a case by case basis.

Section 165 also provides that the Buy America requirements may be waived where:

- (1) their application would be inconsistent with the public interest;
- (2) needed materials and products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality;
- (3) inclusion of an item of domestic material will increase the cost of the contract between the grantee and the supplier of that item by more than 25 percent;
- (4) in the case of the procurement of rolling stock, including train control, communication, and traction power equipment, the cost of components which are produced in the United States is more than 60% of the cost of all components of the end product being acquired, and final assembly of the end product takes place in the United States.

THE BUY AMERICA REQUIREMENT: The Regulations

The Buy America criteria of Section 165 of the STAA has been implemented by regulations set out at 49 CFR, Part 661 and an in depth examination of those regulations is essential to understanding how the Buy America provisions work. A copy of the relevant provisions of Part 661 have been attached as at the end of this Appendix.

The general requirements for Buy America are set out in 661.5 of the Regulations as follows:

661.5 General requirements for steel and manufactured products.

- (a) Except as provided in 661.7 and 661.11 of this part, no funds may be obligated by UMTA for a grantee project unless all steel and manufactured products used in the project are produced in the United States.
- (b) All steel manufacturing processes must take place in the United States, except metallurgical processes involving refinement of steel additives.
- (c) The steel requirements apply to all steel items including, but not limited to, structural steel, running rail and contact rail.
- (d) For a manufactured product to be considered produced in the United States:
 - (1) All of the manufacturing processes for the product must take place in the United States; and
 - (2) All items or material used in the product must be of United States origin.

It is useful to look at several of the elements of 661.5 separately.

Exceptions

Section 661.5 provides that "no funds may be obligated by UMTA for a grantee project unless all steel, iron and manufactured products used in the project are produced in the United States except as provided in paragraphs 661.7 and 661.11". Paragraphs 661.7 and 661.11 provide for four categories of exclusions:

1. Public interest waiver (661.7);
2. Non-availability waiver (661.7);
3. Price differential waiver (661.7); and
4. Rolling stock and associated equipment waiver (661.11).

1. Public Interest Waiver (661.7)

The administrator of UMTA or his designate (the Administrator) may waive the general requirements of 165(a) "if the administrator finds that their application would be inconsistent with the public interest". The administrator is required to consider all appropriate factors in public interest waiver applications on a case by case basis.

A public interest waiver may be granted for an end-product, a component or sub-component in the case of procurement of rolling stock and associated equipment (661.7(f)). If a public interest waiver is granted for a component or a sub-component, that component or sub-component will be considered to be of domestic origin when calculating the domestic content requirement of rolling stock procurement (661.7(f)).

Additionally, a public interest waiver may be granted for a specific item or material that is used in the production of a manufactured product that is produced in the United States and in that case, the specific item or material in respect of which the waiver was granted will be treated as being of domestic origin (661.7(g)).

2. Non-Availability Waiver (661.7)

The Administrator may grant a waiver for materials or products where he finds that the materials or products are not produced in the United States "in sufficient and reasonably available quantities and of a satisfactory quality" (165(6)2 - 661.7(c)). Such a waiver may be granted for components or sub-components that are subject to the domestic content requirement in respect of rolling stock and may be granted in respect of end-products subject to the 100% domestic content rule under 165 of the Act.

Where a non-availability waiver is granted, the components or sub-components are treated as being of domestic origin (661.7(c), (f) and (g)). It should be noted that if the grantee project does not receive a "responsive and responsible bid" offering an item produced in the United States, there is a presumption that the conditions exist to grant a non-availability waiver on that item. (661.7(c)(1)).

In the case of sole source procurement, (a procurement where only one bidder is involved) the Administrator will grant a non-availability waiver only if the grantee provides sufficient information which indicates that the item to be procured is only available from a single source or that the item to be procured is not produced in sufficient and reasonably available quantities of a satisfactory quality in the United States (661.7(c)(2)).

3. Price Differential Waiver (661.7)

If the Administrator finds that inclusion of a domestic item or domestic material will increase the cost of the contract between the grantee and its supplier of that item or material by more than 25%, the administrator will grant a price differential waiver. To test the price differential, the administrator will multiply the lowest responsive and responsible foreign bid offering the item or material by 1.25 and providing the bid so multiplied is less than the lowest responsive and responsible U.S. bid offering the item or material (661.7(d)).

4. Rolling Stock Waiver (661.11)

The rolling stock waiver applies to "rolling stock (including train control, communication and traction power equipment" providing the cost of U.S. origin components is more than 60% of the cost of all of the components and final assembly takes places in the United States.

The rolling stock waiver applies to "rolling stock (including train control, communication and traction power equipment". The regulations include non-exhaustive lists of (i) typical components of rail rolling stock (Appendix C to 661.11); (ii) train control equipment (661.7(v)); (iii) communications equipment (661.11(w)); and (iv) traction power equipment. These lists are provided in at the end of this Appendix.

It should be noted that the power or third rails are not considered traction power equipment and are thus subject to the requirements of Section 165(a) of the Act and produced paragraph 661.5 of the regulations. Power or third rails must be produced in the United States of U.S. steel.

To estimate possible markets for Canadian goods in projects subject to the Buy America requirements and the rolling stock exemption one must first determine where those goods fit in the chain of production.

The first question is to determine the end product of the chain of production. FTA practice is to leave the determination of the end product to the grantee of the funds. Thus, if the grantee is purchasing a complete system, the end product is the complete system, if train cars are being purchased, the end product are train cars.

The end product must be finally assembled in the United States and the components of the end product are the goods to which the 60%/40% cost criteria will be applied. A component is "any article, material or supply, whether manufactured or unmanufactured, that is directly incorporated into an end product at the final assembly location (661.11(e)).

Thus, where the regulations discuss the cost of components, it is reference to a product that is going to be directly incorporated into the end product at the place of final assembly.

A sub-component is "any article, material or supply whether manufactured or unmanufactured that is one step removed from a component in the manufacturing process and is incorporated directly into a component". The origin of a sub-component is relevant to determine only the origin of the component it is used in, it is not relevant to determine general qualification under Buy America rules.

The regulations neither define nor contain any requirements respecting sub-subcomponents. The origin of sub-subcomponents is therefore irrelevant. By process of analogy, a sub-subcomponent would be a material or product that is incorporated directly into a subcomponent.

Origin of Components

In order for a component to be considered a U.S. component, (i) 50% of the sub-components of the component by cost must be U.S. origin, and (ii) the component must be manufactured in the United States (661.11(i)). Once a component qualifies as a U.S. component, its entire cost may be used in calculating the domestic content of the end product. If a component is manufactured in the United States but contains less than 50% domestic sub-components by cost, the cost of the domestic sub-components and the cost of manufacturing the component may be included in the calculation of the domestic content of the end product (661.11(n)). For a component to be considered manufactured in the United States there must be "sufficient activities taking place to advance the value or improve the condition of the sub-components of that component. (661.11(g)). Put another way, "if the sub-components have been substantially transformed or merged into a new and functionally different article", in the United States, the component has been manufactured in the United States (661.11(g)).

UMTA has stated that the key element is "the alteration of sub-components to form a new component", adding that the process of alteration "may include forming, extruding, material removal, welding, soldering, etching, plating, material deposition, pressing, permanent adhesive joining, shot blasting, brushing, grinding, lapping, finishing, vacuum impregnating, and in electrical and electronic pneumatic or mechanical products, the collection, interconnection and testing of various elements".

There are several refinements to the foregoing which should be noted:

- If a sub-component manufactured in the United States is exported for inclusion in a component that is manufactured outside of the United States and it receives tariff exemptions under the procedures set forth in 19 CFR

10.11-10.24, the sub-component retains its domestic identity and can be included in the calculation of the domestic content of an end product even if a such a sub-component represents less than 50% of the cost of a particular component. (661.11(k)).

- If a sub-component manufactured in the United States is exported for inclusion in a component manufactured outside of the United States and it does not receive tariff exemption under the procedures set forth in 19 CFR 10.11-10.24, the subcomponent loses its domestic identify and cannot be included in the calculation of the domestic content of an end product (661.11(l)).
- Raw materials produced in the United States and then exported for incorporation into a component are not considered to be a sub-component for the purposes of calculating domestic content. The value of such raw materials is to be included in the cost of the foreign component (661.11(m)).
- Labour costs involved in final assembly of the end product is not to be included in calculating the cost of components.

Origin of Sub-Components

A sub-component is considered to be of domestic origin if it is manufactured in the United States (661.11(j)). There is no minimum domestic content value requirement. This is a reflection on the UMTA's view that the origin of sub-subcomponent is irrelevant for Buy America requirements.

The regulations do not define manufacturing with respect to sub-components. However, one should refer to the definition of manufacturing with respect to components which is found in the previous section. In addition, the regulations define both "manufactured product" and manufacturing process (661.3). A manufactured product is defined as "an item produced as a result of manufacturing process". [661.3] A manufacturing process is defined as "the application of processes to alter the form or function of materials or of elements of the product in a manner adding value and transforming those materials or elements so that they represent a new end-product functionally different from that which would result from mere assembly of elements or materials" (661.3). All three definitions can usefully give guidance on the question of whether a sub-component is manufactured in the United States.

Determination of the cost of components and sub-components

The cost of a component or a sub-component is "the price that a bidder or offeror must pay to a sub-contractor or supplier for that component or sub-component". (661.11(o)(1)). Transportation costs to the final assembly location must be included in calculating the cost of a component and applicable duties must be included in determining the cost of importers components and sub-components. (661.11(o)(1)). Actual costs, not the bid price must be used. (661.11(s)).

If a component or sub-component is manufactured by the bidder or offeror, the cost of the component is the aggregate of the cost of labor and materials incorporated into the component or sub-component, an allowance for profit and the administrative and overhead costs attributable to that component or sub-component under normal accounting principles. (661.11(o)(2)).

The cost of components of foreign origin is to be assessed at the time the bidder or offeror executes the appropriate by America certificate (661.11(p)).

As noted earlier, U.S. manufactured components may be shipped abroad for inclusion in components to be imported into Canada. Under that provision, the cost of a sub-components which retain their domestic identity is the cost of the sub-component when last purchased FOB United States port of exportation or point of border-crossing as set out in the invoice and entry papers. If no purchase was made, the cost of the sub-component will be its value at the time of shipment for exportation FOB United States port of exportation or point of border-crossing as set out in the invoice and entry papers.

As noted earlier, labor costs involved in final assembly are not to be included in calculating component costs (661.11(r)).

Non-exhaustive list of typical components of rail rolling stock

Car shells, main transformer, pantographs, traction motors, propulsion gear boxes, interior linings, acceleration and braking resistors, propulsion controls, low voltage auxiliary power supplies, air conditioning equipment, air brake compressors, brake controls, foundation brake equipment, articulation assemblies, train control systems, window assemblies, communication equipment, lighting, seating, doors, door actuators and controls, couplers and draft gear, trucks, journal bearings, axles, diagnostic equipment, and third rail pick-up equipment.

Non-exhaustive list of typical train control equipment

(1) mimic board in central control; (2) dispatcher's console; (3) local control panels; (4) station (way side), block control relay cabinets; (5) terminal dispatcher machines; (6) cable/cable trays; (7) switch machines; (8) way side signals; (9) impedance bonds; (10) relay rack bungalows; (11) central computer control; (12) brake equipment; and (13) brake systems.

Non-exhaustive list of typical communication equipment

(1) radios; (2) space station transmitter and receivers; (3) vehicular and handheld radios; (4) PABX telephone switching equipment; (5) PABX telephone instruments; (6) public address amplifiers; (7) public address speakers; (8) cable transmission system cable; (9) cable transmission multiplex equipment; (10) communication console at central control; (11) uninterruptable power supply invertors/rectifiers; (12) uninterruptable power supply batteries; (13) data transmission system central processors; (14) data transmission system remote terminals; (15) line printers for data transmission system; (16) communication system monitor test panels; and (17) security console at central control".

Non-exhaustive list of traction power equipment

(1) primary AC switch gear; (2) primary AC transformers (rectifier); (3) DC switch gear; (4) traction power console and CRT display system at central control; (5) bus ducts with buses (AC and DC); (6) batteries; (7) traction power rectifier assemblies; (8) distribution panels (AC and DC); (9) facility step-down transformers; (10) motor control centers (facility use only); (11) battery chargers; (12) supervisory control panel; (13) annunciator panels; (14) low voltage facility distribution switchboard; (15) DC connect switches; (16) negative bus boxes; (17) power rail insulators; (18) power cables (AC and DC); (19) cable trays; (20) instrumentation for traction power equipment; (21) connectors, tensioners, and insulators for overhead power wire systems; (22) negative drainage boards; (23) invertors; (24) traction motors; (25) propulsion gear boxes; (26) third rail pick-up equipment; and (27) pantographs.

**PART 661—BUY AMERICA
REQUIREMENTS—SURFACE
TRANSPORTATION ASSISTANCE ACT
OF 1982, AS AMENDED**

Sec.

- 661.1 Applicability.
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- 661.21 State Buy America provisions.

Authority: Sec. 165, Pub. L. 97-424, as amended by Sec. 337, Pub. L. 100-17 (49 U.S.C. 1602 note); 49 CFR 1.51.

§ 661.1 Applicability.

Unless otherwise noted, this part applies to all federally assisted procurements using funds authorized by the Urban Mass Transportation Act of 1964, as amended; 23 U.S.C. 103(e)(4); and section 14 of the National Capital Transportation Act of 1969, as amended.

§ 661.3 Definitions.

As used in this part:

Act means the Surface Transportation Assistance Act of 1982 (Pub. L. 97-424), as amended by section 337 of the Surface Transportation and Uniform Relocation Assistance of 1987 (Pub. L. 100-17).

Administrator means the Administrator of UMTA, or designee.

Grantee means any entity that is a recipient of UMTA funds.

Manufactured product means an item produced as a result of manufacturing process.

Manufacturing process means the application of processes to alter the form or function of materials or of elements of the product in a manner adding value and transforming those materials or elements so that they represent a new end product functionally different from that which would result from mere assembly of the elements or materials.

Rolling stock means transit vehicles such as buses, vans, cars, railcars, locomotives, trolley cars and buses, and

ferry boats, as well as vehicles used for support services.

STURAA means the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Pub. L. No. 100-17).

UMTA means the Urban Mass Transportation Administration.

United States means the several States, the Commonwealth of Puerto Rico, the District of Columbia, Guam, American Samoa, the Virgin Islands, and the Commonwealth of the Northern Mariana Islands.

§ 661.5 General requirements for steel and manufactured products.

(a) Except as provided in §§ 661.7 and 661.11 of this part, no funds may be obligated by UMTA for a grantee project unless all steel and manufactured products used in the project are produced in the United States.

(b) All steel manufacturing processes must take place in the United States, except metallurgical processes involving refinement of steel additives.

(c) The steel requirements apply to all steel items including, but not limited to, structural steel, running rail and contact rail.

(d) For a manufactured product to be considered produced in the United States:

(1) All of the manufacturing processes for the product must take place in the United States; and

(2) All items or material used in the product must be of United States origin.

§ 661.6 Certification requirement for procurement of steel or manufactured products.

If steel or manufactured products (as defined in §§ 661.3 and 661.5 of this part) are being procured, the appropriate certificate as set forth below shall be completed and submitted by each bidder in accordance with the requirement contained in § 661.13(b) of this part.

Certificate of Compliance With Section 165(a)

The bidder hereby certifies that it will comply with the requirements of section 165(a) of the Surface Transportation Assistance Act of 1982, as amended, and the applicable regulations in 49 CFR part 661.

Date _____
Signature _____
Company Name _____
Title _____

Certificate for Non-Compliance With Section 165(a)

The bidder hereby certifies that it cannot comply with the requirements of section 165(a) of the Surface Transportation Assistance Act of 1982, as amended, but it may qualify for an exception to the requirement pursuant to section 165 (b)(2) or

(b)(4) of the Surface Transportation Assistance Act of 1982 and regulations in 49 CFR 661.7.

Date _____
Signature _____
Company Name _____
Title _____

§ 661.7 Waivers.

(a) Section 165(b) of the Act provides that the general requirements of section 165(a) shall not apply in four specific instances. This section sets out the conditions for the three statutory waivers based on public interest, non-availability, and price-differential. Section 661.11 of this part sets out the conditions for the fourth statutory waiver governing the procurement of rolling stock and associated equipment.

(b) Under the provision of section 165(b)(1) of the Act, the Administrator may waive the general requirements of section 165(a) if the Administrator finds that their application would be inconsistent with the public interest. In determining whether the conditions exist to grant this public interest waiver, the Administrator will consider all appropriate factors on a case-by-case basis, unless a general exception is specifically set out in this part.

(c) Under the provision of section 165(b)(2) of the Act, the Administrator may waive the general requirements of section 165(a) if the Administrator finds that the materials for which a waiver is requested are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality.

(1) It will be presumed that the conditions exist to grant this non-availability waiver if no responsive and responsible bid is received offering an item produced in the United States.

(2) In the case of a sole source procurement, the Administrator will grant this non-availability waiver only if the grantee provides sufficient information which indicates that the item to be procured is only available from a single source or that the item to be procured is not produced in sufficient and reasonably available quantities of a satisfactory quality in the United States.

(d) Under the provision of section 165(b)(4) of the Act, the Administrator may waive the general requirements of section 165(a) if the Administrator finds that the inclusion of a domestic item or domestic material will increase the cost of the contract between the grantee and its supplier of that item or material by more than 25 percent. The Administrator will grant this price-differential waiver if the amount of the lowest responsive and responsible bid offering the item or material that is not produced in the United States multiplied by 1.25 is less

than the amount of the lowest responsive and responsible bid offering the item or material produced in the United States.

(e) The four statutory waivers of section 165(b) of the Act as set out in this part shall be treated as being separate and distinct from each other.

(f) The waivers described in paragraphs (b) and (c) of this section may be granted for a component or subcomponent in the case of the procurement of the items governed by section 165(b)(3) of the Act (requirements for rolling stock). If a waiver is granted for a component or a subcomponent, that component or subcomponent will be considered to be of domestic origin for the purposes of § 661.11 of this part.

(g) The waivers described in paragraphs (b) and (c) of this section may be granted for a specific item or material that is used in the production of a manufactured product that is governed by the requirements of § 661.5(d) of this part. If such a waiver is granted to such a specific item or material, that item or material will be treated as being of domestic origin.

Appendix A to § 661.7—General Waivers

(a) All waivers published in 49 CFR 25.108 which establish excepted articles, materials, and supplies for the Buy American Act of 1933 (41 U.S.C. 10a-d), as the waivers may be amended from time to time, apply to this part under the provisions of § 661.7 (b) and (c).

(b) Under the provisions of § 661.7(b) of this part, 15 passenger vans produced by Chrysler Corporation are exempt from the requirement that final assembly of the vans take place in the United States (49 FR 13944, April 9, 1984).

(c) Under the provisions of § 661.7(b) of this part, 15 Passenger Wagons produced by Chrysler Corporation are exempt from the requirement that final assembly of the wagons take place in the United States (letter to Chrysler Corporation dated May 13, 1987.)

(d) Under the provisions of § 661.7 (b) and (c) of this part, microcomputer equipment, including software, of foreign origin can be procured by grantees (50 FR 18760, May 2, 1985 and 51 FR 36120, October 8, 1986).

§ 661.9 Application for waivers.

(a) This section sets out the application procedures for obtaining all waivers, except those general exceptions set forth in this part for which individual applications are unnecessary and those covered by section 165(b)(3) of the Act. The procedures for obtaining an exception covered by section 165(b)(3) are set forth in § 661.11 of this part.

(b) A bidder who seeks to establish grounds for an exception must seek the exception, in a timely manner, through the grantee.

(c) Except as provided in paragraph (d) of this section, only a grantee may request a waiver. The request must be in writing, include facts and justification to support the waiver, and be submitted to the Administrator through the appropriate Regional Office.

(d) UMTA will consider a request for a waiver from a potential bidder or supplier only if the waiver is being sought under § 661.7 (f) or (g) of this part.

(e) The Administrator will issue a written determination setting forth the reasons for granting or denying the exception request. Each request for an exception, and UMTA's action on the request, are available for public inspection under the provisions of 49 CFR part 601, subpart C.

§ 661.10 Determination of qualification under section 337(a)(2)(B) of the STURAA.

(a) A supplier or contractor that qualifies under the provisions of section 337(a)(2)(B) because it had supplied an item that complied with the provisions of section 165(b)(3) of the Surface Transportation Assistance Act of 1982 or under section 401 of the Surface Transportation Assistance Act of 1978 must certify to this qualification when its bid or offer is submitted. Such certification must accompany the certification set forth in § 661.12 of this part.

(b) A supplier or contractor that qualifies as a successor in interest or assignee under the provisions of section 337(a)(2)(b) of the STURAA is one to which has been transferred the substantial assets, such as contracts and work in progress, designs and technology, and manufacturing plants and staff, of a previously existing company. The mere acquisition of an established trade name by an existing business enterprise does not qualify as a successor in interest. A supplier or contractor adoption of a new corporate name while maintaining continuity in ownership and assets qualifies the supplier or contractor as a successor in interest.

(c) Any supplier or contractor wishing to claim that it is a successor in interest or assignee under the provisions of paragraph (b) of this section must provide UMTA with sufficient documentation to support its claim. If UMTA determines that a supplier or contractor does qualify as a successor in interest or assignee, UMTA will publish notice of this determination in the Federal Register.

§ 661.11 Rolling stock procurement.

(a) The provisions of § 661.5 of this part do not apply to the procurement of buses and other rolling stock (including train control, communication, and traction power equipment), if the cost of components which are produced in the United States is more than 50 percent of the cost of all of the components and final assembly takes place in the United States.

(b) Except as provided in paragraph (c) of this section, the domestic content requirement is 55% for contracts entered into after October 1, 1989, and is 60% for contracts entered into after October 1, 1991.

(c) The domestic content requirement will be 60% for contracts entered into after April 1, 1992, with any supplier or contractor or any successor in interest or assignee, as determined under the provisions of § 661.10 of this part, which complied with the requirements of section 165(b)(3) of the Surface Transportation Assistance Act of 1982 or section 401 of the Surface Transportation Assistance Act of 1978 before April 2, 1987.

(d) The increased domestic content requirements in paragraphs (b) and (c) of this section also apply to the domestic content requirements for the components set forth in paragraphs (i), (k), and (n) of this section.

(e) A component is any article, material, or supply, whether manufactured or unmanufactured, that is directly incorporated into an end product at the final assembly location.

(f) A component may be manufactured at the final assembly location if the manufacturing process to produce the component is a separate and distinct activity from the final assembly of the end product.

(g) A component is considered to be manufactured if there are sufficient activities taking place to advance the value or improve the condition of the subcomponents of that component; that is, if the subcomponents have been substantially transformed or merged into a new and functionally different article.

(h) Except as provided in paragraph (m) of this section, a subcomponent is any article, material, or supply, whether manufactured or unmanufactured, that is one step removed from a component (as defined in paragraph (e) of this section) in the manufacturing process and that is incorporated directly into a component.

(i) For a component to be of domestic origin, more than 50 percent of the subcomponents of that component, by cost, must be of domestic origin and the manufacture of the component must

take place in the United States. If, under the terms of this part, a component is determined to be of domestic origin, its entire cost may be utilized in calculating the cost of domestic content of an end product.

(j) A subcomponent is of domestic origin if it is manufactured in the United States.

(k) If a subcomponent manufactured in the United States is exported for inclusion in a component that is manufactured outside of the United States and it receives tariff exemptions under the procedures set forth in 19 CFR 10.11-10.24, the subcomponent retains its domestic identity and can be included in the calculation of the domestic content of an end product even if a such a subcomponent represents less than 50% of the cost of a particular component.

(l) If a subcomponent manufactured in the United States is exported for inclusion in a component manufactured outside of the United States and it does not receive tariff exemption under the procedures set forth in 19 CFR 10.11-10.24, the subcomponent loses its domestic identity and cannot be included in the calculation of the domestic content of an end product.

(m) Raw materials produced in the United States and then exported for incorporation into a component are not considered to be a subcomponent for the purposes of calculating domestic content. The value of such raw materials is to be included in the cost of the foreign component.

(n) If a component is manufactured in the United States but contains less than 50% domestic subcomponents, by cost, the cost of the domestic subcomponents and the cost of manufacturing the component may be included in the calculation of the domestic content of the end product.

(o) For purposes of this section, except as provided in paragraph (q) of this section:

(1) The cost of a component or a subcomponent is the price that a bidder or offeror must pay to a subcontractor or supplier for that component or subcomponent. Transportation costs to the final assembly location must be included in calculating the cost of a component. Applicable duties must be included in determining the cost of foreign components and subcomponents.

(2) If a component or subcomponent is manufactured by the bidder or offeror, the cost of the component is the cost of labor and materials incorporated into the component or subcomponent, an allowance for profit, and the administrative and overhead costs attributable to that component or

subcomponent under normal accounting principles.

(p) The cost of a component of foreign origin is set at the time the bidder or offeror executes the appropriate Buy America certificate.

(q) The cost of a subcomponent which retains its domestic identity consistent with paragraph (l) of this section shall be the cost of the subcomponent when last purchased, f.o.b. United States port of exportation or point of border crossing as set out in the invoice and entry papers, or, if no purchase was made, the value of the subcomponent at the time of its shipment for exportation, f.o.b. United States port of exportation or point of border crossing, as set out in the invoice and entry papers.

(r) In accordance with section 165(c) of the Act, labor costs involved in final assembly shall not be included in calculating component costs.

(s) The actual cost, not the bid price, of a component is to be considered in calculating domestic content.

(t) Final assembly is the creation of the end product from individual elements brought together for that purpose through application of manufacturing processes. If a system is being procured as the end product by the grantee, the installation of the system qualifies as final assembly.

(u) An end product means any item subject to section 165(b)(3) of the Act, that is to be acquired by a grantee, as specified in the overall project contract.

(v) Train control equipment includes, but is not limited to, the following equipment:

- (1) Mimic board in central control.
- (2) Dispatchers console.
- (3) Local control panels.
- (4) Station (way side) block control relay cabinets.
- (5) Terminal dispatcher machines.
- (6) Cable/cable trays.
- (7) Switch machines.
- (8) Way side signals.
- (9) Impedance bonds.
- (10) Relay rack bungalows.
- (11) Central computer control.
- (12) Brake equipment.
- (13) Brake systems.

(w) Communication equipment includes, but is not limited to, the following equipment:

- (1) Radios.
- (2) Space station transmitter and receivers.
- (3) Vehicular and hand-held radios.
- (4) PABX telephone switching equipment.
- (5) PABX telephone instruments.
- (6) Public address amplifiers.
- (7) Public address speakers.
- (8) Cable transmission system cable.

- (9) Cable transmission system multiplex equipment.
- (10) Communication console at central control.
- (11) Uninterruptible power supply inverters/rectifiers.
- (12) Uninterruptible power supply batteries.
- (13) Data transmission system central processors.
- (14) Data transmission system remote terminals.
- (15) Line printers for data transmission system.
- (16) Communication system monitor test panel.
- (17) Security console at central control.
- (x) Traction power equipment includes, but is not limited to, the following:
- (1) Primary AC switch gear.
 - (2) Primary AC transformers (rectifier).
 - (3) DC switch gear.
 - (4) Traction power console and CRT display system at central control.
 - (5) Bus ducts with buses (AC and DC).
 - (6) Batteries.
 - (7) Traction power rectifier assemblies.
 - (8) Distribution panels (AC and DC).
 - (9) Facility step-down transformers.
 - (10) Motor control centers (facility use only).
 - (11) Battery chargers.
 - (12) Supervisory control panel.
 - (13) Annunciator panels.
 - (14) Low voltage facility distribution switch board.
 - (15) DC connect switches.
 - (16) Negative bus boxes.
 - (17) Power rail insulators.
 - (18) Power cables (AC and DC).
 - (19) Cable trays.
 - (20) Instrumentation for traction power equipment.
 - (21) Connectors, tensioners, and insulators for overhead power wire systems.
 - (22) Negative drainage boards.
 - (23) Inverters.
 - (24) Traction motors.
 - (25) Propulsion gear boxes.
 - (26) Third rail pick-up equipment.
 - (27) Pantographs.
- (y) The power or third rail is not considered traction power equipment and is thus subject to the requirements of section 165(a) of the Act and the requirements of § 661.5 of this part.
- (z) A bidder on a contract for an item covered by section 165(b)(3) of the Act who will comply with section 165(b)(3) and regulations in this section is not required to follow the application for waiver procedures set out in § 661.9 of this part. In lieu of these procedures, the bidder must submit the appropriate

certificate required by § 661.12 of this part.

Appendix A to § 661.11—General Waivers

(a) The provisions of § 661.11 of this part do not apply when foreign sourced spare parts for buses and other rolling stock (including train control, communication, and traction power equipment) whose total cost is 10 percent or less of the overall project contract cost are being procured as part of the same contract for the major capital item.

Appendix B to § 661.11—Typical Components of Buses

The following is a list of items that typically would be considered components of a bus. This list is not all-inclusive.

Engines, transmissions, front axle assemblies, rear axle assemblies, drive shaft assemblies, front suspension assemblies, rear suspension assemblies, air compressor and pneumatic systems, generator/alternator and electrical systems, steering system assemblies, front and rear air brake assemblies, air conditioning compressor assemblies, air conditioning evaporator/condenser assemblies, heating systems, passenger seats, driver's seat assemblies, window assemblies, entrance and exit door assemblies, door control systems, destination sign assemblies, interior lighting assemblies, front and rear end cap assemblies, front and rear bumper assemblies, specialty steel (structural steel tubing, etc.), aluminum extrusions, aluminum, steel or fiberglass exterior panels, and interior trim, flooring, and floor coverings.

Appendix C to § 661.11—Typical Components of Rail Rolling Stock

The following is a list of items that typically would be considered components of rail rolling stock. This list is not all-inclusive.

Car shells, main transformer, pantographs, traction motors, propulsion gear boxes, interior lighting, acceleration and braking resistors, propulsion controls, low voltage auxiliary power supplies, air conditioning equipment, air brake compressors, brake controls, foundation brake equipment, articulation assemblies, train control systems, window assemblies, communication equipment, lighting, seating, doors, door actuators and controls, couplers and draft gear, trucks, journal bearings, axles, diagnostic equipment, and third rail pick-up equipment.

§ 661.12 Certification requirement for procurement of buses, other rolling stock and associated equipment.

If buses or other rolling stock (including train control, communication, and traction power equipment) are being procured, the appropriate certificate as set forth below shall be completed and submitted by each bidder in accordance with the requirement contained in § 661.13(b) of this part.

Certificate of Compliance With Section 165(b)(3)

The bidder hereby certifies that it will comply with the requirements of section 165(b)(3), of the Surface Transportation

Assistance Act of 1962, as amended, and the regulations of 49 CFR 661.11.

Date _____
Signature _____
Company Name _____
Title _____

Certificate for Non-Compliance with Section 165(b)(3)

The bidder hereby certifies that it cannot comply with the requirements of section 165(b)(3) of the Surface Transportation Assistance Act of 1962, as amended, but may qualify for an exception to the requirement consistent with section 165(b)(2) or (b)(4) of the Surface Transportation Assistance Act, as amended, and regulations in 49 CFR 661.7.

Date _____
Signature _____
Company Name _____
Title _____

§ 661.13 Grantee responsibility.

(a) The grantee shall adhere to the Buy America clause set forth in its grant contract with UMTA.

(b) The grantee shall include in its bid specification for procurement within the scope of these regulations an appropriate notice of the Buy America provision. Such specifications shall require, as a condition of responsiveness, that the bidder or offeror submit with the bid a completed Buy America certificate in accordance with § 661.6 or § 661.12 of this part, as appropriate.

(c) Whether or not a bidder or offeror certifies that it will comply with the applicable requirement, such bidder or offeror is bound by its original certification and is not permitted to change its certification after bid opening. A bidder or offeror that certifies that it will comply with the applicable Buy America requirements is not eligible for a waiver of those requirements.

§ 661.15 Investigation procedures.

(a) It is presumed that a bidder who has submitted the required Buy America certificate is complying with the Buy America provision. A false certification is a criminal act in violation of 18 U.S.C. 1001.

(b) Any party may petition UMTA to investigate the compliance of a successful bidder with the bidder's certification. That party ("the petitioner") must include in the petition a statement of the grounds of the petition and any supporting documentation. If UMTA determines that the information presented in the petition indicates that the presumption in paragraph (a) of this section has been overcome, UMTA will initiate an investigation.

(c) In appropriate circumstances, UMTA may determine on its own to

- (9) Cable transmission system multiplex equipment.
- (10) Communication console at central control.
- (11) Uninterruptible power supply inverters/rectifiers.
- (12) Uninterruptible power supply batteries.
- (13) Data transmission system central processors.
- (14) Data transmission system remote terminals.
- (15) Line printers for data transmission system.
- (16) Communication system monitor test panel.
- (17) Security console at central control.
- (x) Traction power equipment includes, but is not limited to, the following:
- (1) Primary AC switch gear.
- (2) Primary AC transformers (rectifier).
- (3) DC switch gear.
- (4) Traction power console and CRT display system at central control.
- (5) Bus ducts with buses (AC and DC).
- (6) Batteries.
- (7) Traction power rectifier assemblies.
- (8) Distribution panels (AC and DC).
- (9) Facility step-down transformers.
- (10) Motor control centers (facility use only).
- (11) Battery chargers.
- (12) Supervisory control panel.
- (13) Annunciator panels.
- (14) Low voltage facility distribution switch board.
- (15) DC connect switches.
- (16) Negative bus boxes.
- (17) Power rail insulators.
- (18) Power cables (AC and DC).
- (19) Cable trays.
- (20) Instrumentation for traction power equipment.
- (21) Connectors, tensioners, and insulators for overhead power wire systems.
- (22) Negative drainage boards.
- (23) Inverters.
- (24) Traction motors.
- (25) Propulsion gear boxes.
- (26) Third rail pick-up equipment.
- (27) Pantographs.
- (y) The power or third rail is not considered traction power equipment and is thus subject to the requirements of section 165(a) of the Act and the requirements of § 661.5 of this part.
- (z) A bidder on a contract for an item covered by section 165(b)(3) of the Act who will comply with section 165(b)(3) and regulations in this section is not required to follow the application for waiver procedures set out in § 661.9 of this part. In lieu of these procedures, the bidder must submit the appropriate

certificate required by § 661.12 of this part.

Appendix A to § 661.11—General Waivers

(a) The provisions of § 661.11 of this part do not apply when foreign sourced spare parts for buses and other rolling stock (including train control, communication, and traction power equipment) whose total cost is 10 percent or less of the overall project contract cost are being procured as part of the same contract for the major capital item.

Appendix B to § 661.11—Typical Components of Buses

The following is a list of items that typically would be considered components of a bus. This list is not all-inclusive.

Engines, transmissions, front axle assemblies, rear axle assemblies, drive shaft assemblies, front suspension assemblies, rear suspension assemblies, air compressor and pneumatic systems, generator/alternator and electrical systems, steering system assemblies, front and rear air brake assemblies, air conditioning compressor assemblies, air conditioning evaporator/condenser assemblies, heating systems, passenger seats, driver's seat assemblies, window assemblies, entrance and exit door assemblies, door control systems, destination sign assemblies, interior lighting assemblies, front and rear end cap assemblies, front and rear bumper assemblies, specialty steel (structural steel tubing, etc.), aluminum extrusions, aluminum, steel or fiberglass exterior panels, and interior trim, flooring, and floor coverings.

Appendix C to § 661.11—Typical Components of Rail Rolling Stock

The following is a list of items that typically would be considered components of rail rolling stock. This list is not all-inclusive.

Car shells, main transformer, pantographs, traction motors, propulsion gear boxes, interior lighting, acceleration and braking resistors, propulsion controls, low voltage auxiliary power supplies, air conditioning equipment, air brake compressors, brake controls, foundation brake equipment, articulation assemblies, train control systems, window assemblies, communication equipment, lighting, seating, doors, door actuators and controls, couplers and draft gear, trucks, journal bearings, axles, diagnostic equipment, and third rail pick-up equipment.

§ 661.12 Certification requirement for procurement of buses, other rolling stock and associated equipment.

If buses or other rolling stock (including train control, communication, and traction power equipment) are being procured, the appropriate certificate as set forth below shall be completed and submitted by each bidder in accordance with the requirement contained in § 661.13(b) of this part.

Certificate of Compliance With Section 165(b)(3)

The bidder hereby certifies that it will comply with the requirements of section 165(b)(3) of the Surface Transportation

Assistance Act of 1962, as amended, and the regulations of 49 CFR 661.11.

Date _____
Signature _____
Company Name _____
Title _____

Certificate for Non-Compliance with Section 165(b)(3)

The bidder hereby certifies that it cannot comply with the requirements of section 165(b)(3) of the Surface Transportation Assistance Act of 1962, as amended, but may qualify for an exception to the requirement consistent with section 165(b)(2) or (b)(4) of the Surface Transportation Assistance Act, as amended, and regulations in 49 CFR 661.7.

Date _____
Signature _____
Company Name _____
Title _____

§ 661.13 Grantee responsibility.

(a) The grantee shall adhere to the Buy America clause set forth in its grant contract with UMTA.

(b) The grantee shall include in its bid specification for procurement within the scope of these regulations an appropriate notice of the Buy America provision. Such specifications shall require, as a condition of responsiveness, that the bidder or offeror submit with the bid a completed Buy America certificate in accordance with § 661.6 or § 661.12 of this part, as appropriate.

(c) Whether or not a bidder or offeror certifies that it will comply with the applicable requirement, such bidder or offeror is bound by its original certification and is not permitted to change its certification after bid opening. A bidder or offeror that certifies that it will comply with the applicable Buy America requirements is not eligible for a waiver of those requirements.

§ 661.15 Investigation procedures.

(a) It is presumed that a bidder who has submitted the required Buy America certificate is complying with the Buy America provision. A false certification is a criminal act in violation of 18 U.S.C. 1001.

(b) Any party may petition UMTA to investigate the compliance of a successful bidder with the bidder's certification. That party ("the petitioner") must include in the petition a statement of the grounds of the petition and any supporting documentation. If UMTA determines that the information presented in the petition indicates that the presumption in paragraph (a) of this section has been overcome, UMTA will initiate an investigation.

(c) In appropriate circumstances, UMTA may determine on its own to

APPENDIX C
COMPARATIVE TARIFFS

Comparative U.S. Tariffs on Imported Goods

- No tariff item or rates appear where classification is impossible given information available (i.e. to classify alloy steel one needs to know the alloy in question, when classifying carpets one needs to know if felt, woven, tufted, etc.)
- From January 1st, 1998, all FTA qualifying goods are duty free.
- In the Chart "F" indicated a duty free tariff rate.

APPENDIX

Component	Tariff Classification	U.S. FTA Rate					MFN Rate %
		93	94	95	96	97	
Shell assembly	8607.19.90	F					3.9
Wheelset assembly	8607.19.20	F					F
Truck assembly (trailer truck)	8607.12.00	F					5.5
Truck frame weldment	8607.19.30	F					5.5
Water tank casing	8607.99.10	F					5.5
Shell assembly	8607.11.00	F					3.9
Truck assembly (power car)	8607.11.00	F					3.9
Axle (machining)	8607.19.10	F					0.5
Wheelset assembly	8607.19.20	F					F
Quill shaft (machining & bal'g) (power car)	8607.91.00	F					3.9
Tripod shaft(machining & bal'g)(power car)	8607.91.00	F					3.9
Torsion bar ass'y (fabrication) (power car)	8607.91.00	F					3.9
Traction rod assembly (power car)	8607.91.00	F					3.9
Pivot assembly (fabrication) (power car)	8607.91.00	F					3.9
Transformer	8504	1.2	0.9	0.6	0.3	0	2.4
Pantagraph	8607.91.00	F					3.9
Main circuit breaker	8535.29.00	2.6	2.1	1.5	0.9	0.3	5.3
Main transformer	8504	1.2	0.9	0.6	0.3	0	2.4
Line converter	8504.40	F					3.0
Feed back chopper	--						
Inverter	--						
Smoothing coil	8320.10	2.0	1.6	1.2	0.8	0.4	4.0
Power electronic cooling fan	8418.59.80	F					4.7
Auxiliary power equipment set	--						
Traction motor	8501	F					3.5
Monitoring & control equipment (including computers)	--						
Cabling harness (power car)	8607.30.50	F					3.9
Cab signal	8607.91.00	F					3.9
Low alloy, high strength steel	--						
Seats	9401.10.80	F					4.0
Primary spring (coil)	7320.10	2.0	1.6	1.2	0.8	0.4	4.0
Secondary suspension (coil)	7320.10	2.0	1.6	1.2	0.8	0.4	4.0

Component	Tariff Classification	U.S. FTA Rate					MFN Rate %
		93	94	95	96	97	
Coil springs	7320.10	2.0	1.6	1.2	0.8	0.4	4.0
Stainless steel	7219	5.0	4.0	3.0	2.0	1.0	10.1
Driver's seat	9401	F					4.01
Discs (brake)	8607.29.50	F					3.9
Carpet	--	--					--
Axle (machining)	8607.19.10	F					0.5
Wheel forging	8607.19.20	F					F
Wall laminates	--	--					--
Bassboard heaters (electric)	8516.29.00	F					3.7
Batteries	8506.18.507	F-2.5	F-2.0	F-1.5	F-1.0	F-0.5	5.1
Carpet	--	--					--
Low voltage distribution panel	--	--					--
Circuit breaker panel	8535.90.60						
Bearing housing (Steel casting)	--	--					--
Rubber damper	--	--					--
Tilting swing arm	--	--					--
Styrofoam	3903	F					9.2
Wool insulation	--	--					--
Fiberglass reinforced plastic moulding	--	--					--
Rubber air spring (bellows)	--	--					--
Levelling valve assembly	8481	F					3-5
Power converter	8504.40	F					3
Inverter	--	--					--
Rectifier	8504.40	F					3
Main bloc	--	--					--
Power brake switch	--	--					--
Cooling blower	8414.59.80	F					4.7
Smoothing Coil	--	--					--
Flooring (plymetal)	--	--					--
Battery charger	--	--					--

Component	Tariff Classification	U.S. FTA Rate					MFN Rate %
		93	94	95	96	97	
Wheels	8607.19.20	F					F
Electric wiring	8544.30	F					5
Fibreglass reinforced plastic moulding	--	--					--
Thermostats	9032.10	F					4.8
Urethane foam	--	--					--
Air conditioner (Prime)	8415	1.1	0.8	0.5	0.2	0	2.2
Compressor	8414	F					3.4-4.7
Tread brake unit	8607.29.50	F					3.9
Callper assembly (disc brake)	8607.29.50	F					3.9
Brake disc (wheel mounted)	8607.29.50	F					3.9
Compressor	8607.29.50	F					3.9
Brake control & relay valve	8607.29.50	F					3.9
Automatic brake valve	8607.29.50	F					3.9
Wheel slide control	8607.29.50	F					3.9
Double-acting brake cylinder	8607.29.50	F					3.9
Single-acting brake cylinder	8607.29.50	F					3.9
Main air reservoir	8607.29.50	F					3.9
Tank (secondary suspension)	8607.29.50	F					3.9
Hydraulic damper	--	--					--
Hydraulic damper	--	--					--
Antiroll damper	--	--					--
Upper Inter-car damper	--	--					--
Hydraulic tilt actuator	--	--					--
Lateral damper	--	--					--
Anti-pitch damper	--	--					--
Lower anti-car damper	--	--					--
Thermal insulation	--	--					--
Window assembly	7610.00	2.8	2.2	1.6	1.0	0.4	5.7
Wall lamination	--	--					--
Radio-telephone	--	--					--
Water tank	7309 or 7310	F-1.3	F-1.0	F-0.7	F-0.4	0.1	F-2.6
Air dryer	--	--					--

Component	Tariff Classification	U.S. FTA Rate					MFN Rate %
		93	94	95	96	97	
Cabling harness	8607.30.50	F					3.9
Rubber diaphragm	--	--					--
Carpet	--	--					--
Power jumper	--	--					--
Communication jumper	--	--					--
Power receptacle	--	--					--
Communication receptable	--	--					--
Event recorder	--	--					--
Gear (drive) machining	--	--					--
Gear (wheel slide)	--	--					--
Reduction gear box	--	--					--
Traction motor reduction gear box	--	--					--
Door system	8607.91.00	F					3.9
Flooring (plymetal)	--	--					--
Toilet system	--	--					--
Water tank casing	8607.91.00	F					3.9
Tank	--	--					--
Main air reservoir	7309-7310	F-1.3	F-1.0	F-0.7	F-0.4	F-0.1	F-2.6
Door	--	--					--
Door	8607.91.00	F					3.9
Roller bearing	--	--					--
Water cooler	--	--					--
Front automatic coupler	8607.30.50	F					3.9
Rear coupler	8607.30.50	F					3.9
Gear (drive) machining	--	--					--
Gear (wheel slide) machining	--	--					--
Radio-telephone	--	--					--
Low voltage distributing panel	--	--					--
Air conditioner	8415	1.1	0.8	0.5	0.2	0	2.2
Advance train control system	--	--					--
Door system	8607.99	F					5.5

Component	Tariff Classification	U.S. FTA Rate					MFN Rate %
		93	94	95	96	97	
Compressor/condensor unit	--						
Blower fan & evaporator coil	--						
AC control panel	--						
Lighting control panel	--						
Emergency control panel	--						
Gear (drive) machining	--						
Gear (wheel slide) machining	--						
Reduction gear box	--						
Traction motor reduction gear box	--						
Computer assisted manual block system	--						
Visual display unit (VDU)	8471.92	F					3.9
Data communication package	--						
Central safety computer	8471.20	F					3.9
Uninterrupted power supply (UPS)	8471.99.32	F					F
Wayside interface units	8608	F					5.7
Transponders	--						
Switch machine (dual control)	8608	F					5.7
Housing 6" X 6"	--						
Housing 64" X 34"	--						
Hot box & dragging equipment detectors	8608	F					5.7
Track circuit transmitters (AC10QHZ)	8608	F					5.7
Track circuit receivers (AC100HZ)	8608	F					5.7
Regenerative units (AC100HZ)	8608	F					5.7
Insulated joints							
Impedence bond	8608	F					5.7
Switch point helpers & rollers	8608	F					5.7
12 VDC power supply c/w batteries	8608	F					5.7
120 VDC power supply c/w batteries	8608	F					5.7
Vital relays	8608	F					5.7
Fibre optic							
Fibre optic transmission equipment:							
F.O.T.S. terminus							
F.O.T.S. repeaters							
Base stations complete installations for data and voice							

APPENDIX D

**OPTIMISTIC & PESSIMISTIC HSR MARKET AND CDN EXPORT
ESTIMATES**

**Appendix Table D-1 : Estimated U.S. HSR Market
Manufactured Components & Services Above the Rail
Optimistic Case Estimates**

Corridors Cities Linked (U.S. '000)	Cost of Rolling Stock	Power Supply & Distribution	Communi- cations Equipment	Signalling Equipment	Total Component Costs	Eng., Design, Proj. & Cons. Management	Installation Services	Total Exportable Services	Total MKT Components & Services
NORTH WEST									
Port. - Sea. - Van.	346,088	157,331	44,886	80,154	628,459	152,980	100,016	252,995	881,454
CALIFORNIA									
L.A. - San Frans.	789,924	186,853	53,309	95,195	1,125,280	261,253	118,783	380,037	1,505,317
OHIO									
Cin. - Col. - Clev.	109,132	126,126	35,984	64,256	335,497	87,292	80,179	167,471	502,968
ILLINOIS - MICHIGAN									
Chic. - Det.	359,415	130,797	37,316	66,636	594,165	142,236	83,148	225,384	819,549
ILLINOIS - MISSOURI									
Chic. - St - Lou.	126,178	130,797	37,316	66,636	360,928	93,256	83,148	176,404	537,332
EMPIRE									
N. Y. - Alb. - Buf.	669,751	216,283	61,705	110,188	1,057,927	251,038	137,492	388,530	1,446,457
FLORIDA									
Mia. - Orl. - Tam.	252,356	140,140	39,982	71,396	503,874	124,522	89,088	213,609	717,483
NORTH EAST									
Wash - N. Y. - Bos.	468,661	156,000	60,906	108,760	794,327	191,032	115,351	306,383	1,100,710
TOTALS									
(per year)	3,121,506 156,075	1,244,328 62,216	371,404 18,570	663,221 33,161	5,400,458 270,023	1,303,609 65,180	807,205 40,360	2,110,814 105,541	7,511,272 375,564
TOTAL (Cdn \$ '000)									
(per year)	4,151,603 207,580	1,654,956 82,748	493,967 24,698	882,084 44,104	7,182,609 359,130	1,733,800 86,690	1,073,582 53,679	2,807,382 140,369	9,989,991 499,500

Appendix Table D-2 : Estimated Canadian Share of U.S. HSR Market
Manufactured Components & Services Above the Rail
Optimistic Case Estimates
(Cdn \$ '000)

Potential Canadian Share by HSR Sector

Potential Canadian Share by Scenario		Rolling Stock	Power Supply & Distrib.	Communi- cations Equip.	Signal. Equip.	Total Compon.	Eng. & Project Managem.	Installation Services	Total Services	Total MKT Compon. & Services
With Cdn Proj. – Tilt Tech. Adopted	8.53%	293,933	163,179	48,705	86,973	592,791	147,893	105,855	253,748	846,539
With Cdn Proj. – Non-Tilt Tech. Adopt.	4.46%	173,122	78,114	23,315	41,634	316,185	77,327	44,768	122,096	438,281
Without Cdn Project	2.50%	103,790	41,374	12,349	22,052	179,565	43,345	26,840	70,185	249,750
Max. Net Cdn Proj. Related Exp. To U.S.	6.03%	190,143	121,805	36,356	64,921	413,225	104,548	79,016	183,564	596,789
Each Year Over 20 Years										
With Cdn Proj. – Tilt Tech. Adopted	8.53%	14,697	8,159	2,435	4,349	29,640	7,395	5,293	12,687	42,327
With Cdn Proj. – Non-Tilt Tech. Adopt.	4.46%	8,656	3,906	1,166	2,082	15,809	3,866	2,238	6,105	21,914
Without Cdn Project	2.50%	5,190	2,069	617	1,103	8,978	2,167	1,342	3,509	12,487
Max. Net Cdn Proj. Related Exp. To U.S.	6.03%	9,507	6,090	1,818	3,246	20,661	5,227	3,951	9,178	29,839

Appendix Table D-3 : Estimated International HSR Market (excluding U.S.)
Manufactured Components & Services Above the Rail
Optimistic Case Estimates

Total Other International Markets (U.S. \$ '000)	Cost of Rolling Stock	Power Supply & Distribution	Communi- cations Equipment	Signalling Equipment	Total Component Costs	Eng., Design, Proj. & Cons. Management	Installation Services	Total Exportable Services	Total MKT Components & Services
Total for 4 Tilting proj.	1,378,135	621,901	177,427	316,835	2,494,299	606,825	395,345	1,002,170	3,496,469
Total for 3 Non - Tilt proj.	1,128,942	466,426	133,071	289,904	2,018,342	455,119	296,509	751,628	2,622,352
TOTALS (per year)	2,507,077 125,354	1,088,328 54,416	310,498 15,525	606,739 30,337	4,512,641 225,632	1,061,944 53,097	691,854 34,593	1,753,798 87,690	6,118,821 313,322
TOTAL (Cdn \$ '000) (per year)	3,342,769 167,138	1,451,103 72,555	413,997 20,700	808,985 40,449	6,016,855 300,843	1,415,925 70,796	922,472 46,124	2,338,398 116,920	8,355,252 417,763

Appendix Table D-4 : Estimated Canadian Share of International Markets (excluding U.S.)

Manufactured Components & Services Above the Rail

Optimistic Case Estimates

(Cdn \$ '000)

Potential Canadian Share by HSR Sector

Potential Canadian Share by Scenario		Rolling Stock	Power Supply & Distrib.	Communi- cations Equip.	Signal. Equip.	Total Compon.	Eng. & Project Managem.	Installation Services	Total Services	Total MKT Compon. & Services
With Cdn Proj.- Tilt Tech. Adopted	3.66%	113,654	56,593	16,146	31,550	217,943	51,823	35,976	87,799	305,743
With Cdn Proj.- Non-Tilt Tech. Adopt.	2.77%	86,912	42,517	12,130	23,703	165,263	39,221	27,028	66,250	231,512
Without Cdn Project	1.25%	41,785	18,139	5,175	10,112	75,211	17,699	11,531	29,230	104,441
Max. Net Cdn Proj. Related Exp. To U.S.	2.41%	71,870	38,454	10,971	21,438	142,733	34,124	24,446	58,569	201,302
Each Year Over 20 Years										
With Cdn Proj.- Tilt Tech. Adopted	3.66%	5,683	2,830	807	1,578	10,897	2,591	1,799	4,390	15,287
With Cdn Proj.- Non-Tilt Tech. Adopt.	2.77%	4,346	2,126	607	1,185	8,263	1,961	1,351	3,312	11,576
Without Cdn Project	1.25%	2,089	907	259	506	3,761	885	577	1,461	5,222
Max. Net Cdn Proj. Related Exp. To U.S.	2.41%	3,593	1,923	549	1,072	7,137	1,706	1,222	2,928	10,065

**Appendix Table D-5 : Estimated U.S. HSR Market
Manufactured Components & Services Above the Rail
Pessimistic Case Estimates**

Corridors Cities Linked (U.S. '000)	Cost of Rolling Stock	Power Supply & Distribution	Communi- cations Equipment	Signalling Equipment	Total Component Costs	Eng., Design, Proj. & Cons. Management	Installation Services	Total Exportable Services	Total MKT Components & Services
NORTH WEST									
Port. - Sea. - Van.	346,088	157,331	44,886	80,154	628,459	152,980	100,016	252,995	881,454
CALIFORNIA									
L.A. - San Frans.	789,924	186,853	53,309	95,195	1,125,280	261,253	118,783	380,037	1,505,317
OHIO									
Cin. - Col. - Clev.	109,132	126,126	35,984	64,256	335,497	87,292	80,179	167,471	502,968
ILLINOIS - MICHIGAN									
Chic. - Det.	359,415	130,797	37,316	66,636	594,165	142,236	83,148	225,384	819,549
ILLINOIS - MISSOURI									
Chic. - St. - Lou.	126,178	130,797	37,316	66,636	360,928	93,256	83,148	176,404	537,332
EMPIRE									
N.Y. - Alb. - Buf.	669,751	216,283	61,705	110,188	1,057,927	251,038	137,492	388,530	1,446,457
FLORIDA									
Mia. - Orl. - Tam.	252,356	140,140	39,982	71,396	503,874	124,522	89,088	213,609	717,483
Average For 7 Projects	378,978	155,475	44,357	79,209	658,019	158,940	98,836	257,776	915,795
Total for 2 Tilting proj.	757,956	310,951	88,714	158,417	1,316,037	317,879	197,673	515,552	1,831,589
Total for 1 Non-Tilt proj.	413,935	155,475	44,357	96,635	710,402	158,940	98,836	257,776	915,795
NORTH EAST									
Wash - N.Y. - Bos.	468,661	156,000	60,906	108,760	794,327	191,032	115,351	306,383	1,100,710
TOTALS	1,640,552	622,426	193,976	363,812	2,820,766	667,851	411,860	1,079,710	3,848,093
(per year)	82,028	31,121	9,699	18,191	141,038	33,393	20,593	53,986	195,024
TOTAL (Cdn \$ '000)	2,181,934	827,827	257,988	483,870	3,751,619	888,242	547,773	1,436,015	5,187,634
(per year)	109,097	41,391	12,899	24,193	187,581	44,412	27,389	71,801	259,382

Appendix Table D-6 : Estimated Canadian Share of U.S. HSR Market
Manufactured Components & Services Above the Rail
Pessimistic Case Estimates
(Cdn \$ '000)

Potential Canadian Share by HSR Sector

Potential Canadian Share by Scenario		Rolling Stock	Power Supply & Distrib.	Communi- cations Equip.	Signal. Equip.	Total Compon.	Eng. & Project Managem.	Installation Services	Total Services	Total MKT Compon. & Services
With Cdn Proj. – Tilt Tech. Adopted	8.53%	154,481	81,624	25,438	47,710	309,252	75,767	54,010	129,777	439,029
With Cdn Proj. – Non –Tilt Tech. Adopt.	4.46%	90,987	39,073	12,177	22,839	165,076	39,616	22,842	62,458	227,533
Without Cdn Project	2.50%	54,548	20,696	6,450	12,097	93,790	22,206	13,694	35,900	129,691
Max. Net Cdn Proj. Related Exp. To U.S.	6.03%	99,933	60,928	18,988	35,613	215,461	53,561	40,316	93,877	309,338
Each Year Over 20 Years										
With Cdn Proj. – Tilt Tech. Adopted	8.53%	7,724	4,081	1,272	2,385	15,463	3,788	2,701	6,489	21,951
With Cdn Proj. – Non –Tilt Tech. Adopt.	4.46%	4,549	1,954	609	1,142	8,254	1,981	1,142	3,123	11,377
Without Cdn Project	2.50%	2,727	1,035	322	605	4,690	1,110	685	1,795	6,485
Max. Net Cdn Proj. Related Exp. To U.S.	6.03%	4,997	3,046	949	1,781	10,773	2,678	2,016	4,694	15,467

Appendix Table D-7 : Estimated International HSR Market (excluding U.S.)
Manufactured Components & Services Above the Rail
Pessimistic Case Estimates

Total Other International Markets (U.S. \$ '000)	Cost of Rolling Stock	Power Supply & Distribution	Communi- cations Equipment	Signalling Equipment	Total Component Costs	Eng., Design, Proj. & Cons. Management	Installation Services	Total Exportable Services	Total MKT Components & Services
Total for 2 Tilting proj.	689,067	310,951	88,714	158,417	1,247,149	303,413	197,673	501,085	1,748,235
Total for 1 Non-Tilt proj.	376,314	155,475	44,357	96,635	672,781	151,706	98,836	250,543	874,117
TOTALS (per year)	1,065,381 53,269	466,426 23,321	133,071 6,654	255,052 12,753	1,919,930 95,997	455,119 22,756	296,509 14,825	751,628 37,581	2,622,352 133,578
TOTAL (Cdn \$ '000) (per year)	1,420,508 71,025	621,901 31,095	177,427 8,871	340,069 17,003	2,559,907 127,995	606,825 30,341	395,345 19,767	1,002,170 50,109	3,562,077 178,104

Appendix Table D-8 : Estimated Canadian Share of International Markets (excluding U.S.)
Manufactured Components & Services Above the Rail
Pessimistic Case Estimates
(Cdn \$ '000)

Potential Canadian Share by HSR Sector

Potential Canadian Share by Scenario		Rolling Stock	Power Supply & Distrib.	Communi-cations Equip.	Signal. Equip.	Total Compon.	Eng. & Project Managem.	Installation Services	Total Services	Total MKT Compon. & Services
With Cdn Proj.— Tilt Tech. Adopted	3.66%	48,297	24,254	6,920	13,263	92,734	22,210	15,418	37,628	130,362
With Cdn Proj.— Non—Tilt Tech. Adopt.	2.77%	36,933	18,222	5,199	9,964	70,318	16,809	11,584	28,393	98,710
Without Cdn Project	1.25%	17,756	7,774	2,218	4,251	31,999	7,585	4,942	12,527	44,526
Max. Net Cdn Proj. Related Exp. To U.S.	2.41%	30,541	16,480	4,702	9,012	60,735	14,624	10,477	25,101	85,836
Each Year Over 20 Years										
With Cdn Proj.— Tilt Tech. Adopted	3.66%	2,415	1,213	346	663	4,637	1,110	771	1,881	6,518
With Cdn Proj.— Non—Tilt Tech. Adopt.	2.77%	1,847	911	260	498	3,516	840	579	1,420	4,936
Without Cdn Project	1.25%	888	389	111	213	1,600	379	247	626	2,226
Max. Net Cdn Proj. Related Exp. To U.S.	2.41%	1,527	824	235	451	3,037	731	524	1,255	4,292

APPENDIX E

LISTING AND COSTING OF ADAPTIVE R&D PROJECTS

COMPONENT: SNOW INGRESS, EXTERIOR PASSENGER DOORS

OPERATION	PERSONNEL						TIME days	COSTS \$
	Mech. Eng.	Elec. Eng.	Equip. Eng.	T	D	Other		
Familiarization	5	3		5				
Prepare door test set-up	5	3		5	15			
Build test set-up	5	2		5				15,000
Debug	5	2		10	5			2,000
Test	5			10				20,000
Correct				5	10			3,000
Test Report	1			5 3		5		5,000
TOTAL	26	10		48	30	5		45,000
Senior personnel							36	33,700
Technical personnel							78	39,000
Clerical							5	1,900
SUB-TOTAL								119,600
Miscellaneous								12,400
GRAND TOTAL - Estimated costs								132,000

\$15,000 = \$5,000 for door, \$10,000 for test rig

\$20,000 = Test in snow making lab.

COMPONENT: VESTIBULE EVALUATION AND DESIGN

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Mech. Eng.	Elec. Eng.	Equip. Eng.	T	D	Other		
Familiarization with existing design			3	3				
Present problem to transportation			5	3	5	1		
Obtain decision from management			5	2	2	2		
Incorporate changes		5	3	10	20	2		
Build maquette		2	5	10	5	2		20,000
TOTAL		7	21	28	32	7		20,000
Senior personnel							28	28,400
Technical personnel							60	30,100
Clerical							7	2,500
SUB-TOTAL								81,000
Miscellaneous								8,000
GRAND TOTAL - Estimated costs								89,000

COMPONENT: INSULATION REQUIREMENTS - PASSENGER CARS (TRAILERS)

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Mech. Eng.	Elec. Eng.	Equip. Eng.	T	D	Other		
Familiarization with carbody design	5			5		2		
Familiarization with all design parameters	10			5		1		
Evaluation of test results and operating experience	10			5		1		
Review of heating and cooling loads	5	5	5	3		1		
Redesign deficient components	5	3	3	10	20	2		
Rewrite spec.	5	2	2	3	3	2		
Build mock-up	5		3	15	25	5		50,000
Test mock-up	3		3	10	10	3		25,000
Report and specifications	5			5	5	3		
TOTAL	53	10	16	61	63	20		75,000
Senior personnel							79	74,000
Technical personnel							124	62,000
Clerical							20	7,000
SUB-TOTAL								218,000
Miscellaneous								22,000
GRAND TOTAL - Estimated costs								240,000

COMPONENT: WATER AND SEWAGE SYSTEMS

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Mech. Eng.	Elec. Eng.	Equip. Eng.	T	D	Other		
Familiarization		2	3	3				
Define desired systems		5	10	5	10			
Consult regulating agency			5					
Design basic system			10	10	15			
Propose to railway			3	3	5	3		
Propose to regulating agency			3	3				
Prepare specifications			2	5	5	5		
TOTAL		7	36	29	35	8		
Senior personnel							43	40,000
Technical personnel							64	32,000
Clerical							8	3,000
SUB-TOTAL								75,000
Miscellaneous								8,000
GRAND TOTAL - Estimated costs								83,000

COMPONENT: SNOW ACCUMULATION ON TRUCKS AND ELSEWHERE ON CARS

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Mech. Eng.	Elec. Eng.	Equip. Eng.	T	D	Other		
Familiarization	5	3	5	10	5			
Winter test power and trailer cars (4 cars)								400,000
* Transport 4 cars								
* Prepare train		5	10	15	10			
* Test (15 days)		3	10	20	10			50,000
Redesign		10	10	15	15			
Modify				10	10			20,000
Retest (5 days)		2	5	10	10	10		20,000
TOTAL	5	23	40	80	60	10		490,000
Senior personnel							68	64,000
Technical personnel							140	70,000
Clerical							10	4,000
SUB-TOTAL								628,000
Miscellaneous								63,000
GRAND TOTAL - Estimated costs								691,000

COMPONENT: RETENTION OF TRUCK DYNAMIC CHARACTERISTICS

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Mech. Eng.	Elec. Eng.	Equip. Eng.	T	D	Other		
Assemble characteristics of all suspension hydraulic dampers			5	5		2		
Perform test to verify character- istics: * Under extreme temper- atures * In new and worn-out state	40		20	60	40	3		40,000
Evaluate effects of oil viscosity change	20			20		2		20,000
Select means and testing procedure	20			20		1		
TOTAL	80		25	105	40	8		60,000
Senior personnel							105	99,000
Technical personnel							145	72,000
Clerical							8	3,000
SUB-TOTAL								234,000
Miscellaneous								23,000
GRAND TOTAL - Estimated costs								257,000

**Note: Determine if damper characteristics are stable enough to perform satisfactorily
under extremes of temperature**

COMPONENT: SNOW CLEARING ABILITY OF THE TRAIN

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Mech. Eng.	Elec. Eng.	Equip. Eng.	T	D	Other		
Review of snow accumulation and snow removal practices in the corridor			80	80	15	15		3,000
Discussions with transportation and track maintenance on possible ways to clear tracks. Establish if unmodified train needs to be tested			40	40		10		5,000
Prepare train modification proposals. Prepare special plow (track maintenance equipment)			10	20	80	10		5,000
Build special equipment: * train modification * plow construction								100,000 300,000
Summer test - Plow			10	15	10	5		30,000
Winter test - Plow			10	15				15,000
+ train unmodified			5	10				15,000
+ train modified			10	15	15	10		30,000
Correct train			10	20	15	10		25,000
Correct plow (2nd winter)			10	20	15			25,000
Retest train			10	20	5	5		30,000
Retest plow			10	20				15,000
Report and presentation			10	15	15	5		
TOTAL			215	290	170	70		598,000
Senior personnel							215	201,000
Technical personnel							460	230,000
Clerical							70	26,000
SUB-TOTAL								1,055,000
Miscellaneous								105,000
GRAND TOTAL - Estimated costs								1,160,000

COMPONENT: TRACTION MOTOR GEARING

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Mech. Eng.	Elec. Eng.	Equip. Eng.	T	D	Other		
Determine: * max. oper. speed * max. test speed * max. future oper. speed * desired acceleration * desired retarding force	20			30	10	5		
Evaluate limits of gear ratio range	20			20	5	1		
Discuss gear ratio choice with gear supplier and transportation	20			10		1		
Simulate operation over the most difficult routes			20			2		30,000
TOTAL	60		20	60	15	9		30,000
Senior personnel							80	75,000
Technical personnel							75	38,000
Clerical							9	3,000
SUB-TOTAL								146,000
Miscellaneous								14,000
GRAND TOTAL - Estimated costs								160,000

COMPONENT: UTILIZATION OF VEHICLES OF SAME LENGTH

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Mech. Eng.	Elec. Eng.	Equip. Eng.	T	D	Other		
Verify advantages to justify change	10		15	5	5	3		
Verify weight distribution implications	15	5	5	5	10	3		
Present the new proposition	10			10	10	5		
TOTAL	35	5	20	20	25	11		
Senior personnel							60	56,000
Technical personnel							45	22,000
Clerical							11	4,000
SUB-TOTAL								82,000
Miscellaneous								8,000
GRAND TOTAL - Estimated costs								90,000

COMPONENT: CRASHWORTHINESS

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Mech. Eng.	Elec. Eng.	Equip. Eng.	T	D	Other		
Define the operating conditions	20			10		3		
Consult the government agencies	15	10		10		2		5,000
Establish the limits to be covered by the standard	10	10		10		2		
Prepare sample calculations and design guides	20	20			5	3		20,000
Establish the position related requirements	10	10		5	5			
Calculate the energy absorption required for each case	20	40		15	10	2		40,000
Define test requirements	20	10		5		1		
Validate the proposed tests	20	40		20		5		200,000
Submit for approval	20	20		20	10	3		
TOTAL	155	160	0	95	30	21		265,000
Senior personnel							315	295,000
Technical personnel							125	63,000
Clerical							21	8,000
SUB-TOTAL								631,000
Miscellaneous								63,000
GRAND TOTAL - Estimated costs								694,000

COMPONENT: ROLLING STOCK MAINTENANCE

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Mech. Eng.	Elec. Eng.	Equip. Eng.	T	D	Other		
Familiarization			20	20				20,000
Review maintenance practices with European railway			40	40		5		
Prepare maintenance practices for local operation			40	40	10	5		
Prepare shop layouts			20	20	40	3		
Coordinate with repair shop design			20	40	10			
Start up shop operation			120	120				
TOTAL			260	280	60	13		20,000
Senior personnel							260	244,000
Technical personnel							340	170,000
Clerical							13	5,000
SUB-TOTAL								439,000
Miscellaneous								44,000
GRAND TOTAL - Estimated costs								483,000

COMPONENT: OPERATION ON LOW SPEED TRACKS

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Mech. Eng.	Civil Eng.	Equip. Eng.	T	D	Other		
Familiarization with typical routes.			15	10				
Review of level crossing situation			10	10				
Snow accumulation			20	20				
Station platforms dimensions			5	5		5	Travel expense	5,000
Other traffic volume and definition			10					
Present function of right of way and track			15	10				
Prepare estimate of route adaptation		60		20	20	2		
Prepare estimate of rolling stock adaptation			40	60	20	4		
Present to transportation regulatory agencies			20			2		
Run winter test for snow clearing of level crossings		30	30	40		5		30,000
Evaluate (test) ride quality of train. Determine max. speed and speed limitations		20	40	60	40	4		100,000
Evaluation overall results		20	20	20	10	2		
Presentation for decision		10	20	20	10	3		
TOTAL		140	245	275	100	27		135,000
Senior personnel							385	361,000
Technical personnel							375	188,000
Clerical							27	10,000
SUB-TOTAL								694,000
Miscellaneous								69,000
GRAND TOTAL - Estimated costs								763,000

COMPONENT: PANTOGRAPH - CATENARY DYNAMICS

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Res. Eng.	Elec. Eng.	Equip. Eng.	T	D	Other		
Familiarization with catenary systems		20	5	5				
Familiarization with pantograph characteristics		20	10	10		2		
Modelling of pan.-cat.- joint dynamic behavior	60							25,000
Check of 3 or 4 pan.-cat. combinations	20							16,000
Report of evaluation		10				3		
Test 2 likely pantographs with chosen catenary		40	20	30	15			60,000
Report and conclusions		10				4		
TOTAL	80	100	35	45	15	9		101,000
Senior personnel							215	201,000
Technical personnel							60	30,000
Clerical							9	3,000
SUB-TOTAL								335,000
Miscellaneous								34,000
GRAND TOTAL - Estimated costs								369,000

COMPONENT: OPTIMUM SPACING OF 2 OR MORE PANTOGRAPHS

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Mech. Res.	Elec. Eng.	Equip. Eng.	T	D	Other		
Familiarization with possible arrangements	10	5	5					
Simulation of various arrangements	30	15	5			3		24,000
Test train to verify speeds near critical situation. Verify also with wind action (20 days)	20		20	30	10	5		100,000
Prepare report and recommendations	10		5		5	3		
TOTAL	70	20	35	30	15	11		124,000
Senior personnel							125	117,000
Technical personnel							45	22,000
Clerical							11	4,000
SUB-TOTAL								267,000
Miscellaneous								27,000
GRAND TOTAL - Estimated costs								294,000

COMPONENT: REGENERATIVE BRAKING (trains only)

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Elec. Eng.	Mech. Eng.	Res.	T	D	Other		
Line occupation determination		15						
Equipment requirement	20					1		
Braking rate		10						
Use in emergency application	10	10						
Additional equip, required	10							
Weight of equipment added	5			10		1		
Presentation to transportation and maintenance	5	10		5	5	3		
Savings in friction material and maintenance		10		10				
Need for resistors	10							
Consult technology experts	15	15						5,000
Simulation of train operation to determine energy absorbed			30	30		3		20,000
TOTAL	75	70	30	55	5	8		25,000
Senior personnel							175	164,000
Technical personnel							60	30,000
Clerical							8	3,000
SUB-TOTAL								222,000
Miscellaneous								22,000
GRAND TOTAL - Estimated costs								244,000

COMPONENT: TRACK GEOMETRY

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Civil Eng.	Res.		T	D	Other		
Determine what sectors are problematic and type of problems	20							
Define nature of tests required	10	10						
Prepare test program		40				2		
Test:								
- Stability: temperature		10		15	5			8,000
- Stability: axle load	20	15		20	5	3		12,000
- Movement in curves due to speed		10		15	5			8,000
- V & H movement over time - soft base		10		20	5			8,000
Special equipment design:								
- Stability: temperature		3		5	10			
- Stability: axle load	20	3		5	10	2		
- Movement in curves due to speed		3		5	10			
- V & H movement over time - soft base		3		5	10			
TOTAL	70	107		90	60	7		36,000
Senior personnel							177	166,000
Technical personnel							150	75,000
Clerical							7	3,000
SUB-TOTAL								280,000
Miscellaneous								28,000
GRAND TOTAL - Estimated costs								308,000

COMPONENT: ROUTE INTEGRITY

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Civil Eng.	Mech. Res.	Elec. Res.	T	D	Other		
Define the limit conditions	15							
Preliminary design		20	20	20	10	1		
Design review	5	5	5	5		1		
Final design	10	10	10	20	15			
Prototype fabrication		5	5	10				10,000
Prototype test		5	5	10				15,000
Rework		5	5	10	10			
Relest	5	5	5	10				10,000
Service test				15		2		5,000
TOTAL	35	55	55	100	35	4		40,000
Senior personnel							145	136,000
Technical personnel							135	68,000
Clerical							4	1,000
SUB-TOTAL								245,000
Miscellaneous								25,000
GRAND TOTAL - Estimated costs								270,000

COMPONENT: WINTER OPERATION YARDS (see also A-3)

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Mech. Eng.	Civil Eng.	Equip. Eng.	T	D	Other		
Familiarization with train scheduling	15			10				
Familiarization with station trackage	15			10				
Determination of space requirements for snow plowing and snow storage	10			15	10			
Proposal for tack layouts	10			5	15	2		
Determination of snow fall and accumulation	5			15				
Study means available to clear snow: - Main line	5							
- Yards	5							
- Switches local	5							
- Switches foreign	15							
Discuss situation with Transportation & Track Maintenance	10							
Coordination transportation and track maintenance	15			20		2		
Prepare track layout & storage facility		40		10	20	2		
Propose specialized snow removal equipment (consult specialists)	20			30	10			
Consul foreign railways	10					2		5,000
TOTAL	140	40		115	55	8		5,000
Senior personnel							180	169,000
Technical personnel							170	85,000
Clerical							8	3,000
SUB-TOTAL								262,000
Miscellaneous								26,000
GRAND TOTAL - Estimated costs								288,000

COMPONENT: WEATHER PERFORMANCE OF TURNOUTS

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Civil Eng.	Res. Eng.	Equip. Eng.	T	D	Other		
Determine that testing is required	10					1		
Find location for testing	5							
Purchase switch	5					1		
Adapt switch	5	10		20	10			15,000
Install turnout		5		10		1		10,000
Follow test				20				
Make necessary adjustment to winterize mechanism	5			10	10			5,000
Place in extended service test				20				
Prepare revision for turn-out specification	10			10		2		
TOTAL	40	15		90	20	5		30,000
Senior personnel							55	51,000
Technical personnel							110	55,000
Clerical							5	2,000
SUB-TOTAL								138,000
Miscellaneous								14,000
GRAND TOTAL - Estimated costs								152,000

COMPONENT: PROTECTION OF SIGNALING EQUIPMENT

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Sign. Eng.	Res. Eng.	Equip. Eng.	T	D	Other		
Review equipment to be utilized	5			5		1		
Discuss test with track signal personnel	5			5				
Prepare test program	5	10		10	5	2		10,000
Test				15				
Extended reliability test				20				
Design protection equipment	5			10	20			
Purchase protection equipment				5		1		
TOTAL	20	10		70	25	4		10,000
Senior personnel							30	28,000
Technical personnel							95	47,000
Clerical							4	1,000
SUB-TOTAL								86,000
Miscellaneous								9,000
GRAND TOTAL - Estimated costs								95,000

COMPONENT: DISPOSAL OF WASTE

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Mech. Eng.	Res. Eng.	Equip. Eng.	T	D	Other		
Review car born equipment	10			5				
Evaluate quantity of waste to be handled	5					1		
Evaluate existing means of handling and disposing	10			10				
Test systems for difficult situations	10	15		20	10	1		10,000
Prepare technical specification	10			15	10	3		
Review situation with transportation and car maintenance	5			5		1		
TOTAL	50	15		55	20	6		10,000
Senior personnel							65	61,000
Technical personnel							75	38,000
Clerical							6	2,000
SUB-TOTAL								111,000
Miscellaneous								11,000
GRAND TOTAL - Estimated costs								122,000

COMPONENT: SNOW AND ICE MELTING FACILITY

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Maint. Eng.	Rest. Eng.	Equip. Eng.	T	D	Other		
Review maintenance procedures	20			20		1		5,000
Review foreign experience	20			20				
Discuss dead time:								
. with Transportation	15			15				
. with Train Maintenance	15			15				
Decide on need for facility	15			15				
Prepare proposal	15			15	20	3		
Review with Maintenance	10			10				
Prepare technical spec.	40			40	20	5		
Purchase sample equipment	20			20	5	2		
Test sample equipment	10	20		40		3		20,000
TOTAL	180	20		210	45	14		25,000
Senior personnel							200	188,000
Technical personnel							255	128,000
Clerical							14	5,000
SUB-TOTAL								346,000
Miscellaneous								35,000
GRAND TOTAL - Estimated costs								381,000

COMPONENT: COVERED STORAGE TRACKS

OPERATION	PERSONNEL						TIME days	RESOURCES \$
	Civil Eng.	Mech. Eng.	Elec. Eng.	T	D	Other		
Familiarize with storage tracks		10		10				
Review snow related difficulties:								
. with Transportation		10		10				
. with Car Maintenance		10		10				
Evaluate cost chargeable to snow		15		10		1		
Define roof system	20		20		20			
Estimate cost of construction	20		15	20		2		
Estimate maintenance cost	10					1		
Compare station and shop benefits		10		10				
Prepare proposal		15		10		2		
Presentation		5						
TOTAL	50	75	35	80	20	6		
Senior personnel							160	150,000
Technical personnel							100	50,000
Clerical							6	2,000
SUB-TOTAL								202,000
Miscellaneous								20,000
GRAND TOTAL - Estimated costs								222,000

HIGH SPEED RAIL - R & D WORK LOAD AND TIMING

RAILWAY	PRELIMINARY ACTION	OFFICIAL START	PROTOTYPE WORK	1ST SERIE TRAINS	2ND SERIE TRAINS	3RD SERIE TRAINS	4TH SERIE TRAINS
JAPAN Shin'ansen (JNR & JN)	1956: Board of enquiry into Tokaido.	1958: Approval of basic principles. Choices of fundamental system.	1962: Design and construction of 2 prototypes (6 cars).	Series 0 1964: Opening of line. 1965: 3rd long term plan. Construction of new trains for new lines and extensions. Continuous R & D to correct and improve - Snow, noise, reliability, durability, trucks, brakes, weight, etc. 1969: Prototype 951 (2 cars). Later: Prototype 951 (6 cars). 1970-1981: Snow problems R & D and tests '79, '80, '81.	Series 200 1969: Prototype 961 1977: Prototype 962 1980: Delivery Incorporation improvement but similar to Series 0.	Series 100 1985: Prototype Radical carbody changes - 2 double deck cars/train. 1985: Order 1987: Service Energy savings, reduced axle load, reduced interior noise, Eddy current disk brakes.	Series 300 1986: Prototype order 1989: Delivery
FRANCE TGV (SNCF)	1966: Research on Paris-Lyon route. Selection of basic principles.	1967: R & D 37.4 million francs.	1967: TGS 1969: 10 ETG 1973: RTG TGV-001 1969: Order 1972: Delivery 1972/78: Tests RTG-1 1972/74: Test trucks. Also Z-7001 body mounted motors.	TGV - PARIS S-E 1971: Decision 1974: Call tender - 2 trains final 1976: Final approval and order for 85-95 trains 1978: Delivery 1981: Inauguration 1983: Additional order (10 sets) 1984: 2.5 postal TGV 1983: Speed increased 260-270 km/h 1983: Tri-current sets 1986: Air suspension Development of motors, traction systems, trucks suspension, brakes.	TGV-A 1975/79: Preliminary work 1984: Decision Traction system A-C synchronous motors, trucks developed to reduce cost, increase performance. TGV-R 1990: Development work on aluminum carbody, bi-level, asynchronous motors, pantograph, brakes. 300-320 km/h, pressure sealing.	TGV-ZN Logical development to increase carrying capacity without increasing axle load. Reduction in noise level. Disc brakes on power car. 1991: Order TGV-PBKA: 4 voltages TGV-TMST: aluminum truck frame.	SUPER TGV 1990/94: 4 year R & D program French Gov.: 170 million francs SNCF: 95 million francs GBC-ALST: 445 million francs 350 km/h. 1200 - 1250 kw motor. Eddy current brake. Carbon disc brakes.
GERMANY ICE (DB)	1970: ET 403, three-4 car prototypes, 4 th th, all powered (1979 with drawn) 1975: Consortium concept 400 km/h. 1977: Roller rig, test built. 1980: Test car.	1982: DB/industry partnership - DB: 12 million marks Indus.: 16 million marks Gov.: 44 million marks Test train 1982: Order 1985: Delivery (5 cars) 3 ph AC traction, 2 type trucks.	ICE-A 1988: Order for 41 trains 1990: Order for 19 trains 1989: Start multi-voltage version (ICE-M). 1991: Design completion 1995: Prototypes (2) ICE-A coil spring, sec. suspension replaced by air suspension on later series. 1991: Push-pull version	ICE-M Scheduled for 1996-1997 1991: Design 1995: 2 prototypes ICE-400 Project begun			

APPENDIX F

**CANADIAN POTENTIAL MANUFACTURERS LISTED BY HSR
COMPONENTS AND VOLUMES REQUIRED**

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: POWER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
CARBODY						
1. POWER CAR ASSEMBLY (*)	1	2	56	94	Bombardier Inc. (La Pocatière, Quebec) 800 René Lévesque Blvd W. Montreal (Quebec) Tel.: 861-9481 GE Locomotives Montreal - Tel.: 253-7333 GM of Canada Ltd. P.O. Box 5160 London (Ontario) Tel.: (519) 452-5590 Atelier Montreal Facility 1830 Leber Street Montreal (Quebec) Tel.: 399-5168 - Attn. Mr. Fausto Levy	
2. STAINLESS STEEL	4,536 kg	N/A	254,016 kg	N/A	Atlas Alloys 241 Hymus Pointe Claire (Québec) Tel.: 695-7310	
3. LAHT STEEL	N/A	13,600 kg	N/A	639,200 kg	Stelco - Dofasco - Algoma	
4. FLOOR ASSEMBLY	10 m2	20 m2	560 m2	940 m2	Railtech 325 Lee Avenue Baie d'Urfe (Quebec) Tel.: 457-4760	

(*) The power car should be built and assembled by a car builder familiar with Motive Power. Shops must include testing facilities for auxiliaries and certain traction power equipment. Motorized transit rolling stock or locomotive production experience required.

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: POWER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
CARBODY (cont'd)						
5. THERMAL INSULATION	224 m2	560 m2	12,600 m2	26,320 m2	Mineral Wool - Poly Styrene - Poly Urethane	
6. FRP CAB END MOULDING (*)	2	2	112	94	GSM Des. 1400 Pomba Montreal (Quebec) Tel.: 337-3041 Fibrex Fibre de verre Inc. 325 Levellé Terrebonne (Quebec) Tel.: 471-3057	
7. DOORS (*)	8	8	448	376	Raltech Vapor Canada Inc. 10655 Henri Bourassa W. Montreal (Quebec) Tel.: 335-4200	
8. ENERGY ABSORBING END STRUCTURE (*)	2	2	112	94	BY THE CAR BUILDER	
9. GLAZING (SET) (*)	2	2	112	94	Pyramid Transit Products Ltd. 86 Leacock Tel.: 351-5583 Marquez Transtech Ltd. 8810 Pascal-Gagnon St-Leonard (Quebec) Tel.: (514) 322-7477	

(*) Additional component(s) required for the driving trailer (cab equipped).

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: POWER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
TRUCKS						
1. FRAME (*)	2	4	112	188	Bombardier 800 René Lévesque Blvd. Montreal (Quebec) Tel.: 861-9481 GE Locomotives 1505 Dickson Montreal (Quebec) Tel.: (416) 253-7333 General Motors of Canada Ltd. P.O. Box 5160 London, (Ontario) Tel.: (519) 452-5590 Atelier Montreal Facility (AMF) 1830 Leber Street Montreal, Pt. Charles (Quebec) Contact: Fausto Levy Tel.: 399-5168	
2. WHEELS	8	16	448	752	Canadian Steel Wheel 1900 Dickson Montreal (Quebec) Tel.: 255-3605	
3. AXLES	4	8	224	378	Canadian Bronze Co. Ltd. 125 St Joseph Lachine (Quebec) Tel.: 639-1785	

(*) Truck frame could be built (welded plate construction) by locomotive builders or by a good quality plate manufacturer. Transfer of technology is required. It is almost a pre-requisite for assembly of trucks in Canada.

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: POWER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	58 - ABB	47 - TGV		
TRUCKS (cont'd)						
4. GEAR (*)	N/A	8	N/A	376	<p>Quebec Gear Works 2525 Halpern Montreal (Quebec) Tel.: 334-5943</p> <p>Industries Unigear Inc. 20375 Clark Graham Ave. Baie d'Urfe (Quebec) Tel.: (514) 457-7700</p> <p>Wilson Machine Co. 2299 Lapierre LaSalle (Quebec) Tel.: 385-4101</p> <p>Unigear Industries 20375 Clark Graham Baie d'Urfe (Quebec) Tel.: 459-7700</p>	
5. BRAKE DISCS	8	N/A	448	N/A		<p>Wabco Air Brake 227 Tulip Str. Dorval (Quebec) Tel.: 633-1501</p> <p>Knorr Brakes Ltd. 7575 TransCanada Rd. Montreal (Quebec) Tel.: 335-0000</p>

(*) Gears can be manufactured locally. The gear boxes are relatively complex and the original manufacturers may be reluctant to allow the transfer of technology.

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: POWER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
TRUCKS (cont'd)						
6. BEARINGS (*)	8	16	448	752		Timken - Gen. Bearing Service 1326 Notre Dame W. Montreal (Quebec) Tel.: 937-7923 SKF Canada 12055 Cote de Liesse Dorval (Quebec) Tel.: 636-5230
7. GEAR (WHEEL SLIDE)	4	8	224	376		
8. WHEEL-AXLE ASSEMBLIES	4	8	224	376		Atelier Montreal Facility (AMF) CP Rail 910 Peel St. Montreal (Quebec) Tel.: 395-5151
9. TREAD BRAKE UNIT	8	16	448	752		Wabco Air Brake (Montreal) Knorr Brake (Montreal)
10. CALIPER ASSEMBLY	8	N/A	448	N/A		Wabco Air Brake (Montreal) Knorr Brake (Montreal)
11 BEARING HOUSING	8	16	448	752	Dofasco Inc. 1330 Burlington St. E. Hamilton (Ontario) Tel.: (416) 544-3761	SKF of Canada

(*) The bearing and the lubricant will require approval for high speed operation.

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: POWER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
12. PRIMARY SPRING SET	N/A	16	N/A	752		Associated Springs 3100 Mainway Burlington (Ontario) Tel.: (416) 335-6688 Bohne Spring Industries 60 Coronet Rd. Etobicoke (Ontario) Tel.: (416) 335-6688
13. CHEVRON SPRING	8	N/A	448	N/A		
14. RUBBER DAMPERS	N/A	32	N/A	1,504		
15. HYDRAULIC DAMPER (primary)	8	16	448	752		KONI USA 100 Alphin Lane Culpeper, VA 22701 Tel.: (703)547-3288
16. REDUCTION GEAR UNIT (*)	4	8	224	376	See note (*)	
17. QUILL SHAFT	4	N/A	224	N/A	Ateliers M. Driveshaft Inc. 2515 Leger Str. Lasalle (Quebec) Tel.: (514) 363-1821	
18. TRIPOD TRANS.	N/A	8	N/A	376	Truck manufacturer	
19. TRACTION MOTOR	N/A	8	N/A	376	See note (*)	
20. SPRINGS (secondary)	N/A	16	N/A	752		Associated Springs
21. AIR CUSHION ASSEMBLY	4	N/A	224	N/A		

(*) Gears can be manufactured locally. The gear boxes are relatively complex and the original manufacturers may be reluctant to allow the transfer of technology.

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: POWER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
TRUCKS (cont'd)						
22. LEVELLING VALVE	2	N/A	112	N/A	Wabco Canada	
23. AIR TANK	2	N/A	112	N/A	Railtech Ltd. 325 Lee Ave Baie d'Urfe Tel.: 457-4760	
24. TORSION BAR ASSEMBLY	2	4	112	188	Truck manufacturer	
25. TRACTION ROD	2	N/A	112	N/A	Truck manufacturer	
26. PIVOT ASSEMBLY	N/A	4	N/A	188	Truck manufacturer	
27. HYDRAULIC DAMPERS (secondary susp.)	12	8	672	376		KONI USA
28. TRACTION MOTOR (*)	4	8	224	376		ABB 3000 Halpern Montreal (Quebec) 100 Alphin Lane Tel.: 865-6222 GEC-ALSTHOM 9 Place du Commerce Brossard (Quebec) Tel.: 465-9795
29. TRUCK ASSEMBLY	2	4	112	188		Bombardier - Montreal GE Locomotive - Montreal GM of Canada - London (Ontario) AMF - Montreal

(*) Traction motors of this type are no longer produced in Canada. This is a large capital investment item.

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: POWER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
ELECTRICAL EQUIPMENT						
1. PANTOGRAPH	2	4	112	188	Not manufactured in Canada	ABB Faiveley/Wabco Air Brake P.O. Box 2050 Hamilton (Ontario) L8N 3T5 Tel.: (416) 561-8700
2. MAIN CIRCUIT BREAKER	1	2	56	94	Not manufactured in Canada	ABB GEC-ALSTHOM
3. TRANCTION EQUIPMENT (SET):(*)	1	2	56	94	Not manufactured in Canada	ABB
a) Main transformer	1	N/A	56	N/A	Not manufactured in Canada	ABB & WESTINGHOUSE CANADA INC.
b) Line converter	2	N/A	112	N/A	Not manufactured in Canada	ABB
c) Feed back chopper	2	N/A	112	N/A	Not manufactured in Canada	ABB
d) Inverter	2	N/A	112	N/A	Not manufactured in Canada	ABB
e) Smoothing coil	1	N/A	56	N/A	Not manufactured in Canada	ABB
f) Power electronic cooling fan	2	N/A	112	N/A	Not manufactured in Canada	ABB
g) Main bloc	N/A	2	N/A	94	Not manufactured in Canada	GEC-ALSTHOM
h) Rectifier	N/A	2	N/A	94	Not manufactured in Canada	GEC-ALSTHOM
i) Power/brake switch	N/A	2	N/A	94	Not manufactured in Canada	GEC-ALSTHOM
j) Cooling blower	N/A	2	N/A	94	Not manufactured in Canada	GEC-ALSTHOM

(*) In both cases the equipment is specially designed by the manufacturer and is a custom assembly for the application. Not likely to be manufactured in Canada

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: POWER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
ELECTRICAL EQUIPMENT (cont'd)						
3. TRANCTION EQUIPMENT (cont'd)						
k) Smoothing coil	N/A	4	N/A	188	Not manufactured in Canada	GEC-ALSTHOM
l) Main transformer	N/A	2	N/A	94	Not manufactured in Canada	GEC-ALSTHOM Westinghouse Canada Inc.
m) Braking resistor	N/A	2	N/A	94	Westinghouse Canada Inc. 120 King St. W. Hamilton (Ontario) Tel.: (416) 528-8811	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: POWER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
AUXILIARY POWER (*)						
1. AUX. RECTIFIER	1	2	56	94		
2. AUX. TRANSFORMER	N/A	2	N/A	94		
3. AUX. STEP DOWN CHOPPER	N/A	2	N/A	94		
4. INVERTER	1	N/A	56	N/A		
5. LOW VOLTAGE DISTRIB. PANEL	1	2	56	94	Davanac Inc. 135 Montée de Liesse Montral (Quebec) Tel.: 738-1403 Vapor Canada Inc.	
6. CIRCUIT BREAKER PANEL	1	2	56	94	Davanac Inc. Vapor	ETA Circuit Breakers Ltd. 586 Champagne Drive Downview (Ontario) Tel.: (416) 630-7614
7. CABLING	1	2	56	94	Anixter Canada 2075 - 52e Ave. Lachine (Quebec) Tel.: 636-3636 Pirelli Cables 425 St-Louis St Jean sur Richelieu (Quebec) Tel.: 658-1731	

(*) Like the Traction Power Converter, the Auxiliary Power Equipment is generally custom designed to suit the specific application.
This group of equipment should have an undefined but GREATER Canadian content.

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: POWER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
AUXILIARY POWER (*) (cont'd)						
8. BATTERIES (SET)	1	2	56	94	SAFT 200 Middlefield Scarborough Tel.: (416) 298-7322 VARTA Industrial Batteries 5000 François Casson Montreal (Quebec) Tel.: 636-8544	

(*) Like the Traction Power Converter, the Auxiliary Power Equipment is generally custom designed to suit the specific application. This group of equipment should have an undefined but GREATER Canadian content.

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: POWER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
AUXILIARY EQUIPMENT						
1. COMPRESSOR	1	2	56	94	Ingersoll Rand 3501 St-Charles Kirkland (Quebec) Tel.: 695-9040	Knorr Brake Corp. 385 Walline Ave. Mississauga (Ontario) Tel.: (416) 890-1550 or (514) 335-0000 Wabco Air Brake co. P.O. Box 2050 Hamilton (Ontario) Tel.: (416) 561-8700 ext. 218
2. AIR DRYER	1	2	56	94	Xebec 110 Pointe Langlois SteRose (Quebec) Tel.: 622-4240	Pandrol (Salem Dryer) 8310 Cote de Liesse Montreal (Quebec) Tel.: 735-1112
3. TRACTION MOTOR BLOWER & FAN	2	4	112	188		
4. BRAKE CONTROLS (*)	2	2	112	94		Knorr Brake Corp. Wabco Air Brake co.
5. POWER ELECTRONICS COOLING FANS	1	N/A	56	N/A		ABB
6. WHEEL SLIDE EQUIPMENT	4	8	224	376		Knorr Brake Corp. Faiveley/ Wabco Air Brake co.

(*) Equipment required for the driving trailer included here.

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: POWER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
CAB EQUIPMENT (*)						
1. INSTRUMENTS & GAUGES	2	2	112	94	Bach-Simpson London (Ontario)	
2. CONSOLE & CABINETS	2	2	112	94		
3. SEAT	4	4	224	188	Baultar 1040 Queen Blvd. N. Sherbrooke (Quebec) Tel.: (819) 564-3211 Railtech Otaco Seating Co. Orillia Ontario)	
4. DISTRIBUTION PANEL	2	2	112	94		
5. MONITORING & CONTROLS (Including computers)	2	2	112	94		Faiveley/Wabco Air Brakes ABB
6. EVENT RECORDER	2	2	112	94	Q'TRON 92 Queen Greenfield Park (Quebec) Tel.: 963-9433	Bach-Simpson
7. HEAT - VENT. - AIR CONDITIONING	2	2	112	94	Vapor	Prime IEC-Holden 8180 Cote de Liesse Montreal (Quebec) Tel.: 735-4371

(*) Equipment required for the driving trailer included here.

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: POWER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
CAB EQUIPMENT (cont'd) (*)						
8. PUBLIC ADDRESS	1	1	56	47	Faiveley/Wabco Air Brakes	
9. RADIO - TEL.	1	1	56	47		Vale-Harmon 2700 Brabant Mariveau Montreal (Quebec) Tel.: 856-1026 Motorola 5959 TransCanadienne Montreal (Quebec) Tel.: 744-2333
10. CAB SIGNAL	2	2	112	94	Alcatel Canada 9 Place du Commerce Brossard (Quebec) Tel.: 465-9795	
11. REGULATORY LIGHTS	2	2	112	94		GE Canada 2425 Pittfield St-Laurent (Quebec) Tel.: 333-2620
12. ATCS	1	1	56	47	Vapor Canada Inc.	

(*) Equipment required for the driving trailer included here.

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: POWER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
MISC. EQUIPMENT						
1. COUPLER (Front) (*)	2	2	112	94	Not manufactured in North America	Uddemann 446 Hazelhurst Rd. Mississauga (Ontario) Tel.: (416) 823-9200
2. COUPLER (Rear)	1	2	56	94	Not manufactured in North America	Uddemann
3. DIAPHRAGM	1	2	56	94	Not manufactured in Canada	Bendix/Power Parts Co. 135 Montée de Liesse Montreal (Quebec) Tel.: 738-1403

(*) Coupler for driving trailer included here.

N/A = NOT APPLICABLE

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: TRAILER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
CARBODY						
1. Shell	5	N/A	280	N/A	Bombardier Inc. (La Pocatière, Québec) 800 René Lévesque Blvd W. Montreal (Quebec) Tel.: 861-9481 Atelier Montreal Facility 1830 Leber Street Montreal (Quebec) Tel.: 399-5168 - Attn. Mr. Fausto Levy National Steel Car Corp. Hamilton (Ontario) Tel.: (416) 544-3311 Wabco Canada Ltd.	
2. SHELL	N/A	8	N/A	376	Bombardier Inc. (La Pocatière, Québec) *	
3. DOORS	20	16	1,120	752	Vapor Canada Inc. 10655 Henri Bourassa W. Montreal (Quebec) Tel.: 335-4200 Railtech Ltd. 325 Lee Avenue Baie d'Urfe (Quebec) Tel.: 457-4760	

* Bombardier has TGV's patent rights; however, they could sub-contract to AMGF and NSC.

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: TRAILER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
CARBODY (cont'd)						
4. WINDOW ASSEMBLIES (Frame & Glass)	90	92	5,040	4,324	Robert Mitchell Inc. 350 Décarie St-Laurent (Quebec) Tel.: 747-2471 Pyramide Transit Products Ltd. 86 Leacock Pointe Claire (Quebec) Tel.: 694-3631 Marquez Transtech Ltd. 8810 Pascal Gagnon St-Leonard (Quebec) Tel.: (514) 322-7477	
5. STAINLESS STEEL SHEET	1,860 m2	N/A	104,160 m2	N/A	Atlas Alloys 161 The West Mall Etobicoke (Ontario) Tel.: (416) 622-3100 Canadian Metal Rolling Mills 2304 Dixie Rd. Mississauga (Ontario) Tel.: (416) 270-5300	
6. HIGH TENSILE SHEET	N/A	2,975 m2	N/A	139,825 m2	Atlas Alloys Canadian Metal Rolling Mills Dofasco-Algoma	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: TRAILER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	58 - ABB	47 - TGV		
CARBODY (cont'd)					Stelco 110 de la Bare Long Montreal (Quebec) Tel.: 442-3553	
7. ANTI-ROLL DAMPER	N/A	18	N/A	846	Not manufactured in North America	Supplier by US representative: KONI Tel.: (703) 825-7591
8. UPPER INTER-CAR DAMPER	N/A	18	N/A	846	Not manufactured in North America	Same as item 7
9. RUBBER DIAPHRAGM	5	N/A	280	N/A	B.F. Goodrich Canada Ltd. 315 Brunswick Pointe Claire (Quebec) Tel.: (514) 426-3500	Power Parts Co. 135 Montée de Liesse Montreal (Quebec) Tel.: (514) 738-1403
10. EXTERIOR PAINT SYSTEM	1,820 litres	3,030 litres	101,920 litres	142,410 litres	Downing Products Ltd. 1329 Matheson Bld. Mississauga (Ontario) Tel.: (416) 624-2641 International Paint Ltd. 19500 Trans-Canada Hyw. Tel.: (514) 457-4155 Sico Inc. 2505 Metropole Street Longueuil (Quebec) Tel.: (514) 527-5111 Dupont Canada Ajax (Ontario)	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: TRAILER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
TRUCKS						
1. FRAME (Weldment)	10	9	560	423	Bombardier La Pocatiere (Quebec) Tel.: 861-9481 National Steel Car Corp. Hamilton, Ontario Tel.: (416) 544-3311 Atelier Montreal Facility (AMF) 1830 Leber Street Montreal, Pt. Charles (Quebec) Contact: Fausto Levy Tel.: 399-5168	
2. WHEELS	40	36	2,240	1,692	Canadian Steel Wheel 1900 Dickson Montreal (Quebec) Tel.: 255-3605 Griffin Canada Inc. St-Hyacinthe (Quebec) Tel.: 774-5311	
3. AXLES	20	18	1,120	846	Canadian Bronze Co. Ltd. 15 Bury St. Winnipeg, Man. Tel.: (204) 786-6821	
4. DISCS (Brake)	40	72	2,240	3,384	Knorr Brakes Ltd. Mississauga (Ontario) Tel.: (416) 890-1550	Bombardier Inc. Montreal Office Tel.: 861-9481

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: TRAILER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
TRUCKS (cont'd)						
5. ROLLER BEARINGS (a) TIMKEN (b) SKF	N/A 64	36 N/A	N/A 3,584	1,692 N/A	Not manufactured in Canada Not manufactured in Canada	Wabco-Westminghouse Air Brake P.O. Box 158 Nun's Island Montreal (Quebec) Tel.: 765-3101 Timken Pointe Claire (Quebec) Tel.: 695-6520 - Contact: Jacques Cantr SKF Canada Montreal Office Tel.: 636-5238 - Contact Jacques Parme
6. WHEELSET ASSEMBLIES	20	18	1,120	846		Atelier Montreal Facility (AMF) 1830 Leber Street Montreal, Pt. Charles (Quebec) Contact: Fausto Levy Tel.: 399-5168 National Steel Car Hamilton (Ontario) Tel.: (416) 544-3311
7. ANTI-HUNTING DAMPER	N/A	18	N/A	846	Not manufactured in Canada	KONI 8085 Production Avenue Florence, KY 41042-3046 Tel.: (606) 727-5000
8. ANTI-PITCH DAMPER	N/A	36	N/A	1,692	Not manufactured in Canada	KONI
9. LOWER ANTI-CAR DAMPER	N/A	18	N/A	846	Not manufactured in Canada	KONI

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: TRAILER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
TRUCKS (cont'd)						
10. COIL SPRINGS	N/A	36	N/A	1,692	Bohne Spring Industries 60 Coronet Rd. Etobicoke (Ontario) Tel.: (416) 231-9000 Barnes Wallace Co. Ltd. 3100 Main Way Burlington (Ontario) Tel.: (416) 335-6688 Chamberlain Springs Ltd. 12320 Vickers Way Richmond (British Columbia) Tel.: (604) 278-3201	
11. RUBBER AIR SPRINGS	20	18	1,120	846	Not manufactured in Canada	Firestone Co. Dorval (Quebec) Tel.: 685-1511
12. BEARING ADAPTERS	40	36	2,240	1,692	Dofasco P.O. Box 2460 Hamilton (Ontario) Tel.: (416) 545-3236	SKF Canada Montreal Office Tel.: 636-5238 Contact: M. Jacques Parmentier
13. TILTING SWING ARM	20	N/A	1,120	N/A	Dofasco	
14. HYDRAULIC TILT ACTUATOR	20	N/A	1,120	N/A	Not manufactured in Canada	KONI
15. LATERAL DAMPERS	32	N/A	1,792	N/A	Not manufactured in Canada	KONI

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: TRAILER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
TRUCKS (cont'd)						
16. TRUCK ASSEMBLY	10	9	560	423	<p>Atelier Montreal Facility (AMF) 1830 Leber Street Montreal, Pt. Charles (Quebec) Contact: Fausto Levy Tel.: 399-5168</p> <p>National Steel Car Hamilton (Ontario) Tel.: (416) 544-3311</p> <p>Bombardier Inc. La Pocatiere (Quebec) Tel.: Montreal office 861-9481</p>	
17. WHEEL SLIDE DEVICE	40	36	2,240	1,692	Wabco Ltd.	
18. LEVELLING VALVES	20	18	1,120	846	Wabco Ltd.	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: TRAILER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
BRAKING SYSTEM						
1. CONTROL VALVE	5	8	280	376	Knorr Brake Corp. 385 Watline Ave. Mississauga (Ontario) Tel.: (416) 890-1550 or (514) 335-0000 Wabco/Westinghouse Air Brake co. P.O. Box 2050 Hamilton (Ontario) Tel.: (416) 561-8700 ext. 218	
2. AIR RESERVOIR	5	8	280	376	Knorr Brake Corp. Wabco/Westinghouse Air Brake co.	
3. AUTOMATIC BRAKE VALVE	5	8	280	376	Knorr Brake Corp. Wabco/Westinghouse Air Brake co.	
4. BRAKE CYLINDER	40	72	2,240	3,384	Knorr Brake Corp. Wabco/Westinghouse Air Brake co.	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: TRAILER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
CAR INTERIOR						
1. FIBREGLASS INSULATION	1,860 m2	2,975 m2	104,160 m2	139,825 m2	Fibreglass Canada Inc. 4100 Younge St. Willowdale (Ontario) Tel.: (416) 733-1600	
2. WALL LAMINATION	1,395 m2	2,230 m2	78,120 m2	104,810 m2	Commercial Plastics Inc. 47 Gurney Cresc. Toronto (Ontario) Tel.: (416) 787-4214 Forbo-Arborite Inc. 385 Lafleur Ave. Lasalle (Quebec) Tel.: (514) 366-2710 Frank Ralphs Ltd. Dorval (Quebec) Tel.: (514) 683-4322	Melamine Decorative Inc. 5605 Cypihot Montreal (Quebec) 335-2003
3. FLOORING (Plymetal)	375 m2	600 m2	21,000 m2	28,200 m2	Goodfellow Inc. 225 Goodfellow St. Delson (Quebec) Tel.: 635-6511 Railtech Ltd. 325 Lee Ave. Baie d'Urfe (Quebec) Tel.: 457-4760	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: TRAILER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
CAR INTERIOR (cont'd)						
4. CARPET	373 m2	600 m2	21,000 m2	28,200 m2	Peerless Carpet Co. 1 Dawson-Mart "D" (Place Bonaventure) Montreal (Quebec) Tel.: 878-6800 Burlington Carpet Mills Ltd. 9 West Drive (Bramalea) Brampton (Ontario) Tel.: (416) 457-6600 Crossley Carpet Mills Ltd. 40 Constellation Ct. Rexdale (Ontario) Tel.: (416) 675-3030 Interface Flooring Systems 85 St-Paul West Tel.: 987-1100	
5. SEATS	114 doubles 35 singles	127 doubles 112 singles	6,384 doubles 1,960 singles	5,969 doubles 5,264 singles	Arratech Inc. 2400 Guenette Montreal (Quebec) Tel.: 335-0166 Field Aviation Co. Mississauga (Ontario) Tel.: (416) 566-5400	Protectolite Inc. 84 Railside Rd. Toronto (Ontario) Tel.: (416) 444-4484

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: TRAILER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
CAR INTERIOR (cont'd)						
6. TOILET SYSTEM	10	8	560	376	Fibrex 325 Léveillé Terrebonne (Quebec) Tel.: 471-3057	
7. END DOOR LOCKS	12	20	672	940	Railtech Ltd.	James L. Howard 10 Britton Dr. Bloomfield, CT 06002 Tel.: (203) 242-3581
8. SIDE & END DOOR HANGERS	30	60	1,680	2,820		Morton Manufacturing Co. Libertyville, Ill 60048 Tel.: (312) 362-5400
9. ON-BOARD ELECTRONIC SYSTEM	6	10	336	470	Pylon-Electronics Inc. MPB Technologies Inc. Primetech Inc.	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: TRAILER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
HEATING AND AIR CONDITIONING						
1. COMPRESSOR/CONDENSOR UNIT	5	8	280	376	Primetech Electroniques Inc. 7115 Trans-Canada Hyw. St-Laurent (Quebec) Tel.: (514) 421-0023	Vapor Canada Inc. 10655 Henri Bourassa W. Montreal (Quebec) Tel.: 335-4200
2. BLOWER FAN & EVAPORATOR COIL	5	8	280	376	Vapor Canada Inc. 10655 Henri Bourassa W. Montreal (Quebec) Tel.: 335-4200	
3. BASEBOARD HEATERS (ELECTRIC)	190 m	305 m	10,640 m	14,335 m	Vapor Canada Inc. Chromalux of Canada 10500 Cote de Liesse Lachine (Quebec) Tel.: 633-0970	
4. THERMOSTATS	20	32	1,120	1,504	Vapor Canada Inc. Honeywell Ltd. 8 Place du Commerce Iles des Soeurs (Quebec) Tel.: 765-9355	
5. CONTROL PANEL	5	8	280	376	Vapor Canada Inc.	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: TRAILER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
WATER SYSTEM						
1. WATER TANK	5	8	280	376	<p>O'Connor Tanks Ltd. 15 Bermondey Rd. Toronto, Ontario Tel.: (416) 751-1140</p> <p>Railtech 325 Lee Ave. Baie d'Urfe, Quebec Tel.: 457-4760</p> <p>Réservoirs GIL-FAB International Inc. 12655 April St. Montreal (Quebec) Tel.: (514) 322-1510</p> <p>Industries d'acier Inoxydable Ltée 5675 Boul. des Grandes Prairies St-Leonard (Quebec) Tel.: (514) 322-1431</p>	
2. WATER TANK CASING	5	8	280	376	<p>AMF 1830 Leber St. Montreal, Quebec Tel.: 399-5168</p> <p>Railtech</p>	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: TRAILER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
WATER SYSTEM (cont'd) 3. WATER COOLER	5	8	280	376	<p>Sunroc 6221 Marivaux St-Leonard, Quebec Tel.: 328-6645</p> <p>G.H. Wood Ltd. 167 Hymus Pointe-Claire (Quebec) Tel.: (514) 695-0151</p>	<p>Aquarius Water Coolers 8038 - 22nd Avenue St-Michel, Quebec Tel.: 729-6313</p>

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: TRAILER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
EMERGENCY LIGHTING SYSTEM						
1. BATTERIES	160	256	8,960	12,032	<p>GNB Batteries Canada Inc. 275 Lewis St. Fort Erie (Ontario) Tel.: (416) 871-6310</p> <p>Surette P.O. Box 2020 Springhill, Nova Scotia Tel.: (902) 597-3767</p> <p>Commercial Battery R.M. Co. Ltd. 173 Labrosse Pointe Claire (Quebec) Tel.: 695-6346</p> <p>SAB-Knife Corp. Montreal (Quebec) Tel.: (514) 331-5762</p>	
2. BATTERY CHARGER	5	8	280	376	<p>GNB Batteries Canada Inc. SAB-Knife Corp.</p> <p>Vapor Canada Inc. 10655 Henri Bourassa Montreal (Quebec) Tel.: 335-4200</p>	
3. CONTROL PANEL	5	8	280	376	Vapor Canada Inc.	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: TRAILER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
 1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
EMERGENCY LIGHTING... (cont'd)						
4. EMERGENCY LIGHTS	100	160	5,600	7,520	T.G.E Ltd. 2113 St-REgis Blvd. Dollard des Ormeaux (Quebec Tel.: (514) 685-7233	
5. BATTERY STATUS MONITOR	6	10	336	470	SAB-Knife Corp.	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: TRAILER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
MISC. ELECTRICAL EQUIPMENT						
1. POWER JUMPER	6	9	336	423	Pyle-National of Canada Inc. 2560 South Sheridan Way Mississauga (Ontario) Tel.: (416) 822-3710 Mr. Steve Riddle	
2. COMMUNICATION JUMPER	6	9	336	423	Pyle-National of Canada Inc.	
3. POWER RECEPTACLE	6	9	336	423	Pyle-National of Canada Inc.	
4. COMMUNICATION RECEPTACLE	6	9	336	423	Pyle-National of Canada Inc.	
5. ELECTRICAL WIRING	28,650 m	45,720 m	1,604,400 m	2,148,840 m	GE Canada 107 Park N. Peterborough (Ontario) Tel.: (705) 748-8486 Pirelli Cables Inc. 425 St-Louis St-Jean-sur-Richelieu, Chambly (Quebec) Tel.: (514) 658-1731 Canada Wire & Cable Ltd. 9545 Cote de Liesse Dorval (quebec) Tel.: (514) 636-7920 Phillips Electronic Ltd. 5930 Cote de Liesse Dorval (quebec) Tel.: (514) 342-9180	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: TRAILER CARS

BASED ON: 1-8-1 CONFIGURATION FOR TGV
1-5-0 CONFIGURATION FOR ABB

Description of major components	Quantity required per trainset		Total volume for trainsets		Canadian Manufacturers	Canadian Suppliers
	ABB	TGV	56 - ABB	47 - TGV		
MISC. ELECTRICAL EQUIP. (cont'd)						
6. TRANSFORMER	5	8	280	376	Signarail Canada Inc., GEC Alstom 9 Place du Commerce Brossard (Quebec) Tel.: 465-5265 ABB (ASEA Brown Boveri Inc. 3000 Halpern Montreal (Quebec) Tel.: 856-6222	
7. LIGHTING PANEL	5	8	280	376	Vapor Canada Inc.	
8. FLUORESCENT TUBES	200	320	11,200	15,040	Eclairage PA-CO Inc. 780 Salaberry St. Laval (QuebecU) Tel. (514) 668-9620	
9. COMMUNICATION EQUIPMENT	6 carsets	10 carsets	336 carsets	470 carsets	Vale Harmon Enterprises Ltd. 2700 Brabant-Merineau Tel.: (514) 856-1024	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN AND US MANUFACTURERS
ELECTRIFICATION - Tasks 2.2 & 3.1

USED ON: POWER STATIONS (TGV or ABB technology)
BASED ON: 48 SUB-STATIONS

Description of Component	Quantity Required for 48 sub-stations	Manufacturers	Catalog Model	Canadian Suppliers	American Suppliers
1. Utility Voltage - Breaker	96	ABB	ASEA HLR 245-2502 (minimum oil)	ABB 5250 Ferrier Street, Room 610 Montreal (Quebec) H1P 2E1 Tel.: (514) 340-7316 GEC Alstom International Canada Inc. 9 S Place du Commerce Brossard (Quebec) J4W 2V6 Tel.: (514) 465-9795	ABB Power T & D Co. Inc. 300 N Curry Pike Bloomington, Indiana 47402 Tel.: (812) 332-4296
2. Utility Voltage - Motor Disconnect.	288	Keamey (Canada)		Kearney National Canada Ltd. 9240 Langlier Blvd. W. St-Leonard (Quebec) H1P 2E1 Tel.: (514) 323-1274	Kearney P.O. Box 49167 Atlanta, GA 30359 Tel.: (404) 939-6011 Attn.: D. Perone
3. Utility Voltage - Lightning Arr.	288	ABB	ASEA Type XAF	ABB	ABB
4. Utility Voltage - L. Surge Counter	288	ABB	ASEA Type TXA	ABB	ABB
5. Utility Voltage - Current Transf.	1,536	Canadian Westinghouse	Type DPC	Westinghouse Canada Inc. 3365 Harvester Rd. Burlington (Ontario) L7N 3N2 Tel.: (416) 528-8811	Westinghouse Electric Corp. The Quadrangle 4400 Alafaya Trail Orlando, Florida 32826-2399 Tel.: (407) 281-2000

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN AND US MANUFACTURERS
ELECTRIFICATION - Tasks 2.2 & 3.1

USED ON: POWER STATIONS (TGV or ABB technology)
BASED ON: 48 SUB-STATIONS

Description of Component	Quantity Required for 48 sub-stations	Manufacturers	Catalog Model	Canadian Suppliers	American Suppliers
6. Utility Voltage - Voltage Transf.	576	Canadian Westinghouse	Type PCA9	Westinghouse Canada Inc.	Westinghouse Electric Corp.
7. Utility Protection-Phase Overcurrent ANSI 50/51 - See Std C37.2	96	GEC Alstom	Type CDG 23	ABB GEC Alstom	GEC Alstom 5625-5 Kennedy Blvd. North Bergen, NJ 07047 Tel.: (800) 678-9322
8. Utility Protection-Gna Overcurrent ANSI 50/51 G	96	GEC Alstom	Type CTG 25	ABB GEC Alstom	GEC Alstom
9. Power Transf.	96	Canadian General Electric	Special Design	Canadian General Electric Co. Ltd. 2300 Meadowvale Blvd. Mississauga (Ontario) L5N 5P9 Tel.: (416) 858-5100	GE Business Information Center One Winners Circle Albany, NY 12205 Tel.: (800) 626-2004
10. Utility Voltage - Protection P. current differentiels ANSI 87	144	GEC Alstom	Type GAG 14 DTH 31 DFA 4C	GEC Alstom	GEC Alstom
11. Rail Voltage - Motorized Disc	96	Kearney Canada	Type KMT 9A	Kearney National Canada Ltd.	Kearney
12. Transformer - Winding Tern. ANSI 49	96	Brown Boveri	Type 49/50/51	ABB	ABB
13. Transformer - S. current diff. ANSI 87	96	GEC Alstom	Type DTH 31 DFA 4C	GEC Alstom	GEC Alstom

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN AND US MANUFACTURERS
ELECTRIFICATION - Tasks 2.2 & 3.1

USED ON: POWER STATIONS (TGV or ABB technology)
BASED ON: 48 SUB-STATIONS

Description of Component	Quantity Required for 48 sub-stations	Manufacturers	Catalog Model	Canadian Suppliers	American Suppliers
14. Transformer - Rail voltage Overcurrent & time ANSI 50/51	96	GEC Alsthom	Type GDG 13 very inverse	GEC Alsthom	GEC Alsthom
15. Transformer - Rail voltage Current transformer	576	Westinghouse	OPC 69	Westinghouse Canada Inc.	Westinghouse Electric Corp.
16. Transformer - Secondary breaker	96	ABB	ASEA BLG 552 TYPE HLP/1451 2501	ABB	ABB
17. Transformer - Rail voltage Voltage transformer	144	Westinghouse	Type APT	Westinghouse Canada Inc.	Westinghouse Electric Corp.
18. Transformer - Rail voltage Current relay directional ANSI 67	96	GEC Alsthom	Type CCD 23	GEC Alsthom	GEC Alsthom
19. Sta. service - Transformer Utility voltage 120V	96	Canadian General Electric		Canadian General Electric Co. Ltd.	GE Business Information Center
20. Sta. service - High voltage Protection - ANSI 59	96	GEC Alsthom	Type VDG 11	GEC Alsthom	GEC Alsthom

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN AND US MANUFACTURERS
ELECTRIFICATION - Tasks 2.2 & 3.1

USED ON: POWER STATIONS (TGV or ABB technology)
BASED ON: 48 SUB-STATIONS

Description of Component	Quantity Required for 48 sub-stations	Manufacturers	Catalog Model	Canadian Suppliers	American Suppliers
21. Sta. service - LOW voltage Protection - ANSI 27	96	GEC Alsthom	Type VAG 70	GEC Alsthom	GEC Alsthom
22. Station service - Batteries	2,880	Exide Lead Calcium Stationery service battery		Exide	
23. Station service - Batteries Charger with grand fault & overvoltage protection and low voltage alarm	96	C.T.S. Canada Ltd 80 Thomas Street Streetville (Ontario) L5M 1Y9 Tel.: (416) 826-1141		Exide	
24. System control & data requisition	48	Glenayre		Glenayre Electronics Ltd. 1570 Kootenay North Vancouver (BC) V5K 4R1 Tel.: (604) 293-1611	Landis & Cyr 6160 Trans Canada Highway St-Laurent (Quebec) H4T 1X9 Tel.: (514) 341-3045
25. Switchyard c/w ground Mat.	48			Markham Electric Ltd. 215 Anderson Ave. P.O. Box 2700 Markham (Ontario) L3P 4C7 Tel.: (416) 294-9405	
26. Rail voltage - Feeder Breaker SF 6	144	ABB	ASEA HPL 145 1250	ABB	ABB

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN AND US MANUFACTURERS
ELECTRIFICATION - Tasks 2.2 & 3.1

USED ON: POWER STATIONS (TGV or ABB technology)
BASED ON: 48 SUB-STATIONS

Description of Component	Quantity Required for 48 sub-stations	Manufacturers	Catalog Model	Canadian Suppliers	American Suppliers
27. Rail voltage - Feeder motorized disconnect.	288	Kearney Canada	Type KMT 9A	Kearney National Canada Ltd.	Kearney
28. Rail voltage - Lightning Arrestors	144	ABB	ASEA type XAF	ABB	ABB
29. Rail voltage - Feeder protection ANSI 50/51 Inst & time overcurrent	144	GEC Alsthom	Type CDG 23 very inverse	GEC Alsthom	GEC Alsthom
30. Rail voltage - Feeder protection ANSI 50/51 reverse current	144	GEC Alsthom	Type CTIG 19 Sta. inst. overcurr.	GEC Alsthom	GEC Alsthom
31. Rail voltage - Feeder protection Undervoltage - ANSI 27	144	GEC Alsthom	Type VAG 70	GEC Alsthom	GEC Alsthom
32. Rail voltage - Feeder protection Overvoltage - ANSI 59	144	GEC Alsthom	Type VDG 11	GEC Alsthom	GEC Alsthom
33. Rail voltage - Feeder protection Zone current	144	GEC Alsthom	Type YTG 14	GEC Alsthom	GEC Alsthom
34. Rail voltage - Feeder protection Reverse current	144	GEC Alsthom	Type VIT 14	GEC Alsthom	GEC Alsthom
35. Rail voltage - Feeder protection Voltage transformer	144	Westinghouse	Type APT 69	Westinghouse Canada Inc.	Westinghouse Electric Corp.

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN AND US MANUFACTURERS
ELECTRIFICATION - Tasks 2.2 & 3.1

USED ON: POWER STATIONS (TGV or ABB technology)
BASED ON: 48 SUB-STATIONS

Description of Component	Quantity Required for 48 sub-stations	Manufacturers	Catalog Model	Canadian Suppliers	American Suppliers
36. Rail voltage - Feeder protection Current transformer	288	Westinghouse	Type OPC 69	Westinghouse Canada Inc.	Westinghouse Electric Corp.
37. Utility voltage - Under frequency Relay ANSI 81	48	ABB	Type 81	ABB	ABB
38. Utility voltage - Under voltage protection ANSI 27	48	GEC Alsthom	Type VDG 13	GEC Alsthom	GEC Alsthom
39. Rail voltage - Bus current Differential protection ANSI 87	48	GEC Alsthom	Type CAG 14	GEC Alsthom	GEC Alsthom
40. Rail voltage - Power factor Correction reactor	48	Trench electric		Trench Electric 71 Maybrook Drive Scarborough (ontario) M1V 4B6 Tel.: (416) 293-8108	
41. Rail voltage - Power factor Capacitors sets	48	Westinghouse		Westinghouse Canada Inc.	Westinghouse Electric Corp.
42. Rail voltage - Power factor Motorized disconnect.	96	Keamey Canada	Type KMT 9A	Kearney National Canada Ltd.	Kearney
43. Rail voltage - P.F. Corr. Breaker SF6	48	ABB	ASEAR HPL 145 2501	ABB	ABB

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN AND US MANUFACTURERS
ELECTRIFICATION - Tasks 2.2 & 3.1

USED ON: POWER STATIONS (TGV or ABB technology)
BASED ON: 48 SUB-STATIONS

Description of Component	Quantity Required for 48 sub-stations	Manufacturers	Catalog Model	Canadian Suppliers	American Suppliers
44. Rail voltage - P.F. Corr. Capacity fuses	96	Westinghouse	Cat. 5737802	Westinghouse Canada Inc.	Westinghouse Electric Corp.
45. Rail voltage - P.F. Corr. Current transformer	240	Westinghouse	Type OPC 69	Westinghouse Canada Inc.	Westinghouse Electric Corp.
46. Rail voltage - P.F. Corr. Overcurrent protection Time & Inst. ANSI 50/51	48	GEC Alsthom	Type CTG 25 stock	GEC Alsthom	GEC Alsthom
47. Rail voltage - P.F. Corr. Current balance ANSI 60	48	GEC Alsthom	Type DTP-C11	GEC Alsthom	GEC Alsthom
48. Rail voltage - P.F. Corr. Reverse current prof.	48	GEC Alsthom	Type CTIG 19	GEC Alsthom	GEC Alsthom
49. Rail voltage - Harmonic filters Motorized disc, main 5th harm and high pass filters	144	Kearney Canada	Cat 324511-1	Kearney National Canada Ltd.	Kearney
50. Rail voltage - Filter breakers Vacuum filter & capacitors	480	Joslyn	VBM	Joslyn Canada Inc. 1590 - 55th Avenue Lachine (Quebec) H8T 3J5 Tel.: (514) 631-6145	Joslyn Power Products Corp. 11610 T S. Austin Avenue Alsip, Ill 60482 Tel.: (708) 597-8190

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN AND US MANUFACTURERS
ELECTRIFICATION - Tasks 2.2 & 3.1

USED ON: POWER STATIONS (TGV or ABB technology)
BASED ON: 48 SUB-STATIONS

Description of Component	Quantity Required for 48 sub-stations	Manufacturers	Catalog Model	Canadian Suppliers	American Suppliers
51. Rail voltage - Current transformer Main, 5th and high pass	144	Canadian General Electric	Type JKW	Canadian General Electric Co. Ltd.	GE Business Information Center
52. Station service - Transformer	48	Canadian General Electric		Canadian General Electric Co. Ltd.	GE Business Information Center
53. Rail voltage - Reactor 5th harmonic filters	48	Trench Electric		Trench Electric	
54. Rail voltage - Capacitor Sct. 5th harmonic, high pass	48	Westinghouse		Westinghouse Canada Inc.	Westinghouse Electric Corp.
55. Rail voltage - Overcurrent Time and inst. 50/51	96	Canadian General Electric	Type IAC	Canadian General Electric Co. Ltd.	GE Business Information Center
56. Rail voltage - Current balance Alarm/trip 61A/61T - Harmonic filters	192	Canadian General Electric	Type IAC	Canadian General Electric Co. Ltd.	GE Business Information Center

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS
Tasks 2.2 & 3.1

USED ON: CATENARY

Description of Component	Quantity Required for TGV	Quantity Required for X-2000	Canadian Manufacturers & Suppliers
1. Contact wire (107mm long - HD copper)	3,160 Km	3,120 Km	Alcatel Canada Wire 250 Ferrand Dr. Don Mills (Ontario) Tel.: (416) 424-5000
2. Messenger wire (70mm long - HD copper)	3,160 Km	3,120 Km	Phillips Cable Ltd. 90 Nolan Markam (Ontario) Tel.: (416) 475-8550
3. Feeder & earth wire (4/0 ACSR)	6,320 Km	6,240 Km	Alcan Aluminium Ltd. 1188 Sherbrooke St. Montreal (Quebec) Tel.: (514) 843-8000
4. Poles (tangent)	19,440 ea.	19,200 ea.	Canron Easton Structural Division 100 Disco Rd. Rexdale (Ontario) Tel.: (416) 675-6400
5. Poles (curves)	12,150 ea.	12,000 ea.	Canron
6. Poles (double-cantilever)	4,860 ea.	4,800 ea.	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS
Tasks 2.2 & 3.1

USED ON: CATENARY

Description of Component	Quantity Required for TGV	Quantity Required for X-2000	Canadian Manufacturers & Suppliers
7. Portal strut	2,430 ea.	2,400 ea.	Dominion Br1dge 665 Tretheway Drive Toronto (Ontario) Tel.: (416) 249-8157
8. Concrete bases (300 lbs ea.)	4,860 ea.	4,800 ea.	Genstar Cement Ltd. Edmonton (Alberta) Tel.: (403) 447-1450
9. Pile foundation (HP10-50 ft @ 42#/ft)	14,580 ea.	14,400 ea.	Dofasco Inc. 1330 Burlington E. Hamilton (Ontario) Tel.: (416) 544-3761
10. Section & overlap insulator	608 ea.	608 ea.	ABB 5250 Ferrier St. Montreal (Quebec) Tel.: (514) 340-7316
11. Cantilever tubing	316,000 m	312,000 m	Ipsco Regina (Sask) Tel.: (306) 949-3530

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN MANUFACTURERS
Tasks 2.2 & 3.1

USED ON: CATENARY

Description of Component	Quantity Required for TGV	Quantity Required for X-2000	Canadian Manufacturers & Suppliers
12. Wire clamps	63,180 ea.	62,400 ea.	Joslyn Canada Inc. 1590 - 55th Avenue Lachine (Quebec) Tel.: (514) 631-6145
13. Footing plates for poles (3/4" plate)	24,300 ea.	24,000 ea.	LOCAL SUPPLIERS OF STEEL
14. Motorized disconnect (paralleling station)	194 ea.	192 ea.	Kearney National Canada Ltd. 9240 Langelier Blvd. St-Leonard (Quebec) Tel.: (514) 323-1274
15. Circuit breaker (special site)	48 ea.	48 ea.	ABB
16. Rail voltage insulators	170,100 ea.	168,000 ea.	Cegelec Industries Inc. 1400 Industriel Blvd LaPrairie (Quebec) Tel.: (514) 659-8921

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN & AMERICAN SUPPLIERS
Tasks 2.2 & 3.1

INFRASTRUCTURE ELEMENT: TRACK

Components	Units	Qty/ D.T. Km	Basis for Quantity Estimate	Total Quantity		Canadian Suppliers	American Suppliers
				TGV 1,215 km	X2000 1,200 km		
1. Rail 136	tons	288	TGV: Tons/DT km + 6% for other tracks X2000: Tons/DT km + 4% for other tracks	371 K	359 K	<p>Sydney Steel Corp. P.O. Box 1450 Sydney (N.S.) B1P 6K5 Tel.: (902) 564-7910 Fax: (902) 564-7903</p> <p>Algoma Steel Corp. 4 Robert ESpeck Parkway, suite 900 Mississauga (Ontario) L4Z 1S1 Tel.: (416) 270-1400 Fax: (416) 276-1452</p>	<p>No us suppliers acceptable to Canada Other non-USA acceptable Nippon Steel c/o Sumitomo Canada Ltd. 1080 Beaver Hall Hill - Suite 2121 Montreal (Quebec) H2Z 1G8 Tel.: (514) 878-8597 Fax: (514) 871-0224</p> <p>Nippon Kawan c/o Mitsui & Co. (Canada) Ltd. 800 Rene Levesque Montreal (Quebec) H3B 1X9 Tel.: (514) 866-4321 Fax: (514) 875-5111</p> <p>Franco Steel Canada Ltd. 5890 Monkland Ave., Suite 303 Montreal (Quebec) H4A 1O2 Tel.: (514) 489-8458 Fax: (514) 489-7227</p>
2. Concrete Ties	each	3,333	60cm centres	4.29 M	4.18 M	<p>CXT: Edmonton plant has completed a contract with CN now shut-down No other Canadian manufacturer at present No doubt CXT would resume with 4 million production requirement</p>	<p>CXT Spokane, Washington Tel.: (509) 924-6300</p> <p>Koppers 436 - 7th Avenue Pittsburg, PA 15219 Tel.: (412) 227-2400</p>

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN & AMERICAN SUPPLIERS
Tasks 2.2 & 3.1

INFRASTRUCTURE ELEMENT: TRACK

Components	Units	Qty/ D.T. Km	Basis for Quantity Estimate	Total Quantity		Canadian Suppliers	American Suppliers
				TGV 1,215 km	X2000 1,200 km		
3. Pandrol Fasteners	each	13,332 clips 6,666 pads 13,332 insulators	4/tie 2/tie 4/tie	17 M 8.5M 17 M	17 M 8.5M 17 M	Pandrol 8310 Cote de Liesse Rd, Suite 100 Montreal (Quebec) Tel.: (514) 735-1112 Fax: (514) 738-6141 Clip manufacturing now transferred to US Pads & Insulations manufactured in Canada	Pandrol P.O. Box 367 Bridge Port, NJ Tel.: (609) 467-3227 Fax: (609) 467-2994
4. Turnouts	each		#46 for cross-overs @ 20 or 25 Km #20 for sidings @ 30Km #8-10 fo yards and storage areas	120 80 100	120 80 20	Yeast-Alpine Nortrak 16160 River Road Richmond (British Columbia) V6V 1L6 Tel.: (604) 273-3030 Fax: (604) 273-8927	ABC Rail Corp. 200 So. Michigan Avenue Chicago, Ill. 60604 Tel.: 1-800-222-2239 A & K Railroad Material 1505 South Redwood Rd. Salt Lake City, Utah 84130 Tel.: (800) 453-8812 Fax: (801) 473-7393
5. Switch Heaters/Blowers	each		1 per turnout	300	200	Hovey Industries 2793 Sexton Rd. Gloucester (Ontario) Tel.: (613) 822-1765	Rails Corp. 100 Nework Way Maplewood, NJ 07040 Tel.: (201) 763-4320 Fax: (201) 763-2585
6. Ballast	c.y.	6,200	35cm below tie	8M c.y.	7.7M c.y.	Inco Ltd. (This firm supplies nickel slag) Copper Cliff (Ontario) P0M 1C0 Attn.: C.A. Tremblay	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN & AMERICAN SUPPLIERS
Tasks 2.2 & 3.1

INFRASTRUCTURE ELEMENT: TRACK

Components	Units	Qty/ D.T. Km	Basis for Quantity Estimate	Total Quantity		Canadian Suppliers	American Suppliers
				TGV 1,215 km	X2000 1,200 km		
6. Ballast (cont'd)						<p>Heckett, Div. of Harsco Corp. (This firm supplies steel slag) P.O. Box 1010 Contrecoeur (Quebec) J0L 1C0 Attn.: Nelson Doherty Tel.: (514) 587-2065</p> <p>Crushed Rock Suppliers Group Grilli 821 Chemin Lac St John Lachute (Quebec) J8H 3W9 Attn.: P. Ladouceur Tel.: (514) 562-1634</p> <p>Construction & Pavage Maskimo P.O. Box 40 Charette (Quebec) G0X 1E0 Attn.: Rene Deziel Tel.: (819) 221-2075</p> <p>Lamarche McGuinty Inc. P.O. Box 539 Shawville (Quebec) J0X 2Y0 Attn.: D. Lamarche</p> <p>Fournier & Fils P.O. Box 878 Val D'Or (Quebec) J9P 4P8 Attn.: Gaston Fournier Tel.: (819) 825-4000</p> <p>Beton B & F Inc. P.O. Box 208, 15153e Ave. Val d'Or (Quebec) J9P 4P3 Attn.: Guy Barrette Tel.: (819) 825-8112</p>	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: SIGNALS AND COMMUNICATIONS

Description of Components	Total Requirements	Canadian Manufacturers	Canadian Suppliers
SIGNALS - CENTRAL MANAGEMENT SYSTEM			
1. Computer assisted manual block system	1	General Railway Signal 6600 TransCanada Highway Pointe Claire (Quebec) Tel.: (514) 694-7350 Fax: (514) 694-0528 Contact: Tom Strumus	ARINC Research Corp. 2551 Riva Road Annapolis, MD 21401 Tel.: (301) 266-4741 Contact: Robert Avers or Lou Sanders (410) 266-4815
2. Visual display unit (VDU)	8	Motorola Ltd. (Communication Division) 3125 Steffles Ave. East North York (Ontario) Tel.: (416) 499-1441 Contact: Dainis Kivlenleks or Vic Wallace (416) 756-5615	AMCI (Automated Monitoring and Control Inter.) 11819 Miami Omaha, Nebraska 68164 Tel.: (402) 496-5838 Fax: (402) 496-5877 Contact: William A. Mathe
3. Data communication package	1	Union Switch & Signal 1000 St Jean Blvd - Suite 407 Pointe-Claire (Quebec) Tel.: (514) 694-9523 Fax: (514) 694-1747 Contact: D.A. McConnell	Harmon Industries Inc. Blue Spring, Missouri 64015 Tel.: (816) 229-3345 Fax (816) 229-0556 Contact: Robert L. Danley
4. Central safety computer	1	SafeTRAN Corp. 3691 Sawmill Valley Drive Mississauga (Ontario) Tel.: (416) 820-6440 Fax: (416) 820-8516 Contact: W.J. Wilson	
5. Uninterrupted power supply (UPS)	1		
NOTE: ALL THE MANUFACTURERS AND SUPPLIERS CAN SUPPLY ALL THE FIVE (5) COMPONENTS			

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: SIGNALS AND COMMUNICATIONS

Description of Components	Total Requirements	Canadian Manufacturers	Canadian Suppliers
SIGNALS - WAYSIDE EQUIPMENT			
1. Wayside interface units	240	Vapor Canada Inc. 10655 Henri Bourassa W. St-Laurent (Quebec) Tel.: (514) 335-4206 Contact: Peter Buckley DSL Dynamic Science Ltd. 359 Ste-Croix Blvd. Montreal (Quebec) Tel.: (514) 744-5571 Fax: (514) 744-0053	Harmon Industries Inc.
2. Transponders	1,950	Vapor Canada Inc. DSL Dynamic Science Ltd.	Harmon Industries Inc.
3. Switch machine (dual control)	570	Union Switch & Signal General Railway Signal Safetran Corp.	
4. Housing 6' x 6'	300	Union Switch & Signal General Railway Signal	Harmon Industries Inc.

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 2.3

USED ON: SIGNALS AND COMMUNICATIONS

Description of Components	Total Requirements	Canadian Manufacturers	Canadian Suppliers
SIGNALS - WAYSIDE EQUIPMENT (cont'd)			
5. Housing 64" x 34"	270	<p>Safetran Corp.</p> <p>IEC - Holden Montreal (Quebec) Tel.: (514) 735-4371 Fax: (514) 342-3944 Contact: Bryan A. Davey</p> <p>Milrail Inc. 1812 Gagnon Lachine (Quebec) Tel.: (514) 633-8710 Fax: (514) 633-9236</p> <p>Jaychris Indus-Rail Supply Brossard (Quebec) Tel.: (514) 923-4292 Fax: (514) 923-4293</p>	
6. Hot box & dragging equipment detectors	30	<p>Servo Corporation of America 1810 Thornecrest St Gloucester (Orleans) (Ontario) Tel.: (613) 824-8662 Fax (613) 830-5426 Contact: Dennis J. Hutton</p>	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: SIGNALS AND COMMUNICATIONS

Description of Components	Total Requirements	Canadian Manufacturers	Canadian Suppliers
SIGNALS - WAYSIDE EQUIPMENT (cont'd)			
7. Track circuit transmitters (AC10QHZ)	980	Union Switch & Signal	Harmon Industries Inc.
8. Track circuit receivers (AC100HZ)	1,160	General Railway Signal	
9. Regeneratrive units (AC100HZ)	350	Safetran Corp.	
10. Insulated joints	2,930	Portec Ltd. 2044, 32nd Ave. Lachine (Quebec) Tel.: (514) 636-5590 Fax: (514) 636-5747	Allegheny Rail Product Two Gateway Centre - Suite 990 Pittsburgh, PA 15222 Tel.: (412) 391-2141 FAx: (412) 391-2147
11. Impedence bond	1,990	Union Switch & Signal General Railway Signal Safetran Corp.	
12. Switch point helpers & rollers	380	Union Switch & Signal General Railway Signal Safetran Corp.	
13. 12 VDC power supply c/w batteries	530	Union Switch & Signal General Railway Signal Jaychris Indus-Rail Supply Inc. Safetran Corp. Mitrail Inc.	Harmon Industries Inc.

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: SIGNALS AND COMMUNICATIONS

Description of Components	Total Requirements	Canadian Manufacturers	Canadian Suppliers
SIGNALS - WAYSIDE EQUIPMENT (cont'd)			
14. 120 VDC power supply c/w batteries	240	C-CAN 3600 Boul. Mate - Suite H-22 Brossard (Quebec) Tel.: (514) 444-0577 Fax: (514) 444-0581 Contact: Louis Hank	
15. Vital relays	1,710	Union Switch & Signal General Railway Signal Safetran Corp.	
COMMUNICATIONS			
1. FIBRE OPTIC	1,200 KM	Northern Telecom 105 Laurentian Blvd. St-Laurent (Quebec) Tel.: (514) 747-5531	
2. Fibre optic transmission equipment: F.O.T.S. terminus F.O.T.S. repeaters	3 29	Northern Telecom SEL-Alcatel 101 Valley Brook Dr. Don Mills (Ontario) Tel.: (416) 445-8600 Fax: (416) 441-3438	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - CANADIAN MANUFACTURERS & SUPPLIERS
Tasks 2.2 & 3.1

USED ON: SIGNALS AND COMMUNICATIONS

Description of Components	Total Requirements	Canadian Manufacturers	Canadian Suppliers
<p><u>COMMUNICATIONS (cont'd)</u></p> <p>3. Base stations complete installations for data and voice</p>	<p>30</p>	<p style="text-align: center;"><u>RADIO CONTROLLERS</u></p> <p>Motorola 3125 Steeles Avenue Willowdale (Ontario) Tel.: (416) 499-1441</p> <p>Vale Harmon Enterprises 2700 Brabant Marineau St-Laurent (Quebec) Tel.: (514) 856-1026 Fax: (514) 856-1806</p> <p style="text-align: center;"><u>TOWERS & ANTENNA</u></p> <p>Leblanc/Roy Telecom Inc. 514 Chartwell Rd. Oakville (Ontario) Tel.: (416) 844-1242 Fax: (416) 844-8837</p> <p style="text-align: center;"><u>CIRCUIT & CIRCUIT CONDITIONING</u></p> <p>Northern Telecom</p>	

LISTING OF STEEL FABRICATORS - BRIDGE

Tasks 2.2 & 3.1

Canron Ltd.
Eastern Structural Div.
100 Disco Road
Rexdale (Ontario)
M9W 1B7

John T. Hepburn Ltd.
7450 Torbram Rd.
Mississauga (Ontario)
L4T 1G9

Les Industries Supermetal
655 Blvd. Pierre Bertrand
Ville Vanier (Quebec)
G1M 2E4

Marshall Steel Co. Ltd.
807 Marshall Street
Ville de Laval (Quebec)
H7S 1J9

Structures C.Q.S. Inc.
1005 Pere Danielle Street
Trois Tivieres (Quebec)
G9A 5L2

Dominion Bridge
Fabrication Center
500 Notre Dame
P.O. Box 500
Lachine (Quebec)
H8S 2B2

Les Aciers Canam Inc.
2997 Watt Street
Parc Colbert
Ste Foy (Quebec)
G1X 3W1

Locweld Inc.
50 Iberville
Candiac (Quebec)
J5R 1J5

Niagara Structural Steel Co. Ltd.
P.O. Box 730
23 Smith Street
St-Catharines (Ontario)
E2M 3S3

APPENDIX G

**U.S. POTENTIAL MANUFACTURERS LISTED BY HSR
COMPONENTS**

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

US POWER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
CARBODY						
1. POWER CAR ASSEMBLY	2	2			Bombardier Corp. GE Transportation Systems General Motor Corp. (EMD) Morrison Knudsen Corp.	
2. STAINLESS STEEL	20,000 lbs	N/A			Falcon Stainless Waldwick, NJ 07463 Tel.: (201) 670-8300	
3. LAHT STEEL	N/A	30,000 lbs			Buffalo Speciality Products Inc. 894 Marcon Blvd Allentown, PA 18103 Tel.: (800) 247-7479 Bethlehem Steel Corp. Martin Twoer Bethlehem, PA LTV Steel (Republic) 25 T - W Prospect Ave. Cleveland (Ohio)	
4. FLOOR ASSEMBLY	2	2			BY THE CAR BUILDER	
5. THERMAL INSULATION	4,800 sq.ft.	6,000 sq.ft.			Dupont De Neymours & Co. 1007 Market St. Wilmington, DE 19898 Owens Corning Fiberglass Corp. Fiberglass Tower Toledo, OH 43659	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: POWER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
CARBODY (cont'd)						
6. FRP CAB END MOULDING	2	2			BY THE CAR BUILDER	
7. DOORS	8	8			Vapor 6420 W. Howard St. Niles, Illinois 60648 Tel.: (708) 967-8300 Knorr Brakes Wabco Air Brakes	
8. ENERGY ABSORBING END STRUCTURE	2	2			BY THE CAR BUILDER	
9. GLAZING (SET)	2	2			Corning Inc. Houghton Park Corning, NY 14830 PPG Industries 1 PPG Place Pittsburg, PA 15272 Ford Glass Div. 300 Renaissance Center Detroit, MI 48243 Elcon - National Inc. Gagenville, South Carolina 29604-9377 Sierracin-Transtech Sylmar, CA 91342	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: POWER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
TRUCKS						
1. FRAME	4	4			Bombardier Corp. 3684 Meadow Lane Bensalem, PA 19020-5914 Tel.: (215) 639-1444 GE Transportation System Erie, PA 16531 General Motor Corp. (EMD division) 9301 West 55th Street Lagrange, Ill 60625 Tel.: (708) 387-6225 Morrison Knudsen Copr. Boise, Idaho Tel.: (208) 386-5950	
2. WHEELS	16	16			Standard Steel Griffin Wheel Co. 200 W. Monroe St. Chicago, Ill 60606 Tel.: (312) 346-3300	
3. AXLES	8	8			CAE Vanguard Inc. 3500 W 80th St. Minneapolis, MN 55431 Tel.: (612) 896-3915 Viking Engineering Co. 175 W. Chicago Ave. East Chicago, IN 46312 Tel.: (312) 731-4433	
4. GEAR	N/A	8			Penn Locomotive Gear Co. 470 Roberts Ave. Louisville, KY 40214 Tel.: (502) 367-4858	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: POWER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
TRUCKS (cont'd)						
4. GEAR (cont'd)					Logan Corp. P.O. Box 58 Huntington, WY 25706 Tel.: (800) 669-1967	
5. BRAKE DISCS	16	N/A			General Motors Corp. (EMD) Wabco Air Brake P.O. Box 67 Wilmelding, PA 15148 Tel.: (412) 825-1140 Knorr Brakes Starbuck Ave. Watertown, NY 13601 Tel.: (315) 782-7000	
6. BEARINGS	16	16			Timken Railway Bearing Service 2510 Professional Rd. Richmond, VA 23235 Tel.: (800) 320-7943 Hyatt Railway Product Corp. 800 Jefferson Ave. Union, NJ 07083 Tel.: (908) 689-2900 Brenco P.O. Box 389 Petersburg, VA 23804 Tel.: (804) 732-0202	
7. GEAR (WHEEL SLIDE)	8	8			Wabco Air Brake Knorr Brakes	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: POWER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
TRUCKS (cont'd)						
8. WHEEL-AXLE ASSEMBLIES	8	8			American Allied Railway Equipment Co. Inc. 302 W. Holland St. Washington, Ill 61571 Tel.: (309) 444-4334 Burlington Northern Railroad 6600 Burlington Ave. Lincoln, NE 68507 Tel.: (402) 437-3221 Railx 1661 Dixon Airline Rd. Augusta, GA 30906 Tel.: (404) 793-8792 Standard Steel	
9. TREAD BRAKE UNIT	16	16			Wabco Air Brake Knorr Brakes	
10. CALIPER ASSEMBLY	16	N/A			Wabco Air Brake Knorr Brakes	
11 BEARING HOUSING	16	16			National Casting Inc. 110 N 25th Ave. Melrose Park, Ill 60160 Tel.: (708) 344-0675 American Steel Foundries 10 S River Side Plaza Chicago, Ill 60606 Tel.: (800) 621-8442	
12. PRIMARY SPRING SET	N/A	16			Pittsburgh Spring Inc. 1 McCandless Ave. Pittsburgh, PA 15201 Tel.: (412) 782-7300	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: POWER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
TRUCKS (cont'd)						
12. PRIMARY SPRING SET (cont'd)					Alco Spring Industries Inc. 2300 Euclid Ave. Chicago Heights, Ill 60411 Tel.: (708) 755-0438	
13. CHEVRON SPRING	16	N/A			Not manufactured in Noth America	ABB Traction Inc.
14. RUBBER DAMPERS	N/A	32			Not manufactured in Noth America	Bombardier Corp.
15. HYDRAULIC DAMPER (primary)	16	16			KONI USA 100 Alphin Lane Culpeper, VA 22701 Tel.: (703)547-3288	
16. REDUCTION GEAR UNIT	8	8			ABB Traction Inc. East 18th St. Elmira Heights, NY 14903 Tel.: (607) 732-5251 GE Transportation Systems 2901 East Lake Cook Rd. Erie, PA 16531 Tel.: (814) 895-2848 General Motors Corp. (EMD) 9301 W. 55th Street Lagrange, Ill 60525 Tel.: (708) 387-6225 AEG Westlinghouse 1501 Lebanon Church Rd. Pittsburgh, PA 15236-1491 Dana Corp. 5800 Sibley St. Chelsea, MI 48118	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: POWER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
TRUCKS (cont'd)						
16. REDUCTION GEAR UNIT (cont'd)					Twin Disc Inc. 1328 Racine St. Racine, WI 53403	
17. QUILL SHAFT	8	N/A			Truck manufacturer	
18. TRIPOD TRANS.	N/A	8			Truck manufacturer	
19. TRACTION MOTOR REDUCTION GEAR BOX	N/A	8			Same as Item #16	
20. SPRINGS (secondary)	N/A	16			Pittsburg Spring Inc. Alco Spring Industries Inc.	
21. BELLOW ASSEMBLY	8	N/A			Firestone 381 W. Wilbeth Rd. Akron, OH 44319 Tel.: (800) 282-0222	
22. LEVELLING VALVE	4	N/A			Firestone	
23. AIR TANK	4	N/A			Wabco Air Brakes Knorr Brakes	
24. TORSION BAR ASSEMBLY	4	4			Truck manufacturer	
25. TRACTION ROD	4	N/A			Truck manufacturer	
26. PIVOT ASSEMBLY	N/A	4			Truck manufacturer	
27. HYDRAULIC DAMPERS (secondary susp.)	24	8			KONI USA	
28. TRACTION MOTOR	8	8			GE Transportation System General Motors (EMD) ABB Traction Inc. AEG-Westinghouse	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: POWER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
<u>TRUCKS (cont'd)</u>						
29. TRUCK ASSEMBLY	4	4			Bombardier Corp. GE Transportation Systems General Motor Corp. (EMD division) Morrison Knudsen Copr.	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: POWER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
ELECTRICAL EQUIPMENT						
1. PANTOGRAPH	4	4			UKM Co. Inc. P.O. Box 309 Kulpsville, PA 19443 Tel.: (215) 256-4800	
2. MAIN CIRCUIT BREAKER	2	2			Wabco Air Brake Anderson Power Products 145 Newton St. Boston, Mass. 02135 Tel.: (617) 787-5880	Bombardier Corp.
3. TRANCTION EQUIPMENT (SET):	2	2			Westinghouse Electric Corp. ABB Traction	
a) Main transformer	2	N/A			ABB Traction Inc. ABB Traction Inc. GE Transportation System	Bombardier Corp.
b) Line converter	4	N/A			AEG-Westinghouse 1501 Lebanon Church Rd. Pittsburg, PA 15236-1491 Tel.: (412) 655-5335	
c) Feed back chopper	4	N/A			same as item (a)	
d) Inverter	4	N/A			same as item (a)	
e) Smoothing coil	2	N/A			same as item (a)	
f) Power electronic cooling fan	4	N/A			same as item (a)	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: POWER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
ELECTRICAL EQUIPMENT (cont'd)						
3. TRANCTION EQUIPMENT (cont'd)						
g) Main bloc	N/A	2			Not manufactured in North America	Bombardier Corp.
h) Rectifier	N/A	2			Not manufactured in North America	Bombardier Corp.
i) Power/brake switch	N/A	2			Not manufactured in North America	Bombardier Corp.
j) Cooling blower	N/A	2			Not manufactured in North America	Bombardier Corp.
k) Smoothing coil	N/A	4			Not manufactured in North America	Bombardier Corp.
l) Main transformer	N/A	2			Not manufactured in North America	Bombardier Corp.
m) Braking resistor	N/A	2			Westinghouse Electric Corp. 875 Greentree Rd. Pittsburg, PA 15220 Post Glover Resistors Inc. 167 Gap Way Erlander, KY 41018 Tel. : (606) 283-0978	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: POWER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
<u>AUXILIARY POWER</u>						
1. AUX. RECTIFIER	2	2			AEG-Westinghouse GE Transportation Systems ABB Traction	Bombardier Corp.
2. AUX. TRANSFORMER	N/A	2			same as item #1	
3. AUX. STEP DOWN CHOPPER	N/A	2			same as item #1	
4. INVERTER	2	N/A			same as item #1	
5. LOW VOLTAGE DISTRIB. PANEL	2	2			Westinghouse Electric Corp. Vapor Inc.	
6. CIRCUIT BREAKER PANEL	2	2			Westinghouse Electric Corp. Eaton Corp. 4201 N 27th St Milwaukee, WI 53218 Tel.: (414) 449-6000 ETR Circuit Breakers 7400 N. Croname Rd. Chicago, Ill. 60648	
7. CABLING	2	2			Westinghouse Electric Corp. American Wire & Cable Co. 15201 Chatfield Cleveland, Ohio 44111	
8. BATTERIES (SET)	2	2			East Penn. Mfg Co. Lyon Station, PA 19536 Yuasa-Exide Inc. 642 Penn St. Reading, PA 19612-4245 Tel.: (800) 523-8954	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: POWER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
AUXILIARY EQUIPMENT						
1. COMPRESSOR	2	2			Wabco Air Brake Knorr Brakes Ingersoll-Rand Co 200 Chestnut Ridge Rd. Woodcliff Lake, NJ 07675 Tel.: (800) 847-4041	
2. AIR DRYER	2	2			Graham-White 1242 Colorado St. Salem, Virginia Tel.: (703) 387-5620	
3. TRACTION MOTOR BLOWER	4	4			BY THE CAR BUILDER	
4. BRAKE CONTROLS	2	2			Wabco Air Brake Knorr Brakes ABB Traction	
5. POWER ELECTRONICS COOLING FANS	2	N/A			BY TRACTION EQUIPT. MANUFACTURER	
6. WHEEL SLIDE EQUIPMENT	8	8			Wabco Air Brake Knorr Brakes	
7. MAIN AIR RESERVOIR	2	2			Wabco Air Brake Knorr Brakes	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: POWER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
CAB EQUIPMENT						
1. INSTRUMENTS & GAUGES	2	2			Bach Simpson Inc. 755 Industrial Dr. Cary, Ill 60013-1900 Tel.: (708) 516-5353 Vapor	
2. CONSOLE & CABINETS	2	2			BY THE CAR BUILDER	
3. SEAT	4	4			Coach & Car Equipment Corp. 1951 Arthur Ave. Elk Grove Village, Ill. 60007 Tel.: (708) 437-5760 Jaggers 1903 Fern Valley Rd. Louisville, KY 40213 Tel.: (502) 361-2374	
4. DISTRIBUTION PANEL	2	2			Vapor G & G Locotronics Inc. 600 Wheat Lane Wood Dale, Ill 60191 Tel.: (708) 766-6947	
5. MONITORING & CONTROLS (Including computers)	2	2			Wabco Air Brakes ABB Traction Bach Simpson Inc.	
6. EVENT RECORDER	2	2			US & S Inc. P.O. Box 420 Pittsburgh, PA 15230 Tel.: (412) 366-2400 Wabco Air Brakes Quantum Engineering Inc. Jacksonville, FL 32244	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: POWER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
CAB EQUIPMENT (cont'd)						
7. HEAT - VENT. - AIR CONDITIONING	2	2			Vapor Prime Corp. 7730 S 6th St. Oak Creek, WI 53154 Tel.: (800) 657-0707	
8. PUBLIC ADDRESS	1	1			Penta Corp. P.O. Box 10530 New Orleans, LA 70181-0530 Tel.: (504) 733-1700 Wabco Air Brakes	
9. RADIO - TEL.	1	1			Harmon Industries 1300 Jefferson Court Blue Springs, MO 64015 Tel.: (816) 229-3345 Motorola 8201 E McDowell Rd. Scottsdale, AZ 85252	
10. CAB SIGNAL	2	2			General Railway Signal P.O. Box 20600 Rochester, NY 14602 Tel.: (716) 436-2020	
11. REGULATORY LIGHTS	2	2			GE Transportation Systems	
12. ATCS	1	1			Union Switch & Signal P.O. Box 420 Pittsburgh, PA 15230 Tel.: (412) 369-2399	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: POWER CARS

Description of major components	Qty requ'd per trainset			US Manufacturers	US Suppliers
	ABB	TGV	7L		
<u>CAB EQUIPMENT (cont'd)</u> 12. ATCS (cont'd)				Harris Corp. Melbourne, FL 32901 Rockwell International Cedar Rapids, Iowa 52498 General Railway Signal Vapor	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

FOOT ON: POWER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
MISC. EQUIPMENT						
1. COUPLER (Front)	2	2			Wabco Air Brakes Hadady Corp. P.O. Box 492 Lansing, Ill 60438 Tel.: (312) 474-8220	
2. COUPLER (Rear)	2	2			Hadady Corp.	
3. DIAPHRAGM	2	2			Firestone Adam & Westlake 940 N. Michigan St. Elkhart, Indiana 46514 Tel.: (219) 264-1141 Trac Products Inc. 1509 Lynnewood Drive Havertown, PA 19083 Tel.: (215) 789-7853	
4. JUMPER GABLES (SETS)	2	2			Lifton Veam 100 New Wood Rd. Watertown, CT 06795 Tel.: (203) 274-9681 Pyle National	
5. WHISTLE	2	2			Nathan Manufacturing Div. P.O. Box 427 Cold Spring Harbor, NY 11724-0927 Tel.: (516) 364-5463	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USFD ON: TRAILER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
CARBODY						
1. SHELL	8	8			ABB Traction Inc. 425 Phillips Blvd. Trenton, NJ Tel.: (609) 538-7900 Morrison Knudson P.O. Box 73 Boise, ID 83729 Tel.: (208) 386-5950 Morrison-Knudsen *	
2. DOOR SYSTEM	32	16			Vapor Co. 6420 W. Howard Str. Chicago, IL 60648 Tel.: (708) 967-8300 J.T. Nelson Co. Inc. 4003 Collins Lane Louiseville, Ky Tel.: (502) 429-8041	
3. WINDOWS	144	92			J.T. Nelson Co. Inc.	
4. STAINLESS STEEL	32,000 sq.ft.	N/A			Stainless & Alloy Supply Co. Charleston, WV Tel.: (304) 342-0155	
5. HIGH TENSILE STEEL	N/A	32,000 sq.ft.			Bethleem Steel Corp. 215 South Front St. Stelton, PA 17113	

* Morrison-Knudsen would have to acquire patent rights from Bombardier Inc. or otherwise sub-contract to Bombardier

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: TRAILER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
6. ANTI-ROLL DAMPER	N/A	18				KONI America Inc. 8085 Production Avenue Florence, KY 41042 Tel.: (606) 727-500
7. UPPER INTER-CAR DAMPER	N/A	18				KONI America Inc.
8. RUBBER DIAPHRAGM	9	N/A				POWER Parts Co. 1860 N. Wilmor Ave. Chicago, IL 60647

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON TRAILER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
TRUCKS						
1. FRAME (Weldment)	16	N/A			<p>ABB Traction Inc. 425 Philipps Blvd. Trenton, N.J. Tel.: (609) 538-7900</p> <p>ACF Industries Inc. 3301 Rider Trail South Early City, Missouri 63045 Tel.: (314) 344-4500</p> <p>Jaggers Equipment Co. 1903 Fern Valley Road Louisville, Kentucky Tel.: (502) 361-2374</p>	
2. FRAME (Weldment)	N/A	9				Bombardier Inc. (1)
3. WHEELS	64	N/A			<p>ABC Rail Corporation Tel.: (312) 322-0387</p>	<p>Griffin Wheel Co. 200 W Monroe Chicago, Illinois 60606 Tel.: (312) 346-3300</p>
4. WHEELS	N/A	36			<p>Standard Steel 500 N Walnut Street Burnham, PA 17009 Tel.: (717) 248-4911</p>	<p>Canadian Steel Wheel (2) 1900 Dickson Montreal, Québec Tel.: (514) 255-3605</p>
5. AXLES	32	18			<p>Standard Steel</p>	<p>R & W Machine & Tool Works 6551 W 74th Street - P.O. Box 666 Bedford Park, Illinois 60499-0666 Tel.: (608) 458-4200</p>

(1) Bombardier Inc. has patent rights to fabricate truck weldments for the TGV technology.

(2) Canadian Steel Wheel is the only qualified manufacturer to supply special forged wheels for the TGV technology.

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: TRAILER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
TRUCKS (cont'd)						
5. AXLES (Cont'd)	32	18			Johnstown Axle Works 100 Iron St Johnstown, PA 15906 Tel.: (814) 533-2910 Standard Forged Axles 2525 Stemmons Freeway Dallas, Texas 75207 Tel.: (214) 631-8822	ACF Industries Tel.: (314) 344-4500 Francosteel Tel.: (212) 633-1010
6. DISCS (Brake)	64	72			Knorr Brake Corporation P.O. Box 1905 Rockville, Md 20850 Tel.: (301) 424-5500	ABC Rail Corp. Tel.: (312) 322-0387
7. ROLLER BEARINGS	64	36			The Timken Co. (1) 1835 Dueber Ave. S.W. Canton, Ohio 44706-2798 Tel.: (216) 438-3000 SKF (2) 1100 First Ave. King of Prussia, PA 19406-1352 Tel.: (215) 962-4300	
8. ADAPTERS (Roller bearings)	64	36			SKF Advanced Cast Products Inc. 1332 Woodman Dr. Dayton, Ohio 45432 Tel.: (513) 256-8500	

(1) The Timken Co. is the only qualified supplier for roller bearings for the TGV technology.
(2) SKF is the only qualified supplier for roller bearings for the ABB technology.

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: TRAILER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
TRUCKS						
9. WHEELSET ASSEMBLY	32	18			Johnstown Axle Works Corp. 100 Iron Str. Johnstown, PA 15906 Tel.: (814) 533-2910 Morrison-Knudsen P.O. Box 73 Boise, ID 83729 Tel.: (208) 386-5950 ABB Traction Inc.	United Transportation Corp. (UTC) Tel.: 1-800-421-3404 American Allied Rly Equip. Tel.: (309) 444-4334
10. ANTI-HUNTING DAMPER	N/A	18				KONI Tel.: (703) 825-7591 Contact: Jim Vance
11. ANTI-PITCH DAMPER	N/A	36			Not manufactured in North America	KONI
12. LOWER ANTI-CAR DAMPER	N/A	18			Not manufactured in North America	KONI
13. LATERAL DAMPERS	64	N/A			Not manufactured in North America	KONI
14. HYDRAULIC TILT ACTUATOR	32	N/A			Not manufactured in North America	KONI
15. TILTING SWING ARM	32	N/A			American Steel Foundries One Prudential Plaza, 36th Floor 130 East Randolph Chicago, Illinois 60601 Tel.: 1-800-621-8442	
16. COIL SPRINGS	N/A	36			Pittsburgh Spring Co. One McCandless Ave. Pittsburg, PA 15201 Tel.: (412) 782-7300	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: TRAILER CARS

Description of major components	Qty requ'd per trainset		Total volume for		US Manufacturers	US Suppliers
	ABB	TGV				
TRUCKS						
16. COIL SPRINGS (cont'd)					Alco Springs Industries Inc. 2300 Euclid Ave., Chicago Heights, Illinois 60411 Tel.: (708) 755-0438	
17. RUBBER AIR SPRINGS	32	18			Firestone USA	Power Parts Co. 1860 North Wilmot Avenue Chicago, Illinois 60647 Tel.: (312) 772-4600

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: TRAILER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
BRAKING SYSTEM						
1. CONTROL VALVE	8	8			Knorr Brake Corp. P.O. Box 1905 Rockville, MD 20850 Tel.: (301) 424-5500 or (312) 419-7107 Wabco/Westinghouse Air Brake Co. P.O. Box 67 Wilmerding, PA 15148 Tel.: (412) 825-1000	
2. AIR RESERVOIR	8	8			Knorr Brake Corp. Wabco/Westinghouse Air Brake Co.	
3. AUTOMATIC BRAKE VALVE	8	8			Knorr Brake Corp. Wabco/Westinghouse Air Brake Co.	
4. BRAKE CYLINDER	64	72			Knorr Brake Corp. Wabco/Westinghouse Air Brake Co.	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: TRAILER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
CAR INTERIOR						
1. FIBREGLASS INSULATION	32,000 sq.ft.	32,000 sq.ft.			Fibre Flex Company Inc. 574 Ferry Str. Newark, NJ 07105 Tel.: (201) 465-1800	
2. WALL LAMINATION	24,000 sq.ft.	24,000 sq.ft.			Numerous manufacturers and suppliers in all major cities in the US	
3. FLOORING (Plymetal)	6,400 sq.ft.	6,400 sq.ft.			Numerous manufacturers and suppliers in all major cities in the US	
4. CARPET	6,400 sq.ft.	6,400 sq.ft.			Numerous manufacturers and suppliers in all major cities in the US	
5. SEATS	225 double 52 single	127 double 112 single			Coach & Car Equipment Corp. 1951 Arthur Ave. Elk Grove Village, Illinois 6007 Tel.: (708) 437-5760 Seats Inc. Winsconsin Tel.: (608) 524-4316	McLean Industrial Supply Co. 307 Paddock Drive Wayne, PA 19087 Tel.: (215) 647-7555
6. TOILET SYSTEM	16	8			Envirovac Inc. 1260 Turret Drive Rockford, Ill 61111 Tel.: (815) 654-8306 Power Parts Co. 1860 N. Wilmot Ave. Chicago, Ill 60647 Tel.: (312) 772-4600	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON TRAILER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
HEATING AND AIR CONDITIONING						
1. COMPRESSOR/CONDENSOR UNIT	8	8			Vapor Mark IV 6420 W. Howard Str. Chicago, IL 60648 Tel.: (708) 967-8300	
2. BLOWER FAN & EVAPORATOR COIL	8	8			Vapor Mark IV	
3. BASEBOARD HEARTERS (Electric)	200 lengths of 5 feet	200 lengths of 5 feet			Vapor Mark IV Prime Manufacturing Corp. P.O. Box 68 Oak Green, WI 53154 Tel.: (414) 754-1400	
4. THERMOSTATS	32	32			Vapor Mark IV	
5. CONTROL PANEL	8	8			Vapor Mark IV	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: TRAILER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
WATER SYSTEM						
1. STAINLESS STEEL TANK	8	8			ITEL RailCorporation 200 South Michigan Ave. Chicago, Ill. 60604 Tel.: 1-800-621-5273	
2. WATER TANK CASING	8	8			ITEL RailCorporation	
3. WATER COOLER	8	8			PRIME Manufacturing Corp. 7730 South 6th Street Oak Creek, Wisconsin 53154 Tel.: (414) 764-1400	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON- TRAILER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
EMERGENCY LIGHTING SYSTEM						
1. BATTERIES	256	256			GNB Industrial Battery Co. 829 Parkview Blvd. Lombard, Illinois 60148-3249 Tel.: (708) 629-5200 Exide Corporation/General Battery Inc. P.O. Box 14202 Reading, PA 19612-4205 Tel.: (215) 378-0810	
2. BATTERY CHARGER	8	8			Exide Corporation/General Battery Inc. Vapor Mark IV 6420 Howard St Chicago, Illinois 60648 Tel.: (708) 967-8300	
3. CONTROL PANEL	8	8			Exide Corporation/General Battery Inc. Vapor Mark IV	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - US MANUFACTURERS & SUPPLIERS
Task 4.2

USED ON: TRAILER CARS

Description of major components	Qty requ'd per trainset				US Manufacturers	US Suppliers
	ABB	TGV				
MISC. ELECTRICAL EQUIPMENT						
1. POWER JUMPER	9	9			Pyle-National of Canada Inc. 1334 N. Kostor Ave. Chicago, Illinois 60651 Tel.: (312) 342-6300 Mr. Mike Corscia Anderson Power Products 145 Newton St. Boston, Mass. 02135 Tel.: (617) 787-5880	
2. COMMUNICATION JUMPER	9	9			Pyle-National of Canada Inc. Anderson Power Products	
3. POWER RECEPTACLE	9	9			Pyle-National of Canada Inc. Anderson Power Products	
4. COMMUNICATION RECEPTACLE	9	9			Pyle-National of Canada Inc. Anderson Power Products	
5. ELECTRICAL WIRING	150,000 Lin.Ft.	150,000 Lin.Ft.			Numerous manufacturers in all major cities	
6. TRANSFORMER	8	8			ABB Traction Inc. 425 Phillips Rd. Trenton, NJ 06618 Tel.: (609) 538-0900	

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN AND US MANUFACTURERS
ELECTRIFICATION - Task 4.2

USED ON: POWER STATIONS (TGV or ABB technology)
BASED ON: 380 SUB-STATIONS

Description of Component	Quantity	Manufacturers	Catalog Model	Canadian Suppliers	American Manufacturers
1. Utility Voltage - Breaker		ABB	ASEA HLR 245-2502 (minimum oil)	ABB 5250 Ferrier Street, Room 610 Montreal (Quebec) H1P 2E1 Tel.: (514) 340-7316 GEC Alstom International Canada Inc. 9 S Place du Commerce Brossard (Quebec) J4W 2V6 Tel.: (514) 465-9795	ABB Power T & D Co. Inc. 300 N Curry Pike Bloomington, Indiana 47402 Tel.: (812) 332-42760
2. Utility Voltage - Motor Disconnect		Kearney (Canada)		Kearney National Canada Ltd. 9240 Langlier Blvd. W. St-Leonard (Quebec) H1P 2E1 Tel.: (514) 323-1274	Kearney P.O. Box 49167 Atlanta, GA 30359 Tel.: (404) 939-6011 Attn.: D. Perone
3. Utility Voltage - Lightning Arr.		ABB	ASEA Type XAF	ABB	ABB
4. Utility Voltage - L. Surge Counter		ABB	ASEA Type TXA	ABB	ABB
5. Utility Voltage - Current Transf.		Canadian Westinghouse	Type DPC	Westinghouse Canada Inc. 3365 Harvester Rd. Burlington (Ontario) L7N 3N2 Tel.: (416) 528-8811	Westinghouse Electric Corp. The Quedrangle 4400 Alafaya Trail Orlando, Florida 32826-2399 Tel.: (407) 281-2000

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN AND US MANUFACTURERS
ELECTRIFICATION - Task 4.2

USED ON: POWER STATIONS (TGV or ABB technology)
BASED ON: 380 SUB-STATIONS

Description of Component	Manufacturers	Catalog Model	Canadian Suppliers	American Manufacturers
6. Utility Voltage - Voltage Transf.	Canadian Westinghouse	Type PCA9	Westinghouse Canada Inc.	Westinghouse Electric Corp.
7. Utility Protection-Phase Overcurrent ANSI 50/51 - See Std C37.2	GEC Alstom	Type CDG 23	ABB GEC Alstom	GEC Alstom 5625-5 Kennedy Blvd. North Bergen, NJ 07047 Tel.: (800) 678-9322
8. Utility Protection-Gna Overcurrent ANSI 50/51 G	GEC Alstom	Type CTG 25	ABB GEC Alstom	GEC Alstom
9. Power Transf.	Canadian General Electric	Special Design	Canadian General Electric Co. Ltd. 2300 Meadowvale Blvd. Missaussaga (Ontario) L5N 5P9 Tel.: (416) 858-5100	GE Business Information Center One Winners Circle Albany, NY 12205 Tel.: (800) 626-2004
10. Utility Voltage - Protection P. current differentiels ANSI 87	GEC Alstom	Type GAG 14 DTH 31 DFA 4C	GEC Alstom	GEC Alstom
11. Rail Voltage - Motorized Disc	Kearney Canada	Type KMT 9A	Kearney National Canada Ltd.	Kearney
12. Transformer - Winding Tem. ANSI 49	Brown Boveri	Type 49/50/51	ABB	ABB
13. Transformer - S. current diff. ANSI 87	GEC Alstom	Type DTH 31 DFA 4C	GEC Alstom	GEC Alstom

**HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN AND US MANUFACTURERS
ELECTRIFICATION - Task 4.2**

USED ON: POWER STATIONS (TGV or ABB technology)
BASED ON: 380 SUB-STATIONS

Description of Component		Manufacturers	Catalog Model	Canadian Suppliers	American Manufacturers
14. Transformer - Rail voltage Overcurrent & time ANSI 50/51		GEC Alstom	Type GDG 13 very inverse	GEC Alstom	GEC Alstom
15. Transformer - Rail voltage Current transformer		Westinghouse	OPC 69	Westinghouse Canada Inc.	Westinghouse Electric Corp.
16. Transformer - Secondary breaker		ABB	ASEA BLG 552 TYPE HLP/1451 2501	ABB	ABB
17. Transformer - Rail voltage Voltage transformer		Westinghouse	Type APT	Westinghouse Canada Inc.	Westinghouse Electric Corp.
18. Transformer - Rail voltage Current relay directional ANSI 67		GEC Alstom	Type CCD 23	GEC Alstom	GEC Alstom
19. Sta. service - Transformer Utility voltage 120V		Canadian General Electric		Canadian General Electric Co. Ltd.	GE Business Information Center
20. Sta. service - High voltage Protection - ANSI 59		GEC Alstom	Type VDG 11	GEC Alstom	GEC Alstom

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN AND US MANUFACTURERS
ELECTRIFICATION - Task 4.2

USED ON: POWER STATIONS (TGV or ABB technology)
BASED ON: 380 SUB-STATIONS

Description of Component	380 SUB-STATIONS	Manufacturers	Catalog Model	Canadian Suppliers	American Manufacturers
21. Sta. service - LOW voltage Protection - ANSI 27		GEC Alsthom	Type VAG 70	GEC Alsthom	GEC Alsthom
22. Station service - Batteries		Exide Lead Calcium Stationery service battery		Exide	
23. Station service - Batteries Charger with grand fault & overvoltage protection and low voltage alarm		C.T.S. Canada Ltd 80 Thomas Street Streetville (Ontario) L5M 1Y9 Tel.: (416) 826-1141		Exide	
24. System control & data requisition		Glenayre		Glenayre Electronics Ltd. 1570 Kootenay North Vancouver (BC) V5K 4R1 Tel.: (604) 293-1611	Landis & Cyr 6160 Trans Canada Highway St-Laurent (Quebec) H4T 1X9 Tel.: (514) 341-3045
25. Switchyard c/w ground Mat.				Markham Electric Ltd. 215 Anderson Ave. P.O. Box 2700 Markham (Ontario) L3P 4C7 Tel.: (416) 294-9405	
26. Rail voltage - Feeder Breaker SF 6		ABB	ASEA HPL 145 1250	ABB	ABB

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN AND US MANUFACTURERS
ELECTRIFICATION - Task 4.2

USED ON: POWER STATIONS (TGV or ABB technology)
BASED ON: 380 SUB-STATIONS

Description of Component	Sub-stations	Manufacturers	Catalog Model	Canadian Suppliers	American Manufacturers
27. Rail voltage - Feeder motorized disconnect.		Kearney Canada	Type KMT 9A	Kearney National Canada Ltd.	Kearney
28. Rail voltage - Lightning Arrestors		ABB	ASEA type XAF	ABB	ABB
29. Rail voltage - Feeder protection ANSI 50/51 Inst & time overcurrent		GEC Alsthom	Type CDQ 23 very inverse	GEC Alsthom	GEC Alsthom
30. Rail voltage - Feeder protection ANSI 50/51 reverse current		GEC Alsthom	Type CTIG 19 Sta. inst. overcurr.	GEC Alsthom	GEC Alsthom
31. Rail voltage - Feeder protection Undervoltage - ANSI 27		GEC Alsthom	Type VAG 70	GEC Alsthom	GEC Alsthom
32. Rail voltage - Feeder protection Overvoltage - ANSI 59		GEC Alsthom	Type VDG 11	GEC Alsthom	GEC Alsthom
33. Rail voltage - Feeder protection Zone current		GEC Alsthom	Type YTG 14	GEC Alsthom	GEC Alsthom
34. Rail voltage - Feeder protection Reverse current		GEC Alsthom	Type VTT 14	GEC Alsthom	GEC Alsthom
35. Rail voltage - Feeder protection Voltage transformer		Westinghouse	Type APT 69	Westinghouse Canada Inc.	Westinghouse Electric Corp.

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN AND US MANUFACTURERS
ELECTRIFICATION - Task 4.2

USED ON: POWER STATIONS (TGV or ABB technology)
BASED ON: 380 SUB-STATIONS

Description of Component	Manufacturers	Catalog Model	Canadian Suppliers	American Manufacturers
36. Rail voltage - Feeder protection Current transformer	Westinghouse	Type OPC 69	Westinghouse Canada Inc.	Westinghouse Electric Corp.
37. Utility voltage - Under frequency Relay ANSI 81	ABB	Type 81	ABB	ABB
38. Utility voltage - Under voltage protection ANSI 27	GEC Alstom	Type VDG 13	GEC Alstom	GEC Alstom
39. Rail voltage - Bus current Differential protection ANSI 87	GEC Alstom	Type CAG 14	GEC Alstom	GEC Alstom
40. Rail voltage - Power factor Correction reactor	Trench electric		Trench Electric 71 Maybrook Drive Scarborough (ontario) M1V 4B6 Tel.: (416) 293-8108	
41. Rail voltage - Power factor Capacitors scts	Westinghouse		Westinghouse Canada Inc.	Westinghouse Electric Corp.
42. Rail voltage - Power factor Motorized disconnect.	Kearney Canada	Type KMT 9A	Kearney National Canada Ltd.	Kearney
43. Rail voltage - P.F. Corr. Breaker SF6	ABB	ASEAR HPL 145 2501	ABB	ABB

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN AND US MANUFACTURERS
ELECTRIFICATION - Task 4.2

USED ON: POWER STATIONS (TGV or ABB technology)
BASED ON: 380 SUB-STATIONS

Description of Component	Quantity	Manufacturers	Catalog Model	Canadian Suppliers	American Manufacturers
44. Rail voltage - P.F. Corr. Capacity fuses		Westinghouse	Cat. 5737802	Westinghouse Canada Inc.	Westinghouse Electric Corp.
45. Rail voltage - P.F. Corr. Current transformer		Westinghouse	Type OPC 69	Westinghouse Canada Inc.	Westinghouse Electric Corp.
46. Rail voltage - P.F. Corr. Overcurrent protection Time & Inst. ANSI 50/51		GEC Alstom	Type CTG 25 stock	GEC Alstom	GEC Alstom
47. Rail voltage - P.F. Corr. Current balance ANSI 60		GEC Alstom	Type DTP-C11	GEC Alstom	GEC Alstom
380. Rail voltage - P.F. Corr. Reverse current prol.		GEC Alstom	Type CTIG 19	GEC Alstom	GEC Alstom
49. Rail voltage - Harmonic filters Motorized disc, main 5th harm and high pass filters		Kearney Canada	Cat 324511-1	Kearney National Canada Ltd.	Kearney
50. Rail voltage - Filter breakers Vacuum filter & capacitors		Joslyn	VBM	Joslyn Canada Inc. 1590 - 55th Avenue Lachine (Quebec) H8T 3J5 Tel.: (514) 631-6145	Joslyn Power Products Corp. 11610 T.S. Austin Avenue Alsip, Ill 603802 Tel.: (708) 597-8190

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - CANADIAN AND US MANUFACTURERS
ELECTRIFICATION - Task 4.2

USED ON: POWER STATIONS (TGV or ABB technology)
BASED ON: 380 SUB-STATIONS

Description of Component		Manufacturers	Catalog Model	Canadian Suppliers	American Manufacturers
51. Rail voltage - Current transformer Main, 5th and high pass		Canadian General Electric	Type JKW	Canadian General Electric Co. Ltd.	GE Business Information Center
52. Station service - Transformer		Canadian General Electric		Canadian General Electric Co. Ltd.	GE Business Information Center
53. Rail voltage - Reactor 5th harmonic filters		Trench Electric		Trench Electric	
54. Rail voltage - Capacitor Sct. 5th harmonic, high pass		Westinghouse		Westinghouse Canada Inc.	Westinghouse Electric Corp.
55. Rail voltage - Overcurrent Time and inst. 50/51		Canadian General Electric	Type IAC	Canadian General Electric Co. Ltd.	GE Business Information Center
56. Rail voltage - Current balance Alarm/trip 61A/61T - Harmonic filters		Canadian General Electric	Type IAC	Canadian General Electric Co. Ltd.	GE Business Information Center

**HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - AMERICAN MANUFACTURERS
ELECTRIFICATION - Task 4.2**

USED ON: CATENARY

Description of Component			American Manufacturers
1. Contact wire (107mm long - HD copper)			Pirelli Cable Corp. 325-T Columbia Turnpike Florkam Park, NJ 07932 Tel.: (201) 377-7004
2. Messenger wire (70mm long - HD copper)			Philips Dodge Magnet Wire Co. 1302-T East Chreighton Ave. Fort Wayne, IN 46807 Tel.: (219) 458-444
3. Feeder & earth wire (4/0 ACSR)			Alcoa Fujikure Ltd. 105 West Park Drive Brentwest, TN 37027 Tel.: (615) 370-4300
4. Poles (tangent)			Pole Lite Marketing Corp. 253-1st, 8oth Avenue Floral Park, NY 11004 Tel.: (718) 347-6969
5. Poles (curves)			Pole Lite Marketing Corp.
6. Poles (double-cantilever)			Pole Lite Marketing Corp.

**HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - AMERICAN MANUFACTURERS
ELECTRIFICATION - Task 4.2**

USED ON: CATENARY

Description of Component			American Manufacturers
<p>7. Portal strut</p> <p>8. Concrete bases (300 lbs ea.)</p> <p>9. Pile foundation (HP10-50 ft @ 42#/ft)</p> <p>10. Section & overlap insulator</p> <p>11. Cantilever tubing</p> <p>12. Wire clamps</p>			<p>Pole Lite Marketing Corp.</p> <p>LOCAL MANUFACTURERS</p> <p>Foster Bldgs 415 Holiday Drive Pittsburg, PA 15220 Tel.: (412) 928-3410</p> <p>Kupler Corp. 14 T Commercial St. Branford, CT 06405 Tel.: (203) 481-3431</p> <p>Tubetech Inc. 900 East Taggart St. Dept. T East Palestine, OH 44413 Tel.: (216) 426-9476</p> <p>Delta Star Inc. 3350 Mayflower Drive Lynchburg, VA 24506 Tel.: 1-800-368-3017</p>

**HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - TOTAL REQUIREMENTS - AMERICAN MANUFACTURERS
ELECTRIFICATION - Task 4.2**

USED ON: CATENARY

Description of Component			American Manufacturers
13. Footing plates for poles (3/4" plate)			LOCAL MANUFACTURERS
14. Motorized disconnect (paralleling station)			Kearney Atlanta, GA 30359 Tel.: (404) 939-6011
15. Circuit breaker (special site)			ABB Power T & D Co. Inc. 300 N Carry Pike Bloomington, IND 47402 Tel.: (812) 332-4296
16. Rail voltage insulators			Delta Star Inc.

HIGH SPEED RAIL STUDY
LIST OF MAJOR COMPONENTS - AMERICAN SUPPLIERS
Task 4.2

Rail-Tons	Concrete-Tie Each	Fastenings Each	Turnouts Each	S.N. Heaters & Blowers Each
<p>BETHLEEM Steel Products Steelton, PA 17113 Tel.: 1-800-344-7245 Fax: 1-717-986-2700</p> <p>C F & I P.O. Box 1830 Pueblo, Colorado 81002 Tel.: (719) 561-6000</p>	<p>CX7 Incorporated Tie Division P.O Box 14968 Spokane, WA 99214</p> <p>KOPPERS 436 - 7th Ave. PITTSBURG, PA 15219 Tel.: (412) 227-2400</p>	<p>PANDROL 505 Sharptown Rd. P.O. Box 367 Bridgeport, NJ 08014 Tel.: (609) 467-3227 Fax: (609) 467-2994</p>	<p>ABB Rail Corp. 200 So Michigan Ave. Chicago, Ill 60604 Tel.: 1-800-222-2239</p> <p>A & K Railroad Materials 1505 So REdwood Rd. P.O. Box 30076 Salt Lake City, Utah 84130 Tel.: 1-800-453-8812 Fax: (801) 973-7393</p>	<p>RAIL Corp. 101 Newark Way Maplewood, NJ 07040 Tel.: (201) 763-4320 Fax: (201) 763-2585</p>

HIGH SPEED RAIL STUDY

LIST OF MAJOR COMPONENTS
TOTAL REQUIREMENTS FOR US CORRIDORS & US MANUFACTURERS

Task 4.2

USED ON: SIGNALS & COMMUNICATION

Description of Component

US Manufacturers

SIGNALS

1. Wayside interface units
2. Transponders
3. Switch machine
4. Housings 6" x 6"
5. Housings 64" x 34"
6. Hot box and dragging equipment detectors
7. AC (100Hz) track circuit transmitters
8. AC (100Hz) track circuit receivers
9. AC (100Hz) regenerative units
10. Insulated joints
11. Impedance bonds
12. Switch point helpers & rollers
13. 12 VDC power supply cpte with batteries
14. 120 VDC power supply cpte with batteries
15. Vital relays

The ATCS installation undertaken by Canadian National in British Columbia is by a consortium of:
ALCATEL Canada Inc., Sel Division, the systems integrator and supplier of on-board computers, switch controllers and central office interface computer.
MOTOROLA Canada provided the radio communication network and mobil communication packages installed on locomotives at several locations.
VAPOR Canada the computer display terminal in locomotive cabs, wayside transponders and on-board transponder interrogation systems.
The main players for the US market are:

Union Switch & Signal
5800 Corporate Drive
Pittsburg, PA 15237
Tel.: (412) 366-2400
Fax: (412) 369-2360

General Railway Signal
P.O. Box 20600
Rochester, NY 14602-0600

Digital Concepts Inc.
4232 Northern Pike, Suite 104
Monroevelt, PA 15146
Tel.: (412) 856-1919
Fax: (412) 856-7435

Harmon Industries
1300 Jefferson Court
Blue Springs, MO 64015
Tel.: (816) 229-3345
Fax: (816) 229-0556

CENTRAL MANAGEMENT SYSTEM

1. Computer assisted manual block system (camps)
2. Visual display units
3. Data communication package
4. Central safety computer
5. Uninterrupted power supply

Vapor - Mark IV
Transportation Products Grand
6426 W. Howard Str.
Chicago, Ill 60648
Tel.: (708) 967-8300

Description of Component

US Manufacturers

COMMUNICATION

1. Fibre optics	A T & T Network Systems 2000 Northeast Expressway Norcross, GA 30071 Tel.: 1-800-344-0223 ANNIXTER Bros Inc. 4700 Golfroad Skokie, Ill 60076 Tel.: (708) 677-200
2. F.O.T.S. terminals	A T & T Network Systems ANNIXTER Bros Inc.
3. F.O.T.S. repeaters	A T & T Network Systems ANNIXTER Bros Inc.
4. Base stations consisting of: <ul style="list-style-type: none">- radios & controllers- towers & antennas- circuits & circuit controllers	MOTOROLA Communication and Electronics 1301 East Algonquin Rd. Scharimbury, Ill 60196 Tel.: (708) 576-3047 HARMON Industries 1300 Jefferson Cou Blue Springs, MO 64015 Tel.: (816) 229-3345 Fax: (816) 229-0556 AEROTRON 4900 Capital Rd. Raleigh, NC 27611 Tel.: (919) 872-4400 Fax: (919) 872-8751

APPENDIX H

FORECAST OF OPERATION AND MAINTENANCE COMPONENT REQUIREMENTS

HIGH SPEED RAIL STUDY

COMPONENT REQUIREMENTS - OPERATION & MAINTENANCE

Task 2.3

USED ON: TRAILER & POWER CARS
BASED ON: 1-8-1 TRAIN CONFIGURATION FOR TGV
1-5-0 TRAIN CONFIGURATION FOR ABB

COMPONENT	USED ON	Life expectancy/ year		Nbr of components in service per trainset		Nbr of components in service 56 - trainsets - 47		Annual consumption	
		ABB	TGV	ABB	TGV	ABB	TGV	ABB	TGV
1 - Wheels	Trailer car trucks	2	4	40	36	2,240	1,692	1,120	423
2 - Roller bearings	Trailer car trucks	2	4	40	36	2,240	1,692	1,120	423
3 - Roller bearing housings	Trailer car trucks	2	4	40	36	2,240	1,692	1,120	423
4 - Axles	Trailer car trucks	6	12	20	18	1,120	846	187	71
5 - Discs	Trailer car trucks	2	4	40	72	2,240	3,384	1,130	846
6 - Anti-hunting dampers	Trailer car trucks	N/A	4	N/A	18	N/A	846	N/A	212
7 - Anti-pitch dampers	Trailer car trucks	N/A	4	N/A	36	N/A	1,692	N/A	423
8 - Lower ant-car dampers	Trailer car trucks	N/A	4	N/A	18	N/A	846	N/A	212
9 - Lateral dampers	Trailer car trucks	4	N/A	64	N/A	3,584	N/A	896	N/A
10 - Uper inter-car dampers	Trailer car trucks	N/A	4	N/A	18	N/A	846	N/A	212
11 - Anti-roll dampers	Trailer car trucks	N/A	4	N/A	18	N/A	846	N/A	212
12 - Coil springs	Trailer car trucks	N/A	6	N/A	36	N/A	1,692	N/A	282
13 - Air springs	Trailer car trucks	4	6	32	18	1,792	846	448	141
14 - Hydraulic tilt actuator	Trailer car trucks	8	N/A	32	N/A	1,792	N/A	224	N/A
15 - Door operators (motors)	Trailer car doors	7	7	32	18	1,792	846	256	121
16 - Batteries	Trailer & Power cars	7	7	256	256	14,336	12,032	2,048	1,719
17 - Thermostats	Trailer car AC system	8	8	32	32	1,792	1,504	224	188
18 - Re-circulating pump	Trailer car toilet	N/A	8	N/A	16	N/A	752	N/A	94
19 - Vacuum pump	Trailer car toilet	8	N/A	8	N/A	448	N/A	56	N/A

N/A = NOT APPLICABLE

HIGH SPEED RAIL STUDY

COMPONENT REQUIREMENTS - OPERATION & MAINTENANCE

Task 2.3

USED ON: TRAILER & POWER CARS
BASED ON: 1-8-1 TRAIN CONFIGURATION FOR TGV
1-5-0 TRAIN CONFIGURATION FOR ABB

COMPONENT	USED ON	Life expectancy/ year		Nbr of components in service per trainset		Nbr of components in service 56 - trainsets - 47		Annual consumption	
		ABB	TGV	ABB	TGV	ABB	TGV	ABB	TGV
20 - Carpet	Trailer car toilet	8	8	450 m2	450 m2	25,200 sq.m	21,150 sq.m	3,150 sq.m	2,644 sq.m
21 - Wheels	Power car trucks	3	3	8	16	448	752	149	251
22 - Wheel bearings	Power car trucks	3	3	8	16	448	752	149	251
23 - Axles	Power car trucks	3	3	4	8	224	376	75	125
24 - Brake discs	Power car trucks	3	N/A	8	N/A	448	N/A	149	N/A
25 - Hydraulic dampers	Power car trucks	4	4	20	24	1,120	1,128	280	282
26 - Suspension bellows	Power car trucks	4	N/A	4	N/A	224	N/A	56	N/A
27 - Coil springs, primary susp.	Power car trucks	N/A	2.5	N/A	16	N/A	752	N/A	301
28 - Coil springs, secondary susp.	Power car trucks	N/A	2.5	N/A	16	N/A	752	N/A	301
29 - Chevron springs	Power car trucks	5	N/A	8	N/A	448	N/A	90	N/A
30 - Rubber dampers	Power car trucks	N/A	5	N/A	32	N/A	1,504	N/A	301
31 - Traction motor - Gear sets	Power car trucks	5	5	4	8	224	376	45	75
32 - TM gear box bearings	Power car trucks	4	4	16	64	896	3,008	224	752
33 - Traction motor bearings	Power car trucks	4	4	8	16	448	752	112	188

N/A = NOT APPLICABLE